



## **Cisco IOS Quality of Service Solutions Command Reference**

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## Quality of Service Commands

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Cisco IOS quality of service (QoS) commands are used to configure quality of service, a measure of performance for a transmission system that reflects its transmission quality and service availability.

# access-list rate-limit

To configure an access list for use with committed access rate (CAR) policies, use the **access-list rate-limit** command in global configuration mode. To remove the access list from the configuration, use the **no** form of this command.

```
access-list rate-limit acl-index {precedence | mac-address | exp | mask mask}
```

```
no access-list rate-limit acl-index {precedence | mac-address | exp | mask mask}
```

## Syntax Description

<i>acl-index</i>	Access list number. To classify packets by <ul style="list-style-type: none"> <li>• IP precedence, use any number from 1 to 99</li> <li>• MAC address, use any number from 100 to 199</li> <li>• Multiprotocol Label Switching (MPLS) experimental field, use any number from 200 to 299</li> </ul>
<i>precedence</i>	IP precedence. Valid values are numbers from 0 to 7.
<i>mac-address</i>	MAC address.
<i>exp</i>	MPLS experimental field. Valid values are numbers from 0 to 7.
<b>mask</b> <i>mask</i>	Mask. Use this option if you want to assign multiple IP precedences or MPLS experimental field values to the same rate-limit access list.

## Command Default

No CAR access lists are configured.

## Command Modes

Global configuration

## Command History

Release	Modification
11.1CC	This command was introduced.
12.1(5)T	This command now includes an access list based on the MPLS experimental field.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This command was implemented on the Cisco MGX 8850 switch and the MGX 8950 switch with a Cisco MGX RPM-PR card.
12.2(4)T2	This command was implemented on the Cisco 7500 series.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Use this command to classify packets by the specified IP precedence, MAC address, or MPLS experimental field values for a particular CAR access list. You can then apply CAR policies, using the **rate-limit** command, to individual rate-limit access lists. When packets in an access list are classified in this manner, the packets with different IP precedences, MAC addresses, or MPLS experimental field values are treated differently by the CAR process.

You can specify only one command for each rate-limit access list. If you enter this command multiple times using the same access list number, the new command overwrites the previous command.

Use the **mask** keyword to assign multiple IP precedences or MPLS experimental field values to the same rate-limit list. To ascertain the **mask** value, perform the following steps.

1. Decide which precedences you want to assign to this rate-limit access list.
2. Convert the precedences or MPLS experimental field values into 8-bit numbers with each bit corresponding to one value. For example, an MPLS experimental field value of 0 corresponds to 00000001; 1 corresponds to 00000010; 6 corresponds to 01000000; and 7 corresponds to 10000000.
3. Add the 8-bit numbers for the selected MPLS experimental field values. For example, the mask for MPLS experimental field values 1 and 6 is 01000010.
4. The **access-list rate-limit** command expects hexadecimal format. Convert the binary mask into the corresponding hexadecimal number. For example, 01000010 becomes 42 and is used in the command. Any packets that have an MPLS experimental field value of 1 or 6 will match this access list.

A mask of FF matches any precedence, and 00 does not match any precedence.

**Examples**

In the following example, MPLS experimental fields with the value of 7 are assigned to the rate-limit access list 200:

```
Router(config)# access-list rate-limit 200 7
```

You can then use the rate-limit access list in a **rate-limit** command so that the rate limit is applied only to packets matching the rate-limit access list.

```
Router(config)# interface atm4/0.1 mpls
Router(config-if)# rate-limit input access-group rate-limit 200 8000 8000 8000
conform-action set-mpls-exp-transmit 4 exceed-action set-mpls-exp-transmit 0
```

**Related Commands**

Command	Description
<b>rate-limit</b>	Configures CAR and DCAR policies.
<b>show access-lists rate-limit</b>	Displays information about rate-limit access lists.

## atm-address (qos)

To specify the QoS parameters associated with a particular ATM address, use the **atm-address** command in LANE QoS database configuration mode. To revert to the default value, use the **no** form of this command.

```
atm-address atm-address [ubr+ pcr value mcr value]
```

```
no atm-address atm-address [ubr+ pcr value mcr value]
```

### Syntax Description

<i>atm-address</i>	Control ATM address.
<b>ubr+</b>	(Optional) Unspecified bit rate plus virtual channel connection (VCC).
<b>pcr</b>	(Optional) Peak cell rate (PCR).
<i>value</i>	(Optional) UBR+ pcr value in kbps.
<b>mcr value</b>	(Optional) Minimum cell rate (MCR) value in kbps

### Command Default

No default ATM address.

### Command Modes

LANE QoS database configuration

### Command History

Release	Modification
12.1(2)E	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Examples

The following example shows how to enter the required QoS parameters using PCR and MCR values on a specific ATM address. This command is entered from LANE QoS database configuration mode.

```
Router(lane-qos)# atm-address 47.0091810000000061705B0C01.00E0B0951A40.0A ubr+ pcr 500000  
mcr 100000
```

### Related Commands

Command	Description
<b>lane client qos</b>	Applies a QoS over LANE database to an interface.
<b>lane qos database</b>	Begins the process of building a QoS over LANE database.
<b>show lane qos database</b>	Displays the contents of a specific QoS over LANE database.
<b>ubr+ cos</b>	Maps a CoS value to a UBR+ VCC.

# auto discovery qos

To begin discovering and collecting data for configuring the AutoQoS for the Enterprise feature, use the **auto discovery qos** command in interface configuration mode. To stop discovering and collecting data, use the **no** form of this command.

**auto discovery qos [trust]**

**no auto discovery qos**

## Syntax Description

<b>trust</b>	(Optional) Indicates that the differentiated services code point (DSCP) markings of a packet are trust (that is, relied on) for classification of the voice, video, and data traffic.  If the optional <b>trust</b> keyword is not specified, the voice, video, and data traffic is classified using network-based application recognition (NBAR), and the packets are marked with the appropriate DSCP value.
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## Defaults

No data collection is performed.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.3(7)T	This command was introduced.
12.3(11)T	The trust mode was modified to classify packets by DSCP value rather than by protocol type.

## Usage Guidelines

The **auto discovery qos** command initiates the Auto-Discovery (data collection) phase of the AutoQoS for the Enterprise feature. This command invokes NBAR protocol discovery to collect data and analyze the traffic at the egress direction of the interface.

The **no auto discovery qos** command terminates the Auto-Discovery phase and removes any data collection reports generated.

The **trust** keyword is used for the trusted model based on the specified DSCP marking. For more information, see the “Trusted Boundary” section of the *AutoQoS for the Enterprise* feature module, Cisco IOS Release 12.3(7)T.

## Examples

The following is a sample configuration showing the Auto-Discovery (data collection) phase of the AutoQoS for the Enterprise feature enabled on a serial2/1/1 subinterface.

```
Router> enable
Router# configure terminal
Router(config)# interface serial2/1.1
```

```
Router(config-if)# frame-relay interface-dlci 58  
Router(config-if)# auto discovery qos  
Router(config-if)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>auto qos</b>	Installs the QoS class maps and policy maps created by the AutoQoS for the Enterprise feature.
<b>service policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show auto qos</b>	Displays the interface configurations, policy maps, and class maps created by AutoQoS on a specific interface or all interfaces.

# auto qos

To install the quality-of-service (QoS) class maps and policy maps created by the AutoQoS for the Enterprise feature, use the **auto qos** command in interface configuration mode. To remove the QoS policies, use the **no** form of this command.

**auto qos**

**no auto qos**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No QoS policies are installed.

**Command Modes** Interface configuration

## Command History

Release	Modification
12.3(7)T	This command was introduced.

## Usage Guidelines

The class maps and policy maps are created from the templates that are automatically generated by the AutoQoS for the Enterprise feature. These templates (and the resulting class maps and policy maps) are generated on the basis of the data collected during the Auto-Discovery phase of the AutoQoS for the Enterprise feature. For more information about the Auto-Discovery phase, see the “Configuration Phases” section of the *AutoQoS for the Enterprise* feature module, Cisco IOS Release 12.3(7)T.

The **no auto qos** command removes any AutoQoS-generated class maps and policy maps installed on the interface.

## Examples

The following is a sample configuration showing the AutoQoS for the Enterprise feature enabled on a serial2/1/1 subinterface. In this configuration, the AutoQoS class maps and policy maps will be installed on the serial2/1 interface.

```
Router> enable
Router# configure terminal
Router(config)# interface serial2/1
Router(config-if)# frame-relay interface-dlci 58
Router(config-if)# auto qos
Router(config-if)# end
```

Related Commands	Command	Description
	<b>service policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
	<b>show auto qos</b>	Displays the interface configurations, policy maps, and class maps created by AutoQoS on a specific interface or all interfaces.

# auto qos voip

To configure the AutoQoS—VoIP feature on an interface, use the **auto qos voip** command in interface configuration mode or Frame Relay DLCI configuration mode. To remove the AutoQoS—VoIP feature from an interface, use the **no** form of this command.

**auto qos voip [trust] [fr-atm]**

**no auto qos voip [trust] [fr-atm]**

## Syntax Description

<b>trust</b>	(Optional) Indicates that the differentiated services code point (DSCP) markings of a packet are trusted (relied on) for classification of the voice traffic. If the optional <b>trust</b> keyword is not specified, the voice traffic is classified using network-based application recognition (NBAR), and the packets are marked with the appropriate DSCP value.
<b>fr-atm</b>	(Optional) Enables the AutoQoS—VoIP feature for Frame-Relay-to-ATM links. This option is available on the Frame Relay data-link connection identifiers (DLCIs) for Frame-Relay-to-ATM interworking only.

## Command Default

Default mode is Disabled.

## Command Modes

Interface configuration  
Frame Relay DLCI configuration (for use with Frame Relay DLCIs)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

To enable the AutoQoS—VoIP feature for Frame-Relay-to-ATM interworking, the **fr-atm** keyword must be configured explicitly. However, the **fr-atm** keyword affects low-speed DLCIs *only*. It does not affect high-speed DLCIs.



### Note

DLCIs with link speeds lower than or equal to 768 kbps are considered low-speed DLCIs; DLCIs with link speeds higher than 768 kbps are considered high-speed DLCIs.

Depending on whether the **trust** keyword has been configured for this command, the AutoQoS—VoIP feature automatically creates one of the following two policy maps:

- “AutoQoS-Policy-Trust” (created if the **trust** keyword is configured)
- “AutoQoS-Policy-UnTrust” (created if the **trust** keyword is *not* configured)

Both of these policy maps are designed to handle the Voice over IP (VoIP) traffic on an interface or a permanent virtual circuit (PVC) and can be modified to suit the quality of service (QoS) requirements of the network. To modify these policy maps, use the appropriate Cisco IOS command.

These policy maps should not be attached to an interface or PVC by using the **service-policy** command. If the policy maps are attached in this manner, the AutoQoS—VoIP feature (that is, the policy maps, class maps, and access control lists [ACLs]) will not be removed properly when the **no auto qos voip** command is configured.

For low-speed Frame Relay DLCIs that are interconnected with ATM PVCs in the same network, the **fr-atm** keyword must be explicitly configured in the **auto qos voip** command to configure the AutoQoS—VoIP feature properly. That is, the command must be configured as **auto qos voip fr-atm**.

For low-speed Frame Relay DLCIs that are configured with Frame-Relay-to-ATM, Multilink PPP (MLP) over Frame Relay (MLPoFR) is configured automatically. The subinterface must have an IP address. When MLPoFR is configured, this IP address is removed and put on the MLP bundle. The AutoQoS—VoIP feature must also be configured on the ATM side by using the **auto qos voip** command.

The **auto qos voip** command is not supported on subinterfaces.

The **auto qos voip** command is available for Frame Relay DLCIs.

### Disabling AutoQoS—VoIP

The **no auto qos voip** command disables the AutoQoS—VoIP feature and removes the configurations associated with the feature.

When the **no auto qos voip** command is used, the **no** forms of the individual commands originally generated by the AutoQoS—VoIP feature are configured. With the use of individual **no** forms of the commands, the system defaults are reinstated. The **no** forms of the commands will be applied just as if the user had entered the commands individually. As the configuration reinstating the default setting is applied, any messages resulting from the processing of the commands are displayed.



#### Note

If you delete a subinterface or PVC (either ATM or Frame Relay PVCs) without configuring the **no auto qos voip** command, the AutoQoS—VoIP feature will not be removed properly.

### Examples

The following example shows the AutoQoS—VoIP feature configured on serial point-to-point subinterface 4/1.2. In this example, both the **trust** and **fr-atm** keywords are configured.

```
Router> enable
Router# configure terminal
Router(config)# interface serial4/1.2 point-to-point
Router(config-if)# bandwidth 100
Router(config-if)# ip address 192.168.0.0 255.255.255.0
Router(config-if)# frame-relay interface-dlci 102
Router(config-fr-dlci)# auto qos voip trust fr-atm
Router(config-fr-dlci)# end
Router(config-if)# exit
```

### Related Commands

Command	Description
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show auto qos</b>	Displays the configurations created by the AutoQoS—VoIP feature on a specific interface or all interfaces.

## auto qos voip (6500)

To configure AutoQoS on a voice over IP (VoIP) port interface, use the **auto qos voip** command in interface configuration mode. To remove AutoQoS from the configuration, use the **no** form of this command.

```
auto qos voip { cisco-phone | cisco-softphone | trust }
```

```
no auto qos voip { cisco-phone | cisco-softphone | trust }
```

### Syntax Description

<b>cisco-phone</b>	Enables the quality of service (QoS) ingress macro for the Cisco IP Phone.
<b>cisco-softphone</b>	Enables the QoS ingress macro for the Cisco IP SoftPhone.
<b>trust</b>	Specifies AutoQoS for ports trusting differentiated services code point (DSCP) and class of service (CoS) traffic markings.

### Command Default

AutoQoS trusts DSCP and CoS traffic markings.

### Command Modes

Interface configuration (config-if)

### Command History

Release	Modification
12.2(33)SXH	This command was introduced.

### Usage Guidelines

The automation of QoS (AutoQoS) allows you to specify the type of QoS parameters desired on a particular port. For example, entering the **auto qos voip cisco-softphone** command enables the QoS ingress macro for the Cisco IP SoftPhone.

The Smartports feature provides a set of tools for configuring all switch settings related to a specific application with a single command. For example, entering the **auto qos voip cisco-phone** command configures all the settings necessary to connect an IP phone to the switch.

You can enter the **show auto qos** command to display the configured AutoQoS macros.

AutoQoS and Smartports are supported on the following modules:

- WS-X6548-RJ45
- WS-X6548-RJ21
- WS-X6148-GE\_TX
- WS-X6548-GE-TX-CR
- WS-X6148-RJ45V
- WS-X6148-RJ21V
- WS-X6348-RJ45
- WS-X6348-RJ21
- WS-X6248-TEL

**Note**

The **no auto qos voip** interface configuration command does not disable QoS globally or delete the received CoS-to-internal-DSCP maps created by AutoQoS.

The **auto qos voip cisco-phone** and the **auto qos voip cisco-softphone** commands allow you to enable the inbound QoS configuration macros for AutoQoS on an interface. In some cases, the interface-specific **auto qos voip** commands also generate configuration commands that are applied globally.

You must configure the interface with the **switchport** command if you enter the **auto qos voip cisco-phone** command. You cannot configure the interface with the **switchport** command if you enter the **auto qos voip cisco-softphone** command.

If you configure an interface with the **switchport** command, AutoQoS configures the interface to trust CoS. If you do not configure the interface with the **switchport** command, AutoQoS configures the interface to trust DSCP.

AutoQoS uses a nondefault CoS-to-DSCP map. For this reason, you must configure port trust on a per-port-ASIC basis.

When you enter the **auto qos voip cisco-phone** command, the following behavior occurs:

- QoS is enabled if it is disabled.
- The port is changed to port-based QoS.
- The appropriate CoS map is set.
- All ports are changed to port-based mode (if applicable).
- A trust-CoS QoS policy is created and applied for the ports that need a trust-CoS QoS policy (COIL2 and COIL1).
- A trusted boundary is enabled on the port.
- The CoS value for a trust boundary is set to zero.
- The port trust is set to trust-cos.
- Only 10/100 ports and 10/100/1000 ports are supported.
- A warning message is displayed if the CDP version is not version 2.

When you enter the **auto qos voip cisco-softphone** command, the following behavior occurs:

- The **cisco-softphone** macro is a superset of the **cisco-phone** macro and configures all features that are required for a Cisco IP Phone to work properly on the Catalyst 6500 series switch.
- The global settings for AutoQoS policy maps, class maps, and access lists are created to classify VoIP packets and to put them in the priority queue or another low-latency queue. The interface settings are created depending on the type of interface and the link speed.
- Two rate limiters are associated with the interface on which the cisco-softphone port-based autoqos macro is executed. The two rate limiters ensure that all inbound traffic on a cisco-softphone port have the following characteristics:
  - The rate of DSCP 46 is at or less than that of the expected softphone rate.
  - The rate of DSCP 26 is at or less than the expected signaling rate.
  - All other traffic is re-marked to DSCP 0 (default traffic).

- DSCP 46 is policed at the rate of 320 kbps with a burst of 2 Kb. DSCP 26 is policed at 32 kbps with a burst of 8 Kb.
- The port is set to untrusted for all port types. The policed-dscp-map is set to ensure that DSCP 46 is marked down to DSCP 0 and DSCP 26 is marked down to DSCP 0. The default QoS IP ACL re-marks all other traffic to DSCP 0.

When you enter the **auto qos voip soft-phone** command, the following behavior occurs:

- Enables QoS if QoS is disabled.
- Changes the port to port-based QoS.
- Sets the appropriate police-dscp-map.
- Sets the appropriate CoS-to-DSCP map.
- Changes all ports to port-based mode (if applicable).
- Creates a trust-dscp QoS policy for the ports that need it (COIL2 and COIL1).
- Applies the trust-dscp QoS policy to the port (COIL2 and COIL1).
- Disables a trusted boundary on the port.
- Changes trust to untrusted.
- Allows 10/100 ports and 10/100/1000 ports only.
- Applies two rate limiters, one for DSCP 46 and one for DSCP 26 inbound traffic, and trusts only inbound DSCP 46 and DSCP 26 traffic.
- Marks violations of either rate limiter results in traffic down to DSCP 0.
- Re-marks all other (non-DSCP 26 and 46) inbound traffic to DSCP 0.

When you enter the **auto qos voip trust** command, the following applies:

- The DSCP and the CoS markings are trusted for classification of the voice traffic.
- Enables QoS if QoS is disabled.
- Changes the port to port-based QoS.
- Changes all ports to port-based mode (if applicable).
- Creates a trust-dscp and a trust-cos QoS policy for the ports that need it (COIL2 and COIL1).
- Applies the trust-dscp and a trust-cos QoS policy to the port (COIL2 and COIL1).
- Disables the trusted boundary on the port.
- Sets port trust to trust-cos.
- All ports are supported.
- Bases queueing for all ports that allow dscp-to-q mapping on DSCP. If not, queueing is based on CoS.

---

## Examples

The following example shows how to enable the QoS ingress macro for the Cisco IP Phone:

```
Router(config-if)# auto qos voip cisco-phone
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show auto qos</b>	Displays AutoQoS information.
<b>show running-config interface</b>	Displays the status and configuration of the interface.
<b>switchport</b>	Configures the LAN interface as a Layer 2 switched interface.

## bandwidth (policy-map class)

To specify or modify the bandwidth allocated for a class belonging to a policy map, or to enable ATM overhead accounting, use the **bandwidth** command in policy-map class configuration mode. To remove the bandwidth specified for a class or disable ATM overhead accounting, use the **no** form of this command.

```
bandwidth {bandwidth-kbps | remaining percent percentage | percent percentage} []
```

```
no bandwidth {bandwidth-kbps | remaining percent percentage | percent percentage} []
```

### Cisco 10000 Series Router (PRE3)

```
bandwidth {bandwidth-kbps | percent percentage | remaining percent percentage} account  
  {{{qinq | dot1q} {aal5 | aal3} {subscriber-encapsulation}} | {user-defined offset [atm]}}
```

```
no bandwidth {bandwidth-kbps | percent percentage | remaining percent percentage} account  
  {{{qinq | dot1q} {aal5 | aal3} {subscriber-encapsulation}} | {user-defined offset [atm]}}
```

### Syntax Description

<i>bandwidth-kbps</i>	Amount of bandwidth, in kilobits per second (kbps), to be assigned to the class. The amount of bandwidth varies according to the interface and platform in use.
<b>remaining percent</b> <i>percentage</i>	Percentage of guaranteed bandwidth based on a relative percent of available bandwidth. The percentage can be a number from 1 to 100.
<b>percent</b> <i>percentage</i>	Percentage of guaranteed bandwidth based on an absolute percent of available bandwidth to be set aside for the priority class. The percentage can be a number from 1 to 100.
<b>aal3</b>	Specifies the ATM Adaptation Layer 5 that supports both connectionless and connection-oriented links. You must specify either <b>aal3</b> or <b>aal5</b> .
<b>user-defined</b>	Specifies that the router is to use an offset size when calculating ATM overhead.
<i>offset</i>	Specifies the offset size when calculating ATM overhead. Valid values are from -63 to 63 bytes.  <b>Note</b> The router configures the offset size if you do not specify the <b>user-defined</b> <i>offset</i> option.
<b>atm</b>	Applies ATM cell tax in the ATM overhead calculation.  <b>Note</b> Configuring both the <i>offset</i> and <b>atm</b> options adjusts the packet size to the offset size and then adds ATM cell tax.

### Command Default

No bandwidth is specified.  
ATM overhead accounting is disabled.

### Command Modes

Policy-map class configuration (config-pmap-c)

**Command History**

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE and was implemented on Versatile Interface Processor (VIP)-enabled Cisco 7500 series routers.
12.0(7)T	The <b>percent</b> keyword was added.
12.0(17)SL	This command was introduced on the Cisco 10000 series router.
12.0(22)S	Support for the <b>percent</b> keyword was added on the Cisco 10000 series router.
12.0(23)SX	Support for the <b>remaining percent</b> keyword was added on the Cisco 10000 series router.
12.1(5)T	This command was implemented on VIP-enabled Cisco 7500 series routers.
12.2(2)T	The <b>remaining percent</b> keyword was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(31)SB	This command was implemented on the Cisco 10000 series routers.
12.2(31)SB2	This command was introduced on the PRE3 for the Cisco 10000 series router, and was enhanced for ATM overhead accounting on the Cisco 10000 series router for the PRE3.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(31)SB6	This command was enhanced to specify an offset size when calculating ATM overhead and was implemented on the Cisco 10000 series router for the PRE3.
12.2(33)SRC	Support for the Cisco 7600 series router was added.
12.2(33)SB	Support for the Cisco 7300 series router was added.

**Usage Guidelines**

You should use the **bandwidth** command when you configure a policy map for a class defined by the **class-map** command. The **bandwidth** command specifies the bandwidth for traffic in that class. Class-based weighted fair queueing (CBWFQ) derives the weight for packets belonging to the class from the bandwidth allocated to the class. CBWFQ then uses the weight to ensure that the queue for the class is serviced fairly.

**Specifying Bandwidth as a Percentage for All Supported Platforms Except the Cisco 10000 Series Routers**

Besides specifying the amount of bandwidth in kilobits per second (kbps), you can specify bandwidth as a percentage of either the available bandwidth or the total bandwidth. During periods of congestion, the classes are serviced in proportion to their configured bandwidth percentages. The bandwidth percentage is based on the interface bandwidth or when used in a hierarchical policy. Available bandwidth is equal to the interface bandwidth minus the sum of all bandwidths reserved by the Resource Reservation Protocol (RSVP) feature, the IP RTP Priority feature, and the low latency queueing (LLQ) feature.

**Note**

It is important to remember that when the **bandwidth remaining percent** command is configured, hard bandwidth guarantees may not be provided and only relative bandwidths are assured. That is, class bandwidths are always proportional to the specified percentages of the interface bandwidth. When the

link bandwidth is fixed, class bandwidth guarantees are in proportion to the configured percentages. If the link bandwidth is unknown or variable, the router cannot compute class bandwidth guarantees in kbps.

### Specifying Bandwidth as a Percentage for the Cisco 10000 Series Routers

Besides specifying the amount of bandwidth in kilobits per second (kbps), you can specify bandwidth as a percentage of either the available bandwidth or the total bandwidth. During periods of congestion, the classes are serviced in proportion to their configured bandwidth percentages. The minimum bandwidth percentage is based on the nearest parent shape rate.



#### Note

It is important to remember that when the **bandwidth remaining percent** command is configured, hard bandwidth guarantees may not be provided and only relative bandwidths are assured. That is, class bandwidths are always proportional to the specified percentages of the interface bandwidth. When the link bandwidth is fixed, class bandwidth guarantees are in proportion to the configured percentages. If the link bandwidth is unknown or variable, the router cannot compute class bandwidth guarantees in kbps.

The router converts the specified bandwidth to the nearest multiple of 1/255 (ESR–PRE1) or 1/65,535 (ESR–PRE2) of the interface speed. Use the **show policy-map interface** command to display the actual bandwidth.

### Restrictions for All Supported Platforms

The following restrictions apply to the **bandwidth** command:

- The amount of bandwidth configured should be large enough to also accommodate Layer 2 overhead.
- A policy map can have all the class bandwidths specified in kbps or all the class bandwidths specified in percentages, but not a mix of both in the same class. However, the unit for the **priority** command in the priority class can be different from the bandwidth unit of the nonpriority class.
- When the **bandwidth percent** command is configured, and a policy map containing class policy configurations is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed. If a policy map cannot be attached to a particular interface because of insufficient interface bandwidth, the policy is removed from all interfaces to which it was successfully attached. This restriction does not apply to the **bandwidth remaining percent** command.

For more information on bandwidth allocation, see the “Congestion Management Overview” module in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Note that when the policy map containing class policy configurations is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed. If a policy map cannot be attached to a particular interface because of insufficient interface bandwidth, then the policy is removed from all interfaces to which it was successfully attached.

### Modular QoS Command-Line Interface Queue Limits

The **bandwidth** command can be used with the Modular Quality of Service Command-line Interface (MQC) to specify the bandwidth for a particular class. When used with the MQC, the **bandwidth** command uses a default queue limit for the class. This queue limit can be modified using the **queue-limit** command, thereby overriding the default set by the **bandwidth** command.

**Note**

To meet the minimum bandwidth guarantees required by interfaces, it is especially important to modify the default queue limit of high-speed interfaces by using the **queue-limit** command.

**Cisco 10000 Series Router**

The Cisco 10000 series router supports the **bandwidth** command on outbound interfaces only. It does not support this command on inbound interfaces.

On the PRE2, you specify a bandwidth value and a unit for the bandwidth value. Valid values for the bandwidth are from 1 to 2488320000 and units are bps, kbps, mbps, gbps. The default unit is kbps. For example, the following commands configure a bandwidth of 10000 bps and 10000 kbps on the PRE2:

```
bandwidth 10000 bps
```

```
bandwidth 10000
```

On the PRE3, you only specify a bandwidth value. Because the unit is always kbps, the PRE3 does not support the *unit* argument. Valid values are from 1 to 2000000. For example, the following command configures a bandwidth of 128,000 kbps on the PRE3:

```
bandwidth 128000
```

The PRE3 accepts the PRE2 **bandwidth** command only if the command is used without the *unit* argument. The PRE3 rejects the PRE2 **bandwidth** command if the specified bandwidth is outside the valid PRE3 bandwidth value range (1 to 2000000).

Besides specifying the amount of bandwidth in kilobits per second (kbps), you can specify bandwidth as a percentage of either the available bandwidth or the total bandwidth. During periods of congestion, the classes are serviced in proportion to their configured bandwidth percentages. The bandwidth percentage is based on the interface bandwidth or when used in a hierarchical policy the minimum bandwidth percentage is based on the nearest parent shape rate.

**Note**

It is important to remember that when the **bandwidth remaining percent** command is configured, hard bandwidth guarantees may not be provided and only relative bandwidths are assured. Class bandwidths are always proportional to the specified percentages of the interface bandwidth. When the link bandwidth is fixed, class bandwidth guarantees are in proportion to the configured percentages. If the link bandwidth is unknown or variable, the router cannot compute class bandwidth guarantees in kbps.

The router converts the specified bandwidth to the nearest multiple of 1/255 (PRE1) or 1/65535 (PRE2, PRE3) of the interface speed. Use the **show policy-map interface** command to display the actual bandwidth.

**Usage Guidelines for Overhead Accounting for ATM (Cisco 10000 Series Router)**

When configuring ATM overhead accounting, you must specify the BRAS-DSLAM, DSLAM-CPE, and subscriber line encapsulation types. The router supports the following subscriber line encapsulation types:

- snap-rbe
- mux-rbe
- snap-dot1q-rbe
- mux-dot1q-rbe
- snap-pppoa

- mux-pppoa
- snap-1483routed
- mux-1483routed

The user-defined offset values must match for the child and parent policies.

## Examples

### Cisco 10000 Series Router: Example

In the following example, the policy map named VLAN guarantees 30 percent of the bandwidth to the class named Customer1 and 60 percent of the bandwidth to the class named Customer2. If you apply the VLAN policy map to a 1-Mbps link, 300 kbps (30 percent of 1 Mbps) is guaranteed to class Customer1 and 600 kbps (60 percent of 1 Mbps) is guaranteed to class Customer2, with 100 kbps remaining for the class-default class. If the class-default class does not need additional bandwidth, the unused 100 kbps is available for use by class Customer1 and class Customer2. If both classes need the bandwidth, they share it in proportion to the configured rates. In this example, the sharing ratio is 30:60 or 1:2:

```
Router(config)# policy-map VLAN
Router(config-pmap)# class Customer1
Router(config-pmap-c)# bandwidth percent 30
Router(config-pmap-c)# exit
Router(config-pmap)# class Customer2
Router(config-pmap-c)# bandwidth percent 60
```

### CBWFQ Bandwidth Guarantee: Example

The following example creates a policy map with two classes, shows how bandwidth is guaranteed when only CBWFQ is configured, and attaches the policy to serial interface 3/2/1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# bandwidth percent 50
Router(config-pmap-c)# exit
Router(config-pmap)# class class2
Router(config-pmap-c)# bandwidth percent 25
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface serial3/2/1
Router(config-if)# service output policy1
Router(config-if)# end
```

The following output from the **show policy-map** command shows the configuration for the policy map called policy1:

```
Router# show policy-map policy1

Policy Map policy1
Class class1
  Weighted Fair Queueing
  Bandwidth 50 (%) Max Threshold 64 (packets)
Class class2
  Weighted Fair Queueing
  Bandwidth 25 (%) Max Threshold 64 (packets)
```

The output from the **show policy-map interface** command shows that 50 percent of the interface bandwidth is guaranteed for the class called class1, and 25 percent is guaranteed for the class called class2. The output displays the amount of bandwidth as both a percentage and a number of kbps.

```
Router# show policy-map interface serial3/2

Serial3/2
```

```

Service-policy output:policy1

Class-map:class1 (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match:none
  Weighted Fair Queueing
    Output Queue:Conversation 265
    Bandwidth 50 (%)
    Bandwidth 772 (kbps) Max Threshold 64 (packets)
    (pkts matched/bytes matched) 0/0
    (depth/total drops/no-buffer drops) 0/0/0

Class-map:class2 (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match:none
  Weighted Fair Queueing
    Output Queue:Conversation 266
    Bandwidth 25 (%)
    Bandwidth 386 (kbps) Max Threshold 64 (packets)
    (pkts matched/bytes matched) 0/0
    (depth/total drops/no-buffer drops) 0/0/0

Class-map:class-default (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match:any

```

In this example, serial interface 3/2 has a total bandwidth of 1544 kbps. During periods of congestion, 50 percent (or 772 kbps) of the bandwidth is guaranteed to the class called class1, and 25 percent (or 386 kbps) of the link bandwidth is guaranteed to the class called class2.

### CBWFQ and LLQ Bandwidth Allocation: Example

In the following example, the interface has a total bandwidth of 1544 kbps. During periods of congestion, 50 percent (or 772 kbps) of the bandwidth is guaranteed to the class called class1, and 25 percent (or 386 kbps) of the link bandwidth is guaranteed to the class called class2.

The following sample output from the **show policy-map** command shows the configuration of a policy map called p1:

```

Router# show policy-map p1

Policy Map p1
  Class voice
    Weighted Fair Queueing
      Strict Priority
      Bandwidth 500 (kbps) Burst 12500 (Bytes)
  Class class1
    Weighted Fair Queueing
      Bandwidth remaining 50 (%) Max Threshold 64 (packets)
  Class class2
    Weighted Fair Queueing
      Bandwidth remaining 25 (%) Max Threshold 64 (packets)

```

The following output from the **show policy-map interface** command on serial interface 3/2 shows that 500 kbps of bandwidth is guaranteed for the class called voice1. The classes called class1 and class2 receive 50 percent and 25 percent of the remaining bandwidth, respectively. Any unallocated bandwidth is divided proportionally among class1, class2, and any best-effort traffic classes.

**Note**

In this sample output (unlike many of the others earlier in this section), the bandwidth is displayed only as a percentage for class 1 and class 2. Bandwidth expressed as a number of kbps is not displayed because the **percent** keyword was used with the **bandwidth remaining** command. The **bandwidth remaining percent** command allows you to allocate bandwidth as a relative percentage of the total bandwidth available on the interface.

```
Router# show policy-map interface serial3/2

Serial3/2

Service-policy output:pl

  Class-map:voice (match-all)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match:ip precedence 5
    Weighted Fair Queueing
      Strict Priority
      Output Queue:Conversation 264
      Bandwidth 500 (kbps) Burst 12500 (Bytes)
      (pkts matched/bytes matched) 0/0
      (total drops/bytes drops) 0/0

  Class-map:class1 (match-all)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match:none
    Weighted Fair Queueing
      Output Queue:Conversation 265
      Bandwidth remaining 50 (%) Max Threshold 64 (packets)
      (pkts matched/bytes matched) 0/0
      (depth/total drops/no-buffer drops) 0/0/0

  Class-map:class2 (match-all)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match:none
    Weighted Fair Queueing
      Output Queue:Conversation 266
      Bandwidth remaining 25 (%) Max Threshold 64 (packets)
      (pkts matched/bytes matched) 0/0
      (depth/total drops/no-buffer drops) 0/0/0

  Class-map:class-default (match-any)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match:any
```

**Traffic Shaping Overhead Accounting for ATM: Example**

When a parent policy has ATM overhead accounting enabled, you are not required to enable ATM overhead accounting on a child traffic class that does not contain the **bandwidth** or **shape** command. In the following configuration example, ATM overhead accounting is enabled for bandwidth on the gaming and class-default class of the child policy map named `subscriber_classes` and on the class-default class of the parent policy map named `subscriber_line`. The `voip` and `video` classes do not have ATM overhead accounting explicitly enabled; these priority queues have overhead accounting implicitly enabled because ATM overhead accounting is enabled on the parent policy. Notice that the features in the parent and child policies use the same encapsulation type.

```
Router(config)# policy-map subscriber_classes
```

```

Router(config-pmap)# class voip
Router(config-pmap-c)# priority level 1
Router(config-pmap-c)# police 8000
Router(config-pmap-c)# exit
Router(config-pmap)# class video
Router(config-pmap-c)# priority level 2
Router(config-pmap-c)# police 20
Router(config-pmap-c)# exit
Router(config-pmap)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80 account aal5 snap-rbe-dot1q
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20 account aal5 snap-rbe-dot1q
Router(config-pmap-c)# policy-map subscriber_line
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10 account aal5 snap-rbe-dot1q
Router(config-pmap-c)# shape average 512 account aal5 snap-rbe-dot1q
Router(config-pmap-c)# service policy subscriber_classes

```

In the following example, the r

```

Router(config)# policy-map child
Router(config-pmap)# class class1
Router(config-pmap-c)# bandwidth 500 account user-defined 20 atm
Router(config-pmap-c)# exit
Router(config-pmap)# class class2
Router(config-pmap-c)# shape average 30000 account user-defined 20 atm
Router(config-pmap)# exit
Router(config)# exit
Router(config)# Router(config-pmap)#Router(config-pmap-c)#Router(config-pmap-c)# Router(co
nfig-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# Router(config-if)# Router(config-if)# end

```

## Related Commands

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>max-reserved-bandwidth</b>	Changes the percent of interface bandwidth allocated for CBWFQ, LLQ, and IP RTP Priority.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>priority</b>	Specifies the priority of a class of traffic belonging to a policy map.
<b>queue-limit</b>	Specifies or modifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP precedence.

<b>Command</b>	<b>Description</b>
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# bandwidth remaining ratio

To specify a bandwidth-remaining ratio for class-level or subinterface-level queues to be used during congestion to determine the amount of excess bandwidth (unused by priority traffic) to allocate to nonpriority queues, use the **bandwidth remaining ratio** command in policy-map class configuration mode. To remove the bandwidth-remaining ratio, use the **no** form of this command.

**bandwidth remaining ratio** *ratio*

**no bandwidth remaining ratio** *ratio*

## Cisco 7300 Series Router, Cisco 7600 Series Router, and Cisco 10000 Series Router

**bandwidth remaining ratio** *ratio* [**account** {**qinq** | **dot1q**} [**aal5**] {*subscriber-encapsulation* | **user-defined** *offset*}]

**no bandwidth remaining ratio** *ratio* [**account** {**qinq** | **dot1q**} [**aal5**] {*subscriber-encapsulation* | **user-defined** *offset*}]

## Cisco ASR 1000 Series Router

**bandwidth remaining ratio** *ratio*

**no bandwidth remaining ratio** *ratio*

### Syntax Description

<i>ratio</i>	Relative weight of this subinterface or class queue with respect to other subinterfaces or class queues. Valid values are from 1 to 1000. At the subinterface level, the default value is platform dependent. At the class queue level, the default is 1.
<b>Cisco 7300 Series Router, Cisco 7600 Series Router, and Cisco 10000 Series Router</b>	
<i>ratio</i>	Relative weight of this subinterface or class queue with respect to other subinterfaces or class queues.  <b>Note</b> For the Cisco 7300 series router and 7600 series router, valid values are from 1 to 10000, and the default value is 1.  <b>Note</b> For the Cisco 10000 series router, valid values are from 1 to 1000, and the default is 1.
<b>account</b>	(Optional) Enables ATM overhead accounting.
<b>qinq</b>	(Optional) Specifies queue-in-queue encapsulation as the BRAS-DSLAM encapsulation type.
<b>dot1q</b>	(Optional) Specifies IEEE 802.1Q VLAN encapsulation as the BRAS-DSLAM encapsulation type.
<b>aal5</b>	(Optional) Specifies the ATM adaptation layer 5 that supports connection-oriented variable bit rate (VBR) services.
<i>subscriber-encapsulation</i>	(Optional) Specifies the encapsulation type at the subscriber line. Encapsulation type varies according to subscriber line.

<b>user-defined</b> <i>offset</i>	(Optional) Specifies the offset size, in bytes, that the router uses when calculating the ATM overhead.
<b>Note</b>	For the Cisco 7300 series router and 7600 series router, valid values are from -48 to +48.
<b>Note</b>	For the Cisco 10000 series router, valid values are from -63 to +63.
<b>Cisco ASR 1000 Series Routers</b>	
<i>ratio</i>	Relative weight of this subinterface or class queue with respect to other subinterfaces or class queues. Valid values are from 1 to 1000. At the subinterface level and class-queue level, the default is 1.

**Command Default**

For most platforms, the default bandwidth ratio is 1.

**Cisco 10000 Series Router**

When using default bandwidth-remaining ratios at the subinterface level, the Cisco 10000 series router distinguishes between interface types. At the subinterface level, the default bandwidth-remaining ratio is 1 for VLAN subinterfaces and Frame Relay DLCIs. For ATM subinterfaces, the router computes the default bandwidth-remaining ratio based on the subinterface speed.

When using default bandwidth-remaining ratios at the class level, the Cisco 10000 series router makes no distinction between interface types. At the class level, the default bandwidth-remaining ratio is 1.

**Command Modes**

Policy-map class (config-pmap-c)

**Command History**

Release	Modification
12.2(31)SB2	This command was introduced and implemented on the Cisco 10000 series router for the PRE3.
12.2(33)SRC	This command was implemented on the Cisco 7600 series router. Additional keywords and arguments were added to support ATM overhead accounting (optional) on the Cisco 7600 series router and the Cisco 10000 series router for the PRE3.
12.2(33)SB	Support for the Cisco 7300 series router was added. The additional keyword and arguments associated with ATM overhead accounting are also supported.
Cisco IOS XE 2.1	This command integrated into Cisco IOS XE Release 2.1 and was implemented on the Cisco ASR 1000 series router.

**Usage Guidelines****Cisco 10000 Series Router**

The scheduler uses the ratio specified in the **bandwidth remaining ratio** command to determine the amount of excess bandwidth (unused by priority traffic) to allocate to a class-level queue or a subinterface-level queue during periods of congestion. The scheduler allocates the unused bandwidth relative to other queues or subinterfaces.

The **bandwidth remaining ratio** command cannot coexist with another **bandwidth** command in different traffic classes of the same policy map. For example, the following configuration is not valid and causes an error message to display:

```
policy-map Prec1
  class precedence_0
    bandwidth remaining ratio 10
  class precedence_2
    bandwidth 1000
```

For the PRE2, the **bandwidth remaining ratio** command can coexist with another **bandwidth** command in the same class of a policy map. On the PRE3, the **bandwidth remaining ratio** command cannot coexist with another **bandwidth** command in the same class. For example, the following configuration is not valid on the PRE3 and causes an error message to display:

```
policy-map Prec1
  class precedence_0
    bandwidth 1000
    bandwidth remaining ratio 10
```

In a hierarchical policy map in which the parent policy has only the class-default class defined with a child queuing policy applied, the router accepts only the **bandwidth remaining ratio** form of the **bandwidth** command in the class-default class.

The **bandwidth remaining ratio** command cannot coexist with the **priority** command in the same class. For example, the following configuration is not valid and causes an error message to display:

```
policy-map Prec1
  class precedence_1
    priority
    police percent 30
    bandwidth remaining ratio 10
```

All of the queues for which the **bandwidth remaining ratio** command is not specified receive the platform-specified minimum bandwidth-remaining ratio. The router determines the minimum committed information rate (CIR) based on the configuration.

#### ATM Overhead Accounting (Optional)

The **bandwidth remaining ratio** command can also be used to enable ATM overhead accounting. To enable ATM overhead accounting, use the **account** keyword and the subsequent keywords and arguments as documented in the Syntax Description table.

## Examples

### Cisco 7300 Series Router, Cisco 7600 Series Router, and Cisco 10000 Series Router

The following example shows how to configure a bandwidth-remaining ratio on an ATM subinterface. In the example, the router guarantees a peak cell rate of 50 Mbps for the variable bit rate-non-real time (VBR-nrt) PVC 0/200. During periods of congestion, the subinterface receives a share of excess bandwidth (unused by priority traffic) based on the bandwidth-remaining ratio of 10, relative to the other subinterfaces configured on the physical interface.

```
policy-map Child
  class precedence_0
    bandwidth 10000
  class precedence_1
    shape average 100000
    bandwidth 100
!
policy-map Parent
  class class-default
```

```

    bandwidth remaining ratio 10
    shape average 20000000
    service-policy Child
!
interface ATM2/0/3.200 point-to-point
ip address 10.20.1.1 255.255.255.0
pvc 0/200
protocol ip 10.20.1.2
vbr-nrt 50000
encapsulation aal5snap
service-policy output Parent

```

The following example shows how to configure bandwidth remaining ratios for individual class queues. Some of the classes configured have bandwidth guarantees and a bandwidth-remaining ratio explicitly specified. When congestion occurs within a subinterface level, the class queues receive excess bandwidth (unused by priority traffic) based on their class-level bandwidth-remaining ratios: 20, 30, 120, and 100, respectively for the precedence\_0, precedence\_1, precedence\_2, and precedence\_5 classes. Normally, the precedence\_3 class (without a defined ratio) would receive bandwidth based on the bandwidth-remaining ratio of the class-default class defined in the Child policy. However, in the example, the Child policy does not define a class-default bandwidth remaining ratio, therefore, the router uses a ratio of 1 to allocate excess bandwidth to precedence\_3 traffic.

```

policy-map Child
class precedence_0
  shape average 100000
  bandwidth remaining ratio 20
class precedence_1
  shape 10000
  bandwidth remaining ratio 30
class precedence_2
  shape average 200000
  bandwidth remaining ratio 120
class precedence_3
  set ip precedence 3
class precedence_5
  set ip precedence 5
  bandwidth remaining ratio 100
policy-map Parent
class class-default
  bandwidth remaining ratio 10
  service-policy Child
!
interface GigabitEthernet 2/0/1.10
encapsulation dot1q 10
service-policy output Parent

```

### Overhead Accounting: Example

The following example shows how to configure overhead accounting by using the optional **account** keyword and associated keywords and arguments.

```

policy-map subscriber_line
class class-default
  bandwidth remaining ratio 10 account aal5 snap-rbe-dot1q
  shape average 512 account dot1q aal5 snap-rbe-dot1q
  service policy subscriber_classes

```

Related Commands	Command	Description
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps. If configured, the command output includes information about ATM overhead accounting and bandwidth-remaining ratios, used to determine a queue's fair share of excess bandwidth during congestion.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface. If configured, the command output includes information about bandwidth-remaining ratios, used to determine a queue's fair share of excess bandwidth during congestion.

# bump

To configure the bumping rules for a virtual circuit (VC) class that can be assigned to a VC bundle, use the **bump** command in VC-class configuration mode. To remove the explicit bumping rules for the VCs assigned to this class and return to the default condition of implicit bumping, use the **no bump explicit** command or the **bump implicit** command. To specify that the VC bundle members do not accept any bumped traffic, use the **no** form of this command.

To configure the bumping rules for a specific VC or permanent virtual circuit (PVC) member of a bundle, use the **bump** command in bundle-vc or SVC-bundle-member configuration mode. To remove the explicit bumping rules for the VC or PVC bundle member and return to the default condition of implicit bumping, use the **bump implicit** command. To specify that the VC or PVC bundle member does not accept any bumped traffic, use the **no bump traffic** command.

**bump** { **explicit** *precedence-level* | **implicit** | **traffic** }

**no bump** { **explicit** *precedence-level* | **implicit** | **traffic** }

## Syntax Description

<b>explicit</b> <i>precedence-level</i>	Specifies the precedence level to which traffic on a VC or PVC will be bumped when the VC or PVC goes down. Valid values for the <i>precedence-level</i> argument are numbers from 0 to 7.
<b>implicit</b>	Applies the implicit bumping rule, which is the default, to a single VC or PVC bundle member or to all VCs in the bundle (VC-class mode). The implicit bumping rule stipulates that bumped traffic is to be carried by a VC or PVC with a lower precedence level.
<b>traffic</b>	Specifies that the VC or PVC accepts bumped traffic (the default condition). The <b>no</b> form stipulates that the VC or PVC does not accept any bumped traffic.

## Command Default

Implicit bumping  
Permit bumping (VCs accept bumped traffic)

## Command Modes

VC-class configuration (for a VC class)  
Bundle-vc configuration (for an ATM VC bundle member)  
SVC-bundle-member configuration (for an SVC bundle member)

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(4)T	This command was made available in SVC-bundle-member configuration mode.
12.0(23)S	This command was made available in VC-class and bundle-vc configuration modes on the 8-port OC-3 STM-1 ATM line card for Cisco 12000 series Internet routers.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S and implemented on the Cisco 10000 series router.

Release	Modification
12.2(16)BX	This command was implemented on the ESR-PRE2.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Use the **bump** command in bundle-vc configuration mode (for an ATM VC bundle member) or SVC-bundle-member configuration mode (for an SVC bundle member) to configure bumping rules for a discrete VC or PVC bundle member. Use the **bump** command in VC-class configuration mode to configure a VC class that can be assigned to a bundle member.

The effects of different bumping configuration approaches are as follows:

- **Implicit bumping:** If you configure implicit bumping, bumped traffic is sent to the VC or PVC configured to handle the next lower precedence level. When the original VC or PVC that bumped the traffic comes back up, the traffic that it is configured to carry is restored to it. If no other positive forms of the **bump** command are configured, the **bump implicit** command takes effect.
- **Explicit bumping:** If you configure a VC or PVC with the **bump explicit** command, you can specify the precedence level to which traffic will be bumped when that VC or PVC goes down, and the traffic will be directed to a VC or PVC mapped with that precedence level. If the VC or PVC that picks up and carries the traffic goes down, the traffic is subject to the bumping rules for that VC or PVC. You can specify only one precedence level for bumping.
- **Permit bumping:** The VC or PVC accepts bumped traffic by default. If the VC or PVC has been previously configured to reject bumped traffic, you must use the **bump traffic** command to return the VC or PVC to its default condition.
- **Reject bumping:** To configure a discrete VC or PVC to reject bumped traffic when the traffic is directed to it, use the **no bump traffic** command.



#### Note

When no alternative VC or PVC can be found to handle bumped traffic, the bundle is declared down. To avoid this occurrence, configure explicitly the bundle member VC or PVC that has the lowest precedence level.

To use this command in VC-class configuration mode, you must enter the **vc-class atm** global configuration command before you enter this command.

To use this command to configure an individual bundle member in bundle-VC configuration mode, first issue the **bundle** command to enter bundle configuration mode for the bundle to which you want to add or modify the VC member to be configured. Then use the **pvc-bundle** command to specify the VC to be created or modified and enter bundle-vc configuration mode.

This command has no effect if the VC class that contains the command is attached to a standalone VC; that is, if the VC is not a bundle member. In this case, the attributes are ignored by the VC.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next-highest precedence):

- VC configuration in bundle-vc mode
- Bundle configuration in bundle mode (with the effect of assigned VC-class configuration)
- Subinterface configuration in subinterface mode

## Examples

The following example configures the class called “five” to define parameters applicable to a VC in a bundle. If the VC goes down, traffic will be directed (bumped explicitly) to a VC mapped with precedence level 7.

```
vc-class atm five
ubr 5000
precedence 5
bump explicit 7
```

The following example configures the class called “premium-class” to define parameters applicable to a VC in a bundle. Unless overridden with a bundle-vc **bump** configuration, the VC that uses this class will not allow other traffic to be bumped onto it.

```
vc-class atm premium-class
no bump traffic
bump explicit 7
```

## Related Commands

Command	Description
<b>bundle</b>	Enters bundle configuration mode to create a bundle or modify an existing bundle.
<b>class</b>	Assigns a map class or VC class to a PVC or PVC bundle member.
<b>class-vc</b>	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
<b>dscp (frame-relay vc-bundle-member)</b>	Specifies the DSCP value or values for a specific Frame Relay PVC bundle member.
<b>precedence</b>	Configures precedence levels for a VC or PVC class that can be assigned to a VC or PVC bundle and thus applied to all members of that bundle.
<b>protect</b>	Configures a VC or PVC class with protected group or protected VC or PVC status for application to a VC or PVC bundle member.
<b>pvc-bundle</b>	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.
<b>pvc (frame-relay vc-bundle)</b>	Creates a PVC and PVC bundle member and enters frame-relay vc-bundle-member configuration mode.
<b>svc-bundle</b>	Creates or modifies a member of an SVC bundle.
<b>ubr</b>	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>ubr+</b>	Configures UBR QoS and specifies the output peak cell rate and output minimum guaranteed cell rate for an ATM PVC, SVC, VC class, or VC bundle member.

<b>Command</b>	<b>Description</b>
<b>bundle</b>	Enters bundle configuration mode to create a bundle or modify an existing bundle.
<b>vbr-nrt</b>	Configures the VBR-NRT QoS and specifies output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vc-class atm</b>	Configures a VC class or an ATM VC or interface.

# bundle

To create a bundle or modify an existing bundle to enter bundle configuration mode, use the **bundle** command in subinterface configuration mode. To remove the specified bundle, use the **no** form of this command.

**bundle** *bundle-name*

**no bundle** *bundle-name*

## Syntax Description

<i>bundle-name</i>	The name of the bundle to be created. The limit is 16 alphanumeric characters.
--------------------	--

## Command Default

No bundle is specified.

## Command Modes

Subinterface configuration

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S and implemented on the Cisco 10000 series router.
12.2(16)BX	This command was implemented on the ESR-PRE2.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

From within bundle configuration mode you can configure the characteristics and attributes of the bundle and its members, such as the encapsulation type for all virtual circuits (VCs) in the bundle, the bundle management parameters, and the service type. Attributes and parameters you configure in bundle configuration mode are applied to all VC members of the bundle.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next highest precedence):

- VC configuration in bundle-vc mode
- Bundle configuration in bundle mode
- Subinterface configuration in subinterface mode

To display status on bundles, use the **show atm bundle** and **show atm bundle statistics** commands.

**Examples**

The following example configures a bundle called bundle1. The example specifies the IP address of the subinterface and the router protocol—the router uses Intermediate System-to-Intermediate System (IS-IS) as an IP routing protocol—then configures the bundle.

```
interface atm1/0.1 multipoint
  ip address 10.0.0.1 255.255.255.0
  ip router isis
  bundle bundle1
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>class-bundle</b>	Configures a VC bundle with the bundle-level commands contained in the specified VC class.
<b>oam-bundle</b>	Enables end-to-end F5 OAM loopback cell generation and OAM management for all VC members of a bundle, or for a VC class that can be applied to a VC bundle.
<b>pvc-bundle</b>	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.
<b>show atm bundle</b>	Displays the bundle attributes assigned to each bundle VC member and the current working status of the VC members.
<b>show atm bundle statistics</b>	Displays statistics on the specified bundle.

# bundle svc

To create or modify a switched virtual circuit (SVC) bundle, use the **bundle svc** command in interface configuration mode. To remove the specified bundle, use the **no** form of this command.

**bundle svc** *bundle-name* **nsap** *nsap-address*

**no bundle svc** *bundle-name* **nsap** *nsap-address*

## Syntax Description

<i>bundle-name</i>	Unique bundle name that identifies the SVC bundle in the router. The bundle names at each end of the virtual circuit (VC) must be the same. Length limit is 16 alphanumeric characters.
<b>nsap</b> <i>nsap-address</i>	Destination network services access point (NSAP) address of the SVC bundle.

## Command Default

No SVC bundle is created or modified.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(4)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command causes the system to enter SVC-bundle configuration mode. The bundle name must be the same on both sides of the VC.

From SVC-bundle configuration mode, you can configure the characteristics and attributes of the bundle and its members, such as the encapsulation type for all virtual circuits (VCs) in the bundle, the bundle management parameters, the service type, and so on. Attributes and parameters you configure in SVC-bundle configuration mode are applied to all VC members of the bundle.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next-highest precedence):

- VC configuration in bundle-VC mode
- Bundle configuration in bundle mode
- Subinterface configuration in subinterface mode

To display the status of bundles, use the **show atm bundle svc** and **show atm bundle svc statistics** commands.

**Examples**

The following example configures an SVC bundle called “sanfrancisco”:

```
interface ATM1/0.1 multipoint
 ip address 10.0.0.1 255.255.255.0
 atm esi-address 111111111111.11
 bundle svc sanfrancisco nsap 47.0091810000000003E3924F01.999999999999.99
 protocol ip 10.0.0.2
 broadcast
 oam retry 4 3 10
 encapsulation aal5snap
 oam-bundle manage
 svc-bundle seven
 class-vc seven
 svc-bundle six
 class-vc six
 svc-bundle five
 class-vc five
 svc-bundle four
 class-vc four
 svc-bundle three
 class-vc three
 svc-bundle two
 class-vc two
 svc-bundle one
 class-vc one
 svc-bundle zero
 class-vc zero
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>class-bundle</b>	Configures a VC bundle with the bundle-level commands contained in the specified VC class.
<b>oam-bundle</b>	Enables end-to-end F5 OAM loopback cell generation and OAM management for all VC members of a bundle, or for a VC class that can be applied to a VC bundle.
<b>pvc-bundle</b>	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.
<b>show atm bundle svc</b>	Displays the bundle attributes assigned to each bundle VC member and the current working status of the VC members.
<b>show atm bundle svc statistics</b>	Displays statistics on the specified bundle.

## class (EtherSwitch)

To define a traffic classification for a policy to act on using the class-map name or access group, use the **class** command in policy-map configuration mode. To delete an existing class map, use the **no** form of this command.

```
class class-map-name [access-group acl-index-or-name]
```

```
no class class-map-name
```

### Syntax Description

<i>class-map-name</i>	Name of the class map.
<b>access-group</b> <i>acl-index-or-name</i>	(Optional) Number or name of an IP standard or extended access control list (ACL). For an IP standard ACL, the index range is 1 to 99 and 1300 to 1999; for an IP extended ACL, the index range is 100 to 199 and 2000 to 2699.

### Command Default

No policy-map class maps are defined.

### Command Modes

Policy-map configuration

### Command History

Release	Modification
12.1(6)EA2	This command was introduced.
12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.

### Usage Guidelines

Before you use the **class** (EtherSwitch) command, use the **policy-map** global configuration command to identify the policy map and to enter policy-map configuration mode. After you specify a policy map, you can configure a policy for new classes or modify a policy for any existing classes in that policy map. You attach the policy map to an interface by using the **service-policy** interface configuration command; however, you cannot attach one that uses an ACL classification to the egress direction.

The class name that you specify in the policy map ties the characteristics for that class to the class map and its match criteria as configured by using the **class-map** global configuration command.

The **class** (EtherSwitch) command performs the same function as the **class-map global configuration command**. Use the **class** (EtherSwitch) command when a new classification, which is not shared with any other ports, is needed. Use the **class-map** command when the map is shared among many ports.



#### Note

In a policy map, the class named “class-default” is not supported. The Ethernet switch network module does not filter traffic on the basis of the policy map defined by the **class class-default** policy-map configuration command.

After entering the **class** (EtherSwitch) command, you enter policy-map class configuration mode. When you are in this mode, these configuration commands are available:

- **default**: sets a command to its default.
- **exit**: exits policy-map class configuration mode and returns to policy-map configuration mode.
- **no**: returns a command to its default setting.
- **police**: defines a policer for the classified traffic. The policer specifies the bandwidth limitations and the action to take when the limits are exceeded. For more information, see the **police** command.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

**Note**

For more information about configuring IP ACLs, refer to the “Configuring IP Services” chapter in the *Cisco IOS IP Application Services Configuration Guide*.

**Examples**

The following example shows how to create a policy map named “policy1.” When attached to the ingress port, it matches all the incoming traffic defined in class1 and polices the traffic at an average rate of 1 Mbps and bursts at 131072 bytes. Traffic exceeding the profile is dropped.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# police 1000000 131072 exceed-action drop
Router(config-pmap-c)# exit
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

**Related Commands**

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to the class whose name you specify.
<b>match (class-map configuration)</b>	Defines the match criteria to classify traffic.
<b>police</b>	Configures traffic policing.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to multiple interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays QoS policy maps.

## class (policy-map)

To specify the name of the class whose policy you want to create or change or to specify the default class (commonly known as the class-default class) before you configure its policy, use the **class** command in policy-map configuration mode. To remove a class from the policy map, use the **no** form of this command.

```
class { class-name | class-default } [insert-before class-name]
```

```
no class { class-name | class-default }
```

### Syntax Description

<i>class-name</i>	Name of the class to be configured or whose policy is to be modified. The class name is used for both the class map and to configure a policy for the class in the policy map.
<b>class-default</b>	Specifies the default class so that you can configure or modify its policy.
<b>insert-before</b> <i>class-name</i>	(Optional) Adds a class map between any two existing class maps. Inserting a new class map between two existing class map provides more flexibility when modifying existing policy map configurations. Without this option, the class map is appended to the end of the policy map. This keyword is supported only on flexible packet matching (FPM) policies.

### Command Default

No class is specified.

### Command Modes

QoS policy-map configuration

### Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(14)SX	Support for this command was introduced on Cisco 7600 routers.
12.2(17d)SXB	This command was implemented on the Cisco 7600 router and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(18)SXE	The <b>class-default</b> keyword was added to the Cisco 7600 router.
12.4(4)T	The <b>insert-before</b> <i>class-name</i> option was added.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(31)SB2	This command was introduced on the PRE3 for the Cisco 10000 series router.
12.2(18)ZY	The <b>insert-before</b> <i>class-name</i> option was integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

---

**Usage Guidelines****Policy Map Configuration Mode**

Within a policy map, the **class** (policy-map) command can be used to specify the name of the class whose policy you want to create or change. First, the policy map must be identified.

To identify the policy map (and enter the required policy-map configuration mode), use the **policy-map** command before you use the **class** (policy-map) command. After you specify a policy map, you can configure policy for new classes or modify the policy for any existing classes in that policy map.

**Class Characteristics**

The class name that you specify in the policy map ties the characteristics for that class—that is, its policy—to the class map and its match criteria, as configured using the **class-map** command.

When you configure policy for a class and specify its bandwidth and attach the policy map to an interface, class-based weighted fair queueing (CBWFQ) determines if the bandwidth requirement of the class can be satisfied. If so, CBWFQ allocates a queue for the bandwidth requirement.

When a class is removed, available bandwidth for the interface is incremented by the amount previously allocated to the class.

The maximum number of classes that you can configure for a router—and, therefore, within a policy map—is 64.

**Predefined Default Class**

The **class-default** keyword is used to specify the predefined default class called class-default. The class-default class is the class to which traffic is directed if that traffic does not match any of the match criteria in the configured class maps.

**Tail Drop or WRED**

You can define a class policy to use either tail drop by using the **queue-limit** command or Weighted Random Early Detection (WRED) by using the **random-detect** command. When using either tail drop or WRED, note the following points:

- The **queue-limit** and **random-detect** commands cannot be used in the same class policy, but they can be used in two class policies in the same policy map.
- You can configure the **bandwidth** command when either the **queue-limit** command or the **random-detect** command is configured in a class policy. The **bandwidth** command specifies the amount of bandwidth allocated for the class.
- For the predefined default class, you can configure the **fair-queue** (class-default) command. The **fair-queue** command specifies the number of dynamic queues for the default class. The **fair-queue** command can be used in the same class policy as either the **queue-limit** command or the **random-detect** command. It cannot be used with the **bandwidth** command.

**Cisco 10000 Series Router**

The PRE2 allows you to configure 31 class queues in a policy map.

In a policy map, the PRE3 allows you to configure one priority level 1 queue, plus one priority level 2 queue, plus 12 class queues, plus one default queue.

---

**Examples**

The following example configures three class policies included in the policy map called policy1. Class1 specifies policy for traffic that matches access control list 136. Class2 specifies policy for traffic on interface ethernet101. The third class is the default class to which packets that do not satisfy configured match criteria are directed.

```

! The following commands create class-maps class1 and class2
! and define their match criteria:
class-map class1
  match access-group 136
class-map class2
  match input-interface ethernet101

! The following commands create the policy map, which is defined to contain policy
! specification for class1, class2, and the default class:
policy-map policy1

Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# bandwidth 2000
Router(config-pmap-c)# queue-limit 40

Router(config-pmap)# class class2
Router(config-pmap-c)# bandwidth 3000
Router(config-pmap-c)# random-detect
Router(config-pmap-c)# random-detect exponential-weighting-constant 10

Router(config-pmap)# class class-default
Router(config-pmap-c)# fair-queue 16
Router(config-pmap-c)# queue-limit 20

```

Class1 has these characteristics: A minimum of 2000 kbps of bandwidth is expected to be delivered to this class in the event of congestion, and the queue reserved for this class can enqueue 40 packets before tail drop is enacted to handle additional packets.

Class2 has these characteristics: A minimum of 3000 kbps of bandwidth is expected to be delivered to this class in the event of congestion, and a weight factor of 10 is used to calculate the average queue size. For congestion avoidance, WRED packet drop is used, not tail drop.

The default class has these characteristics: 16 dynamic queues are reserved for traffic that does not meet the match criteria of other classes whose policy is defined by the policy map called policy1, and a maximum of 20 packets per queue is enqueued before tail drop is enacted to handle additional packets.



#### Note

When the policy map that contains these classes is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed, taking into account all class policies and Resource Reservation Protocol (RSVP), if configured.

The following example configures policy for the default class included in the policy map called policy8. The default class has these characteristics: 20 dynamic queues are available for traffic that does not meet the match criteria of other classes whose policy is defined by the policy map called policy8, and a weight factor of 14 is used to calculate the average queue size. For congestion avoidance, WRED packet drop is used, not tail drop.

```

Router(config)# policy-map policy8
Router(config-pmap)# class class-default
Router(config-pmap-c)# fair-queue 20
Router(config-pmap-c)# random-detect exponential-weighting-constant 14

```

The following example configures policy for a class called acl136 included in the policy map called policy1. Class acl136 has these characteristics: a minimum of 2000 kbps of bandwidth is expected to be delivered to this class in the event of congestion, and the queue reserved for this class can enqueue 40 packets before tail drop is enacted to handle additional packets. Note that when the policy map that contains this class is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed, taking into account all class policies and RSVP, if configured.

```
Router(config)# policy-map policy1
Router(config-pmap)# class acl136
Router(config-pmap-c)# bandwidth 2000
Router(config-pmap-c)# queue-limit 40
```

The following example configures policy for a class called int101 included in the policy map called policy8. Class int101 has these characteristics: a minimum of 3000 kbps of bandwidth are expected to be delivered to this class in the event of congestion, and a weight factor of 10 is used to calculate the average queue size. For congestion avoidance, WRED packet drop is used, not tail drop. Note that when the policy map that contains this class is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed.

```
Router(config)# policy-map policy8
Router(config-pmap)# class int101
Router(config-pmap-c)# bandwidth 3000
Router(config-pmap-c)# random-detect exponential-weighting-constant 10
```

The following example configures policy for the **class-default** default class included in the policy map called policy1. The **class-default** default class has these characteristics: 10 hashed queues for traffic that does not meet the match criteria of other classes whose policy is defined by the policy map called policy1; and a maximum of 20 packets per queue before tail drop is enacted to handle additional enqueued packets.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class-default
Router(config-pmap-c)# fair-queue
Router(config-pmap-c)# queue-limit 20
```

The following example configures policy for the class-default default class included in the policy map called policy8. The **class-default** default class has these characteristics: 20 hashed queues for traffic that does not meet the match criteria of other classes whose policy is defined by the policy map called policy8; and a weight factor of 14 is used to calculate the average queue size. For congestion avoidance, WRED packet drop is used, not tail drop.

```
Router(config)# policy-map policy8
Router(config-pmap)# class class-default
Router(config-pmap-c)# fair-queue 20
Router(config-pmap-c)# random-detect exponential-weighting-constant 14
```

The following example shows how to configure FPM for blaster packets. The class map contains the following match criteria: TCP port 135, 4444 or UDP port 69; and pattern 0x0030 at 3 bytes from start of IP header.

```
load protocol disk2:ip.phdf
load protocol disk2:tcp.phdf
load protocol disk2:udp.phdf

class-map type stack match-all ip-tcp
  match field ip protocol eq 0x6 next tcp

class-map type stack match-all ip-udp
  match field ip protocol eq 0x11 next udp

class-map type access-control match-all blaster1
  match field tcp dest-port eq 135
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster2
  match field tcp dest-port eq 4444
Router(config-cmap)# match start 13-start offset 3 size 2 eq 0x0030
```

## class (policy-map)

```
class-map type access-control match-all blaster3
match field udp dest-port eq 69
match start 13-start offset 3 size 2 eq 0x0030
```

```
policy-map type access-control fpm-tcp-policy
class blaster1
drop
class blaster2
drop
```

```
policy-map type access-control fpm-udp-policy
class blaster3
drop
```

```
policy-map type access-control fpm-policy
class ip-tcp
service-policy fpm-tcp-policy
class ip-udp
service-policy fpm-udp-policy
```

```
interface gigabitEthernet 0/1
service-policy type access-control input fpm-policy
```

### Related Commands

Command	Description
<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>queue-limit</b>	Specifies or modifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.

# class arp-peruser

To create a control class for arp-peruser, use the **class arp-peruser** command in policy map configuration mode. To remove the arp-peruser class, use the **no** form of this command.

```
class arp-peruser
```

```
no class arp-peruser
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** A control policy map is not created.

**Command Modes** Policy map configuration

Command History	Release	Modification
	12.2(33)SRB	This command was introduced.

**Usage Guidelines** Use this command when creating a per-user policy map.

**Examples** The following example shows creating a per-user policy map.

```
Router(config-pmap)# class arp-peruser
Router(config)# policy-map copp-peruser
Router(config-pmap)# class arp-peruser
Router(config-pmap-c)# police rate 5 pps burst 50 packets
Router(config-pmap-c)# class dhcp-peruser
Router(config-pmap-c)# police rate 10 pps burst 100 packets
```

Related Commands	Command	Description
	<b>class-map arp-peruser</b>	Creates a class map to be used for matching ARP per-user packets.
	<b>policy-map copp-peruser</b>	Creates a policy map that defines a CoPP per-user policy.

# class type tag

To associate a class map with a policy map, use the **class type tag** command in policy map configuration mode. To disassociate the command, use the **no** form of this command.

```
class type tag class-name [ insert-before {class-name} ]
```

```
no class type tag class-name [ insert-before {class-name} ]
```

<b>Syntax Description</b>	<i>class-name</i>	Name of the class map.
	<b>insert-before</b> <i>class-name</i>	(Optional) Adds a class map between any two existing class maps.
	<b>Note</b>	Inserting a new class map between two existing class maps provides more flexibility when modifying existing policy map configurations. Without this option, the class map is appended to the end of the policy map.

**Command Default** A class map is not associated with a policy map.

**Command Modes** Policy map configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
		12.4(6)T

**Usage Guidelines** If this command is used and the class is not configured, an error is generated. The error may be something such as “% class map {*name*} not configured.” If the class needs to be inserted before a specific class map, the **insert-before** keyword can be used. The **insert-before** keyword is typically needed if the administrator is configuring any per-host class maps and would like it inserted before a specific class map. The **class type tag** command creates the policy-map class configuration mode. There can be multiple classes under the policy map.

**Examples** The following example shows the class map “usergroup1\_class” is to be associated with a policy map:

```
class type tag usergroup1_class
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
		<b>policy-map</b>

# class-bundle

To configure a virtual circuit (VC) bundle with the bundle-level commands contained in the specified VC class, use the **class-bundle** command in bundle or SVC-bundle configuration mode. To remove the VC class parameters from a VC bundle, use the **no** form of this command.

**class-bundle** *vc-class-name*

**no class-bundle** *vc-class-name*

## Syntax Description

<i>vc-class-name</i>	Name of the VC class that you are assigning to your VC bundle.
----------------------	--

## Command Default

No VC class is assigned to the VC bundle.

## Command Modes

Bundle configuration  
SVC-bundle configuration

## Command History

Release	Modification
12.0T	This command was introduced, replacing the <b>class</b> command for configuring ATM VC bundles.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S and implemented on the Cisco 10000 series router.
12.2(16)BX	This command was implemented on the ESR-PRE2.
12.2(4)T	This command was made available in SVC-bundle configuration mode.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

To use this command, you must first enter the **bundle** or **bundle svc** command to create the bundle and enter bundle or SVC-bundle configuration mode.

Use this command to assign a previously defined set of parameters (defined in a VC class) to an ATM VC bundle. Parameters set through bundle-level commands that are contained in a VC class are applied to the bundle and its VC members.

You can add the following commands to a VC class to be used to configure a VC bundle: **broadcast**, **encapsulation**, **inarp**, **oam-bundle**, **oam retry**, and **protocol**.

Bundle-level parameters applied through commands that are configured directly on a bundle supersede bundle-level parameters applied through a VC class by the **class-bundle** command. Some bundle-level parameters applied through a VC class or directly to the bundle can be superseded by commands that you directly apply to individual VCs in bundle-VC configuration mode.

**Examples**

In the following example, a class called “class1” is created and then applied to the bundle called “bundle1”:

```
! The following commands create the class class1:
vc-class atm class1
 encapsulation aal5snap
 broadcast
 protocol ip inarp
 oam-bundle manage 3
 oam 4 3 10
```

```
! The following commands apply class1 to the bundle called bundle1:
bundle bundle1
 class-bundle class1
```

With hierarchy precedence rules taken into account, VCs belonging to the bundle called “bundle1” will be characterized by these parameters: aal5snap, encapsulation, broadcast on, use of Inverse Address Resolution Protocol (Inverse ARP) to resolve IP addresses, and Operation, Administration, and Maintenance (OAM) enabled.

**Related Commands**

Command	Description
<b>broadcast</b>	Configures broadcast packet duplication and transmission for an ATM VC class, PVC, SVC, or VC bundle.
<b>bundle</b>	Creates a bundle or modifies an existing bundle to enter bundle configuration mode.
<b>bundle svc</b>	Creates an SVC bundle or modifies an existing SVC bundle.
<b>class-int</b>	Assigns a VC class to an ATM main interface or subinterface.
<b>class-vc</b>	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
<b>encapsulation</b>	Sets the encapsulation method used by the interface.
<b>inarp</b>	Configures the Inverse ARP time period for an ATM PVC, VC class, or VC bundle.
<b>oam-bundle</b>	Enables end-to-end F5 OAM loopback cell generation and OAM management for all VC members of a bundle, or for a VC class that can be applied to a VC bundle.
<b>oam retry</b>	Configures parameters related to OAM management for an ATM PVC, SVC, VC class, or VC bundle.
<b>protocol (ATM)</b>	Configures a static map for an ATM PVC, SVC, VC class, or VC bundle. Enables Inverse ARP or Inverse ARP broadcasts on an ATM PVC by configuring Inverse ARP either directly on the PVC, on the VC bundle, or in a VC class (applies to IP and IPX protocols only).
<b>pvc-bundle</b>	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.

# class-map

To create a class map to be used for matching packets to a specified class, use the **class-map** command in global configuration mode. To remove an existing class map from the router, use the **no** form of this command.



## Note

The **class-map** command enters class-map configuration mode in which you can enter one of the **match** commands to configure the match criteria for this class.

### Cisco 2600, 3660, 3845, 6500, 7200, 7401, and 7500 Series Routers

```
class-map [type {stack | access-control | port-filter | queue-threshold | logging log-class}]
[match-all | match-any] class-map-name
```

```
no class-map [type {stack | access-control | port-filter | queue-threshold | logging log-class}]
[match-all | match-any] class-map-name
```

### Cisco 7600 Series Routers

```
class-map class-map-name [match-all | match-any]
```

```
no class-map class-map-name [match-all | match-any]
```

## Syntax Description

<b>type stack</b>	(Optional) Enables flexible packet matching (FPM) functionality to determine the correct protocol stack to examine.  If the appropriate protocol header description files (PHDFs) have been loaded onto the router (via the <b>load protocol</b> command), a stack of protocol headers can be defined so that the filter can determine which headers are present and in what order.
<b>type access-control</b>	(Optional) Determines the exact pattern to look for in the protocol stack of interest.  <b>Note</b> You must specify a stack class map (via the <b>type stack</b> keywords) before you can specify an access-control class map (via the <b>type access-control</b> keywords).
<b>type port-filter</b>	(Optional) Creates a port-filter class map that enables the TCP/UDP port policing of control plane packets. When enabled, it provides filtering of traffic that is destined to specific ports on the control-plane host subinterface.
<b>type queue-threshold</b>	(Optional) Enables queue thresholding that limits the total number of packets for a specified protocol that are allowed in the control plane IP input queue. This feature applies only to the control-plane host subinterface.
<b>type logging log-class</b>	(Optional) Enables logging of packet traffic on the control plane. The <i>log-class</i> is the name of the log class. The name can be a maximum of 40 alphanumeric characters.

<b>match-all</b>	(Optional) Determines how packets are evaluated when multiple match criteria exist. Matches statements under this class map based on the logical AND function. One statement and another are accepted. If you do not specify the <b>match-all</b> or <b>match-any</b> keyword, the default keyword is <b>match-all</b> .
<b>match-any</b>	(Optional) Determines how packets are evaluated when multiple match criteria exist. Matches statements under this class map based on the logical OR function. One statement or another is accepted. If you do not specify the <b>match-any</b> or <b>match-all</b> keyword, the default keyword is <b>match-all</b> .
<i>class-map-name</i>	Name of the class for the class map. The name can be a maximum of 40 alphanumeric characters. The class name is used for both the class map and to configure a policy for the class in the policy map.

**Command Default** No class map is configured by default.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)T	This command was introduced.
	12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
	12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.2(14)SX	Support for this command was introduced on Cisco 7600 series routers.
	12.2(17d)SXB	This command was implemented on the Cisco 7600 series routers and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.4(4)T	The <b>type stack</b> and <b>type access-control</b> keywords were added to support FPM. The <b>type port-filter</b> and <b>type queue-threshold</b> keywords were added to support Control Plane Protection.
	12.4(6)T	The <b>type logging</b> keyword was added to support control plane packet logging.
	12.2(18)ZY	The <b>type stack</b> and <b>type access-control</b> keywords were integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA)

**Usage Guidelines** Cisco 2600, 3660, 3845, 6500, 7200, 7401, and 7500 Series Routers

Use the **class-map** command to specify the class that you will create or modify to meet the class-map match criteria. This command enters class-map configuration mode in which you can enter one of the **match** commands to configure the match criteria for this class. Packets that arrive at either the input interface or the output interface (determined by how the **service-policy** command is configured) are checked against the match criteria configured for a class map to determine if the packets belong to that class.

When configuring a class map, you can use one or more **match** commands to specify match criteria. For example, you can use the **match access-group** command, the **match protocol** command, or the **match input-interface** command. The **match** commands vary according to the Cisco IOS release. For more information about match criteria and **match** commands, see the “Modular Quality of Service Command-Line Interface (CLI) (MQC)” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

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You apply the **class-map** command and its subcommands on a per-interface basis to define packet classification, marking, aggregate, and flow policing as part of a globally named service policy.

You can attach a service policy to an EtherChannel. Do not attach a service policy to a port that is a member of an EtherChannel.

After you are in class-map configuration mode, the following configuration commands are available:

- **exit**—Used to exit from class-map configuration mode.
- **no**—Used to remove a match statement from a class map.
- **match**—Used to configure classification criteria. The following optional **match** subcommands are available:
  - **access-group** {*acl-index* | *acl-name*}
  - **ip** {**dscp** | **precedence**} *value1 value2 ... value8*

The following subcommands appear in the CLI help but are not supported on LAN interfaces or WAN interfaces on the Optical Service Modules (OSMs):

- **input-interface** {*interface-type interface-number* | **null** *number* | **vlan** *vlan-id*}
- **protocol** *link-type*
- **destination-address mac** *mac-address*
- **source-address mac** *mac-address*

OSMs are not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 32.

Policy Feature Card (PFC) QoS does not support the following commands:

- **input-interface** {*interface-type interface-number* | **null** *number* | **vlan** *vlan-id*}
- **protocol** *link-type*
- **destination-address mac** *mac-address*
- **source-address mac** *mac-address*
- **qos-group** *group-value*

If you enter these subcommands, PFC QoS does not detect the unsupported keywords until you attach a policy map to an interface. When you try to attach the policy map to an interface, you get an error message. For additional information, see the *Cisco 7600 Series Router Cisco IOS Software Configuration Guide* and the *Cisco IOS Release 12.2 Command Reference* publications.

After you have configured the class-map name and are in class-map configuration mode, you can enter the **match access-group** and **match ip dscp** subcommands. The syntax for these subcommands is as follows:

```
match [[access-group {acl-index | acl-name}] | [ip {dscp | precedence} value]]
```

See [Table 6](#) for a syntax description of the **match** subcommands.

**Table 6** match Syntax Description

Optional Subcommand	Description
<b>access-group</b> <i>acl-index</i>   <i>acl-name</i>	(Optional) Specifies the access list index or access list names; valid access list index values are from 1 to 2699.
<b>access-group</b> <i>acl-name</i>	(Optional) Specifies the named access list.
<b>ip dscp</b> <i>value1 value2 ... value8</i>	(Optional) Specifies the IP DSCP values to match; valid values are from 0 to 63. You can enter up to 8 DSCP values and separate each value with one white space.
<b>ip precedence</b> <i>value1 value2 ... value8</i>	(Optional) Specifies the IP precedence values to match; valid values are from 0 to 7. You can enter up to 8 precedence values and separate each value with one white space.

**Examples**

The following example specifies class101 as the name of a class, and it defines a class map for this class. The class called class101 specifies policy for traffic that matches access control list 101.

```
Router(config)# class-map class101
Router(config-cmap)# match access-group 101
```

The following example shows how to define FPM traffic classes for slammer and UDP packets. The match criteria defined within the class maps are for slammer and UDP packets with an IP length not to exceed 404 bytes, UDP port 1434, and pattern 0x4011010 at 224 bytes from the start of the IP header.

```
Router(config)# load protocol disk2:ip.phdf
Router(config)# load protocol disk2:udp.phdf

Router(config)# class-map type stack match-all ip-udp
Router(config-cmap)# description "match UDP over IP packets"
Router(config-cmap)# match field ip protocol eq 0x11 next udp

Router(config)# class-map type access-control match-all slammer
Router(config-cmap)# description "match on slammer packets"
Router(config-cmap)# match field udp dest-port eq 0x59A
Router(config-cmap)# match field ip length eq 0x194
Router(config-cmap)# match start 13-start offset 224 size 4 eq 0x4011010
```

The following example shows how to configure a port-filter policy to drop all traffic that is destined to closed or "nonlistened" ports except SNMP.

```
Router(config)# class-map type port-filter pf-class
Router(config-cmap)# match not port udp 123
Router(config-cmap)# match closed-ports
Router(config-cmap)# exit
Router(config)# policy-map type port-filter pf-policy
Router(config-pmap)# class pf-class
Router(config-pmap-c)# drop
Router(config-pmap-c)# end
```

The following example shows how to access the **class-map** commands and subcommands, configure a class map named ipp5, and enter a match statement for **IP precedence 5**:

```
Router(config)# class-map ipp5
Router(config-cmap)# match ip precedence 5
```

Related Commands	Command	Description
	<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
	<b>class class-default</b>	Specifies the default class for a service policy map.
	<b>match (class-map)</b>	Configures the match criteria for a class map on the basis of port filter and/or protocol queue policies.
	<b>match access-group</b>	Configures the match criteria for a class map on the basis of the specified ACL.
	<b>match input-interface</b>	Configures a class map to use the specified input interface as a match criterion.
	<b>match ip dscp</b>	Identifies one or more DSCP, AF, and CS values as a match criterion
	<b>match mpls experimental</b>	Configures a class map to use the specified EXP field value as a match criterion.
	<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	<b>service-policy</b>	Attaches a policy map to an input interface or virtual circuit (VC) or to an output interface or VC to be used as the service policy for that interface or VC.
	<b>show class-map</b>	Displays class-map information.
	<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

# class-map arp-peruser

To create a class map to be used for matching Address Resolution Protocol (ARP) per-user packets, use the **class-map arp-peruser** command in global configuration mode. To disable, use the **no** form of the command.

```
class-map arp-peruser
```

```
no class map arp-peruser
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** No class map is configured.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(33)SRB	This command was introduced.

**Usage Guidelines** Use this command to create an ARP class map when configuring CoPP.

**Examples** The following example shows creating an ARP class-map:

```
Router(config)# class-map arp-peruser
Router(config-cmap)# match protocol arp
Router(config-cmap)# match subscriber access
```

Related Commands	Command	Description
	<b>match protocol arp</b>	Matches ARP traffic to a policy map.
	<b>match subscriber access</b>	Matches subscriber access traffic to a policy map.

# clear control-plane

To clear counters for control-plane interfaces or subinterfaces, use the **clear control-plane** command in privileged EXEC mode.

**clear control-plane** [**\*** | **aggregate** | **host** | **transit** | **cef-exception**]

## Syntax Description

<b>*</b>	(Optional) Clears counters for all control-plane features.
<b>aggregate</b>	(Optional) Clears counters for all features on the control-plane aggregate path.
<b>host</b>	(Optional) Clears counters for all features on the control-plane host feature path.
<b>transit</b>	(Optional) Clears counters for all features on the control-plane transit feature path.
<b>cef-exception</b>	(Optional) Clears counters for all features on the control-plane CEF-exception feature path.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.4(4)T	This command was introduced.

## Usage Guidelines

Use the **clear control-plane** command to clear counters for all features on the control-plane interfaces or subinterfaces.

## Examples

The following example clears the counters for all features on the control-plane host feature path.

```
Router# clear control-plane host
```

## Related Commands

Command	Description
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.

<b>Command</b>	<b>Description</b>
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# clear ip rsvp authentication

To eliminate Resource Reservation Protocol (RSVP) security associations before their lifetimes expire, use the **clear ip rsvp authentication** command in privileged EXEC mode.

**clear ip rsvp authentication** [*ip-address* | *hostname*]

## Syntax Description

<i>ip-address</i>	(Optional) Frees security associations with a specific neighbor.
<i>hostname</i>	(Optional) Frees security associations with a specific host.



## Note

The difference between the *ip-address* and *hostname* arguments is the difference of specifying the neighbor by its IP address or by its name.

## Command Default

The default behavior is to clear all security associations.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **clear ip rsvp authentication** command for the following reasons:

- To eliminate security associations before their lifetimes expire
- To free up memory
- To resolve a problem with a security association being in some indeterminate state
- To force reauthentication of neighbors

You can delete all RSVP security associations if you do not enter an IP address or a hostname, or just the ones with a specific RSVP neighbor or host.

If you delete a security association, it is re-created as needed when the trusted RSVP neighbors start sending more RSVP messages.

## Examples

The following command shows how to clear all security associations before they expire:

```
Router# clear ip rsvp authentication
```

**clear ip rsvp authentication****Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp authentication lifetime</b>	Controls how long RSVP maintains security associations with other trusted RSVP neighbors.
<b>show ip rsvp authentication</b>	Displays the security associations that RSVP has established with other RSVP neighbors.

# clear ip rsvp counters

To clear (set to zero) all IP Resource Reservation Protocol (RSVP) counters that are being maintained, use the **clear ip rsvp counters** command in EXEC mode.

**clear ip rsvp counters [confirm]**

Syntax Description	confirm	(Optional) Requests a confirmation that all IP RSVP counters were cleared.
--------------------	---------	--

Command Modes	EXEC
---------------	------

Command History	Release	Modification
	12.0(14)ST	This command was introduced.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines	This command allows you to set all IP RSVP counters to zero so that you can see changes easily.
------------------	---

Examples	In the following example, all IP RSVP counters that are being maintained are cleared:
----------	---

```
Router# clear ip rsvp counters
Clear rsvp counters [confirm]
```

Related Commands	Command	Description
	<b>show ip rsvp counters</b>	Displays counts of RSVP messages that were sent and received.

# clear ip rsvp hello instance counters

To clear (refresh) the values for Hello instance counters, use the **clear ip rsvp hello instance counters** command in privileged EXEC mode.

## clear ip rsvp hello instance counters

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(31)SXH.

**Examples** Following is sample output from the **show ip rsvp hello instance detail** command and then the **clear ip rsvp hello instance counters** command. Notice that the “Statistics” fields have been cleared to zero.

```
Router# show ip rsvp hello instance detail

Neighbor 10.0.0.2 Source 10.0.0.1
  State: UP (for 2d18h)
  Type: PASSIVE (responding to requests)
  I/F: Et1/1
  LSPs protecting: 0
  Refresh Interval (msec) (used when ACTIVE)
    Configured: 100
  Statistics: (from 2398195 samples)
    Min: 100
    Max: 132
    Average: 100
    Waverage: 100 (Weight = 0.8)
    Current: 100
  Src_instance 0xA9F07C13, Dst_instance 0x9BBAA407
  Counters:
    Communication with neighbor lost:
      Num times: 0
      Reasons:
        Missed acks: 0
        Bad Src_Inst received: 0
        Bad Dst_Inst received: 0
        I/F went down: 0
        Neighbor disabled Hello: 0
    Msgs Received: 2398194
      Sent: 2398195
      Suppressed: 0
```

```

Router# clear ip rsvp hello instance counters

Neighbor 10.0.0.2 Source 10.0.0.1
  State: UP (for 2d18h)
  Type: PASSIVE (responding to requests)
  I/F: Et1/1
  LSPs protecting: 0
  Refresh Interval (msec) (used when ACTIVE)
    Configured: 100
  Statistics:
    Min: 0
    Max: 0
    Average: 0
    Waverage: 0
    Current: 0
  Src_instance 0xA9F07C13, Dst_instance 0x9BBAA407
  Counters:
    Communication with neighbor lost:
      Num times: 0
      Reasons:
        Missed acks: 0
        Bad Src_Inst received: 0
        Bad Dst_Inst received: 0
        I/F went down: 0
        Neighbor disabled Hello: 0
    Msgs Received: 2398194
      Sent: 2398195
      Suppressed: 0

```

**Related Commands**

Command	Description
<b>ip rsvp signalling hello (configuration)</b>	Enables Hello globally on the router.
<b>ip rsvp signalling hello (interface)</b>	Enables Hello on an interface where you need Fast Reroute protection.
<b>ip rsvp signalling hello statistics</b>	Enables Hello statistics on the router.
<b>show ip rsvp hello statistics</b>	Displays how long Hello packets have been in the Hello input queue.

# clear ip rsvp hello instance statistics

To clear Hello statistics for an instance, use the **clear ip rsvp hello instance statistics** command in privileged EXEC mode.

**clear ip rsvp hello instance statistics**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Hello statistics are not cleared for an instance.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(31)SXH.

**Examples** This example shows sample output from the **show ip rsvp hello statistics** command and the values in those fields after you enter the **clear ip rsvp hello instance statistics** command.

```
Router# show ip rsvp hello statistics
```

```
Status: Enabled
Packet arrival queue:
  Wait times (msec)
    Current:0
    Average:0
    Weighted Average:0 (weight = 0.8)
    Max:4
  Current length: 0 (max:500)
  Number of samples taken: 2398525
```

```
Router# clear ip rsvp hello instance statistics
```

```
Status: Enabled
Packet arrival queue:
  Wait times (msec)
    Current:0
    Average:0
    Weighted Average:0 (weight = 0.8)
    Max:0
  Current length: 0 (max:500)
  Number of samples taken: 0
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello (configuration)</b>	Enables Hello globally on the router.
<b>ip rsvp signalling hello (interface)</b>	Enables Hello on an interface where you need Fast Reroute protection.
<b>ip rsvp signalling hello statistics</b>	Enables Hello statistics on the router.
<b>show ip rsvp hello statistics</b>	Displays how long Hello packets have been in the Hello input queue.

# clear ip rsvp hello statistics

To globally clear Hello statistics, use the **clear ip rsvp hello statistics** command in privileged EXEC mode.

## clear ip rsvp hello statistics

**Syntax Description** This command has no arguments or keywords.

**Command Default** Hello statistics are not globally cleared.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(31)SXH.

**Usage Guidelines** Use this command to remove all information about how long Hello packets have been in the Hello input queue.

**Examples** Following is sample output from the **show ip rsvp hello statistics** command and the **clear ip rsvp hello statistics** command. Notice that the values in the “Packet arrival queue” fields have been cleared.

```
Router# show ip rsvp hello statistics

Status: Enabled
Packet arrival queue:
  Wait times (msec)
    Current:0
    Average:0
    Weighted Average:0 (weight = 0.8)
    Max:4
  Current length: 0 (max:500)
  Number of samples taken: 2398525

Router# clear ip rsvp hello statistics

Status: Enabled
Packet arrival queue:
  Wait times (msec)
    Current:0
    Average:0
```

```
Weighted Average:0 (weight = 0.8)
Max:0
Current length: 0 (max:500)
Number of samples taken: 16
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello statistics</b>	Enables Hello statistics on the router.
<b>show ip rsvp hello statistics</b>	Displays how long Hello packets have been in the Hello input queue.

# clear ip rsvp high-availability counters

To clear (set to zero) the Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) counters that are being maintained by a Route Processor (RP), use the **clear ip rsvp high-availability counters** command in privileged EXEC mode.

**clear ip rsvp high-availability counters**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(33)SRA	This command was introduced.
	12.2(33)SRB	Support for In-Service Software Upgrade (ISSU) was added.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** Use the **clear ip rsvp high-availability counters** command to clear (set to zero) the HA counters, which include state, ISSU, resource failures, and historical information.

**Examples** The following example clears all the HA information currently being maintained by the RP:

```
Router# clear ip rsvp high-availability counters
```

Related Commands	Command	Description
	<b>show ip rsvp high-availability counters</b>	Displays the RSVP TE HA counters that are being maintained by an RP.

# clear ip rsvp msg-pacing

To clear the Resource Reservation Protocol (RSVP) message pacing output from the **show ip rsvp neighbor** command, use the **clear ip rsvp msg-pacing** command in privileged EXEC mode.

**clear ip rsvp msg-pacing**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(14)ST	This command was introduced.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Examples** The following example clears the RSVP message pacing output:

```
Router# clear ip rsvp msg-pacing
```

Related Commands	Command	Description
	<b>show ip rsvp counters</b>	Displays counts of RSVP messages that were sent and received.
	<b>show ip rsvp neighbor</b>	Displays the current RSVP neighbors and indicates whether the neighbor is using IP or UDP encapsulation for a specified interface or for all interfaces.

# clear ip rsvp reservation

To remove Resource Reservation Protocol (RSVP) RESV-related receiver information currently in the database, use the **clear ip rsvp reservation** command in EXEC mode.

```
clear ip rsvp reservation {session-ip-address sender-ip-address {tcp | udp | ip-protocol}
session-dport sender-sport | *}
```

## Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver; for multicast sessions, it is the IP multicast address of the session.
<i>sender-ip-address</i>	The IP address of the sender.
<b>tcp</b>   <b>udp</b>   <i>ip-protocol</i>	TCP, User Datagram Protocol (UDP), or IP protocol in the range from 0 to 65535.
<i>session-dport</i>	The destination port.  <b>Note</b> Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If destination is zero, source must be zero, and the implication is that ports are not checked. If destination is nonzero, source must be nonzero (except for wildcard filter (wf) reservations, for which the source port is always ignored and can therefore be zero).
<i>sender-sport</i>	The source port.  <b>Note</b> Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If destination is zero, source must be zero, and the implication is that ports are not checked. If destination is nonzero, source must be nonzero (except for wildcard filter (wf) reservations, for which the source port is always ignored and can therefore be zero).
*	Wildcard used to clear all senders.

## Command Modes

EXEC

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

---

**Usage Guidelines**

Use the **clear ip rsvp reservation** command to remove the RESV-related sender information currently in the database so that when reservation requests arrive, based on the RSVP admission policy, the relevant ones can be reestablished.

Whenever you change the clockrate or bandwidth of an interface, RSVP does not update its database to reflect the change. This is because such a change requires that RSVP reestablish reservations based on the new clockrate or bandwidth value and arbitrarily dropping some reservations while retaining others is not desired. The solution is to clear the RESV state by issuing the **clear ip rsvp reservation** command.

The **clear ip rsvp reservation** command clears the RESV state from the router on which you issued the command and causes the router to send a PATH TEAR message to the upstream routers thereby clearing the RESV state for that reservation on all the upstream routers.

---

**Examples**

The following example clears all the RESV-related receiver information currently in the database:

```
Router# clear ip rsvp reservation *
```

The following example clears all the RESV-related receiver information for a specified reservation currently in the database:

```
Router# clear ip rsvp reservation 10.2.1.1 10.1.1.2 udp 10 20
```

---

**Related Commands**

Command	Description
<b>clear ip rsvp sender</b>	Removes RSVP PATH-related sender information currently in the database.

# clear ip rsvp sender

To remove Resource Reservation Protocol (RSVP) PATH-related sender information currently in the database, use the **clear ip rsvp sender** command in EXEC mode.

```
clear ip rsvp sender {session-ip-address sender-ip-address {tcp | udp | ip-protocol} session-dport sender-sport | * }
```

## Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver; for multicast sessions, it is the IP multicast address of the session.
<i>sender-ip-address</i>	The IP address of the sender.
<b>tcp</b>   <b>udp</b>   <i>ip-protocol</i>	TCP, User Datagram Protocol (UDP), or IP protocol in the range from 0 to 65535.
<i>session-dport</i>	The destination port.  <b>Note</b> Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If destination is zero, source must be zero, and the implication is that ports are not checked. If destination is nonzero, source must be nonzero (except for wildcard filter (wf) reservations, for which the source port is always ignored and can therefore be zero).
<i>sender-sport</i>	The source port.  <b>Note</b> Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If destination is zero, source must be zero, and the implication is that ports are not checked. If destination is nonzero, source must be nonzero (except for wildcard filter (wf) reservations, for which the source port is always ignored and can therefore be zero).
*	Wildcard used to clear all senders.

## Command Modes

EXEC

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

---

**Usage Guidelines**

Use the **clear ip rsvp sender** command to remove the PATH-related sender information currently in the database so that when reservation requests arrive, based on the RSVP admission policy, the relevant ones can be reestablished.

Whenever you change the clockrate or bandwidth of an interface, RSVP does not update its database to reflect the change. This is because such a change requires that RSVP reestablish reservations based on the new clockrate or bandwidth value and arbitrarily dropping some reservations while retaining others is not desired. The solution is to clear the PATH state by issuing the **clear ip rsvp sender** command.

The **clear ip rsvp sender** command clears the PATH state from the router on which you issued the command and causes the router to send a PATH TEAR message to the downstream routers thereby clearing the PATH state for that reservation on all the downstream routers.

---

**Examples**

The following example clears all the PATH-related sender information currently in the database:

```
Router# clear ip rsvp sender *
```

The following example clears all the PATH-related sender information for a specified reservation currently in the database:

```
Router# clear ip rsvp sender 10.2.1.1 10.1.1.2 udp 10 20
```

---

**Related Commands**

Command	Description
<b>clear ip rsvp reservation</b>	Removes RSVP RESV-related receiver information currently in the database.

---

# clear ip rsvp signalling fast-local-repair statistics

To clear (set to zero) the Resource Reservation Protocol (RSVP) fast local repair (FLR) counters, use the **clear ip rsvp signalling fast-local-repair statistics** command in user EXEC or privileged EXEC mode.

## clear ip rsvp signalling fast-local-repair statistics

**Syntax Description** This command has no keywords or arguments.

**Command Default** The default is to clear all the RSVP FLR counters.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	12.2(33)SRB	This command was introduced.

**Usage Guidelines** Use the **clear ip rsvp signalling fast-local-repair statistics** command to set all the RSVP FLR counters to zero. The statistics include information about FLR procedures such as the current state, the start time, and the repair rate.

**Examples** The following example clears all the RSVP FLR counters being maintained in the database:

```
Router# clear ip rsvp signalling fast-local-repair statistics
```

Related Commands	Command	Description
	<b>show ip rsvp signalling fast-local-repair</b>	Displays FLR-related information.

# clear ip rsvp signalling rate-limit

To clear (set to zero) the number of Resource Reservation Protocol (RSVP) messages that were dropped because of a full queue, use the **clear ip rsvp signalling rate-limit** command in EXEC mode.

**clear ip rsvp signalling rate-limit**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **clear ip rsvp signalling rate-limit** command to clear the counters recording dropped messages.

**Examples** The following command shows how all dropped messages are cleared:

```
Router# clear ip rsvp signalling rate-limit
```

Related Commands	Command	Description
	<b>debug ip rsvp rate-limit</b>	Displays debug messages for RSVP rate-limiting events.
	<b>ip rsvp signalling rate-limit</b>	Controls the transmission rate for RSVP messages sent to a neighboring router during a specified amount of time.
	<b>show ip rsvp signalling rate-limit</b>	Displays rate-limiting parameters for RSVP messages.

# clear ip rsvp signalling refresh reduction

To clear (set to zero) the counters associated with the number of retransmissions and the number of out-of-order Resource Reservation Protocol (RSVP) messages, use the **clear ip rsvp signalling refresh reduction** command in EXEC mode.

## clear ip rsvp signalling refresh reduction

**Syntax Description** This command has no arguments or keywords.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **clear ip rsvp signalling refresh reduction** command to clear the counters recording retransmissions and out-of-order RSVP messages.

**Examples** The following command shows how all the retransmissions and out-of-order messages are cleared:

```
Router# clear ip rsvp signalling refresh reduction
```

Related Commands	Command	Description
	<b>ip rsvp signalling refresh reduction</b>	Enables refresh reduction.
	<b>show ip rsvp signalling refresh reduction</b>	Displays refresh-reduction parameters for RSVP messages.

# clear mls qos

To clear the multilayer switching (MLS) aggregate-quality of service (QoS) statistics, use the **clear mls qos** command in privileged EXEC mode.

```
clear mls qos [ip | ipx | mac | mpls | ipv6 | arp [interface-type interface-number |
null interface-number | port-channel number | vlan vlan-id]]
```

Syntax Description	
<b>ip</b>	(Optional) Clears MLS IP aggregate-QoS statistics.
<b>ipx</b>	(Optional) Clears MLS IPX aggregate-QoS statistics.
<b>mac</b>	(Optional) Clears MLS MAC aggregate-QoS statistics.
<b>mpls</b>	(Optional) Clears MLS MPLS aggregate-QoS statistics.
<b>ipv6</b>	(Optional) Clears MLS IPv6 aggregate QoS statistics.
<b>arp</b>	(Optional) Clears MLS ARP aggregate QoS statistics.
<i>interface-type</i>	(Optional) Interface type; possible valid values are <b>ethernet</b> , <b>fastethernet</b> , <b>gigabitethernet</b> , and <b>tengigabitethernet</b> . See the “Usage Guidelines” section for additional valid values.
<i>interface-number</i>	(Optional) Module and port number; see the “Usage Guidelines” section for valid values.
<b>null</b> <i>interface-number</i>	(Optional) Specifies the null interface; the valid value is 0.
<b>port-channel</b> <i>number</i>	(Optional) Specifies the channel interface; valid values are a maximum of 64 values ranging from 1 to 256.
<b>vlan</b> <i>vlan-id</i>	(Optional) Specifies the VLAN ID; valid values are from 1 to 4094.

**Command Default** This command has no default settings.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17a)SX	This command was changed to include the <b>mpls</b> keywords.
	12.2(17d)SXB	Support for this command on the Supervisor Engine 2 was extended to Release 12.2(17d)SXB.
	12.2(18)SXD	This command was changed to include the <b>arp</b> keyword.
	12.2(18)SXE	This command was changed to include the <b>ipv6</b> and <b>arp</b> keywords on the Supervisor Engine 720 only.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines**

The valid values for *interface-type* include the **ge-wan**, **atm**, and **pos** keywords that are supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

The **ipx** keyword is supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2 only.

The **ipv6** and **arp** keywords are supported on Cisco 7600 series routers that are configured with a Supervisor Engine 720 only.

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 1 to 13 and valid values for the port number are from 1 to 48.

If you enter the **clear mls qos** command with no arguments, the global and per-interface aggregate QoS counters for all protocols are cleared.

If you do not enter an interface type, the protocol aggregate-QoS counters for all interfaces are cleared.

**Note**

Entering the **clear mls qos** command affects the policing token bucket counters and might briefly allow traffic to be forwarded that would otherwise be policed.

**Examples**

This example shows how to clear the global and per-interface aggregate-QoS counters for all protocols:

```
Router# clear mls qos
```

This example shows how to clear the specific protocol aggregate-QoS counters for all interfaces:

```
Router# clear mls qos ip
```

**Related Commands**

Command	Description
<b>show mls qos</b>	Displays MLS QoS information.

# compression header ip

To configure Real-Time Transport Protocol (RTP) or TCP IP header compression for a specific class, use the **compression header ip** command in policy-map class configuration mode. To remove RTP or TCP IP header compression for a specific class, use the **no** form of this command.

**compression header ip [rtp | tcp]**

**no compression header ip**

## Syntax Description

<b>rtp</b>	(Optional) Configures RTP header compression.
<b>tcp</b>	(Optional) Configures TCP header compression.

## Defaults

If you do not specify either RTP or TCP header compression (that is, you press the enter key after the command name) both RTP and TCP header compressions are configured. This is intended to cover the “all compressions” scenario.

## Command Modes

Policy-map class configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Usage Guidelines

Using any form of the **compression header ip** command overrides any previously entered form.

The **compression header ip** command can be used at any level in the policy map hierarchy configured with the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC) feature.

## Examples

In the following example, the **compression header ip** command has been configured to use RTP header compression for a class called “class1”. Class1 is part of policy map called “policy1”.

```
Router(config)# policy-map policy1
Router(config-pmap)# class-map class1
Router(config-pmap-c)# compression header ip rtp
Router(config-pmap-c)# end
```

Related Commands	Command	Description
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# control-plane

To enter control-plane configuration mode, which allows users to associate or modify attributes or parameters (such as a service policy) that are associated with the control plane of the device, use the **control-plane** command in global configuration mode. To remove an existing control-plane configuration from the router, use the **no** form of this command.

## Syntax for T Releases

```
control-plane [host | transit | cef-exception]
```

```
no control-plane [host | transit | cef-exception]
```

## Syntax for 12.0S Releases

```
control-plane [slot slot-number] [host | transit | cef-exception]
```

```
no control-plane [slot slot-number] [host | transit | cef-exception]
```

## Syntax for 12.2S Releases for Cisco 7600 Series Routers

```
no control-plane
```

Syntax Description	host	(Optional) Applies policies to host control-plane traffic.
	<b>transit</b>	(Optional) Applies policies to transit control-plane traffic.
	<b>cef-exception</b>	(Optional) Applies policies to CEF-exception control-plane traffic.
	<b>slot <i>slot-number</i></b>	(Optional) Specifies the slot number for the line card to which you want to attach a QoS policy to perform distributed control-plane services.

**Command Default** No control-plane service policies are defined.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(18)S	This command was introduced.
	12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
	12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
	12.0(30)S	The <b>slot <i>slot-number</i></b> parameter was added to configure distributed Control Point (CP) services.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.4(4)T	The <b>host</b> , <b>transit</b> , and <b>cef-exception</b> keywords were added.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(31)SXH.

**Usage Guidelines**

After you enter the **control-plane** command, you can apply a control-plane policing (CoPP), port-filter, or queue-threshold policy to police traffic destined for the control plane. You can define aggregate CoPPs for the route processor (RP) and configure a service policy to police all traffic destined to the control plane:

- From all line cards on the router (aggregate CP services)
- From all interfaces on a line card (distributed CP services)

Aggregate CP services manage traffic destined for the control plane and received on the central switch engine from all line cards in the router.

Distributed CP services manage CP traffic from interfaces on a specified line card before CP packets are forwarded to the central switch engine where aggregate CP services are applied.

**Note**

On the Cisco 12000 series Internet router, you can combine distributed and aggregate CP services to protect the control plane from DoS attacks and provide packet QoS. The **slot slot-number** parameter is used only for distributed CP services configurations.

Control-plane policing includes enhanced control-plane functionality. It provides a mechanism for early dropping of packets directed toward closed or nonlistened Cisco IOS TCP/UDP ports on the router. It also provides the ability to limit protocol queue usage such that no single misbehaving protocol process can wedge the **control plane** interface hold queue.

**Note**

The **control-plane** command is supported by Cisco IOS Release 12.2S only for the Cisco 7600 router. For other Cisco IOS releases, the Cisco 7600 supports only the **no control-plane** command to discontinue a previously existing configuration condition.

With this enhancement, you can classify control-plane traffic into different categories of traffic. These categories are as follows:

- **Control-plane host subinterface**—Subinterface that receives all control-plane IP traffic that is directly destined for one of the router interfaces. Examples of control-plane host IP traffic include tunnel termination traffic, management traffic, or routing protocols such as SSH, SNMP, BGP, OSPF, and EIGRP. All host traffic terminates on and is processed by the router. Most control-plane protection features and policies operate strictly on the control-plane host subinterface. Since most critical router control-plane services, such as routing protocols and management traffic, are received on the control-plane host subinterface, it is critical to protect this traffic through policing and protection policies. CoPP, port-filtering, and per-protocol queue thresholding protection features can be applied on the control-plane host subinterface.
- **Control-plane transit subinterface**—Subinterface that receives all control-plane IP traffic that is software switched by the route processor. This means packets not directly destined to the router itself but rather traffic traversing through the router. Nonterminating tunnels handled by the router are an example of this type of control-plane traffic. Control-plane protection allows specific aggregate policing of all traffic received at this subinterface.
- **Control-plane CEF-exception subinterface**—Subinterface that receives all traffic that is either redirected as a result of a configured input feature in the CEF packet forwarding path for process switching or directly enqueued in the control-plane input queue by the interface driver (for example, ARP, L2 keepalives, and all non-IP host traffic). Control-plane protection allows specific aggregate policing of this specific type of control-plane traffic.

## Examples

The following example shows how to configure trusted hosts with source addresses 10.1.1.1 and 10.1.1.2 to forward Telnet packets to the control plane without constraint, while allowing all remaining Telnet packets to be policed at the specified rate. The QoS policy is then applied for aggregate CP services to all packets that are entering the control plane from all line cards in the router.

```
! Allow 10.1.1.1 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate-limit all other Telnet traffic.
Router(config)# access-list 140 permit tcp any any eq telnet
! Define class map "telnet-class."
Router(config)# class-map telnet-class
Router(config-cmap)# match access-group 140
Router(config-cmap)# exit
Router(config)# policy-map control-plane-in
Router(config-pmap)# class telnet-class
Router(config-pmap-c)# police 80000 conform transmit exceed drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
! Define aggregate control plane service for the active route pSrocessor.
Router(config)# control-plane
Router(config-cp)# service-policy input control-plane-in
Router(config-cp)# exit
```

The next example also shows how to configure trusted hosts with source addresses 10.1.1.1 and 10.1.1.2 to forward Telnet packets to the control plane without constraint, while allowing all remaining Telnet packets that enter through slot 1 to be policed at the specified rate. The QoS policy is applied for distributed CP services to all packets that enter through the interfaces on the line card in slot 1 and are destined for the control plane.

```
! Allow 10.1.1.1 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate-limit all other Telnet traffic.
Router(config)# access-list 140 permit tcp any any eq telnet
! Define class map "telnet-class."
Router(config)# class-map telnet-class
Router(config-cmap)# match access-group 140
Router(config-cmap)# exit
Router(config)# policy-map control-plane-in
Router(config-pmap)# class telnet-class
Router(config-pmap-c)# police 80000 conform transmit exceed drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
! Define aggregate control plane service for the active route processor.
Router(config)# control-plane slot 1
Router(config-cp)# service-policy input control-plane-in
Router(config-cp)# exit
```

The following shows how to apply an aggregate CoPP policy to the host control-plane traffic by applying it to the host control-plane feature path:

```
Router(config)# control-plane host
Router(config-cp)# service-policy input cpp-policy-host
```

The following shows how to apply an aggregate CoPP policy to the transit control-plane traffic by applying it to the control-plane transit feature path:

```
Router(config)# control-plane transit
Router(config-cp)# service-policy input cpp-policy-transit
```

The following shows how to apply an aggregate CoPP policy to the Cef-exception control-plane traffic by applying it to the control-plane CEF-exception feature path:

```
Router(config)# control-plane cef-exception
Router(config-cp)# service-policy input cpp-policy-cef-exception
```

#### Related Commands

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change or specifies the default class (commonly known as the class-default class) before you configure its policy.
<b>class-map</b>	Accesses the QoS class-map configuration mode to configure QoS class maps.
<b>drop</b>	Configures a traffic class to discard packets that belonging to a specific class.
<b>match access-group</b>	Configures the match criteria for a class map on the basis of the specified ACL.
<b>policy-map</b>	Accesses QoS policy-map configuration mode to configure the QoS policy map.
<b>service-policy (control-plane)</b>	Attaches a policy map to the control plane for aggregate or distributed control-plane services.
<b>show policy-map control-plane</b>	Displays the configuration of a class or all classes for the policy map attached to the control plane.

# custom-queue-list

To assign a custom queue list to an interface, use the **custom-queue-list** command in interface configuration mode. To remove a specific list or all list assignments, use the **no** form of this command.

**custom-queue-list** [*list-number*]

**no custom-queue-list** [*list-number*]

## Syntax Description

<i>list-number</i>	Any number from 1 to 16 for the custom queue list.
--------------------	--

## Command Default

No custom queue list is assigned.

## Command Modes

Interface configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Only one queue list can be assigned per interface. Use this command in place of the **priority-list interface** command (not in addition to it). Custom queueing allows a fairness not provided with priority queueing. With custom queueing, you can control the bandwidth available on the interface when the interface is unable to accommodate the aggregate traffic enqueued. Associated with each output queue is a configurable byte count, which specifies how many bytes of data should be delivered from the current queue by the system before the system moves on to the next queue. When a particular queue is being processed, packets are sent until the number of bytes sent exceeds the queue byte count or until the queue is empty.

Use the **show queueing custom** and **show interfaces** commands to display the current status of the custom output queues.

## Examples

In the following example, custom queue list number 3 is assigned to serial interface 0:

```
interface serial 0
 custom-queue-list 3
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.
	<b>queue-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the queue list.
	<b>queue-list interface</b>	Establishes queueing priorities on packets entering on an interface.
	<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
	<b>queue-list queue limit</b>	Designates the queue length limit for a queue.
	<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
	<b>show queueing</b>	Lists all or selected configured queueing strategies.

## description (class-map)

To add a description to the class map or the policy map, use the **description** command in class-map configuration or policy-map configuration mode. To remove the description from the class map or the policy map, use the **no** form of this command.

**description** *character-string*

**no description**

### Syntax Description

<i>character-string</i>	Comment or a description that is added to the class map or the policy map. The character-string cannot exceed 161 characters.
-------------------------	---

### Defaults

If this command is not issued, a description does not exist.

### Command Modes

Class-map configuration  
Policy-map configuration

### Command History

Release	Modification
12.4(4)T	This command was introduced.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

### Usage Guidelines

The **description** command is meant solely as a comment to be put in the configuration to help you remember information about the class map or policy map, such as which packets are included within the class map.

### Examples

The following example shows how to specify a description within the class map “ip-udp” and the policy map “fpm-policy”:

```
class-map type stack match-all ip-udp
  description "match UDP over IP packets"
  match field ip protocol eq 0x11 next udp
!
policy-map type access-control fpm-policy
  description "drop worms and malicious attacks"
  class ip-udp
  service-policy fpm-udp-policy
!
!
interface gigabitEthernet 0/1
  service-policy type access-control input fpm-policy
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Create or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

# disconnect qdm

To disconnect a Quality of Service Device Manager (QDM) client, use the **disconnect qdm** command in EXEC or privileged EXEC mode.

**disconnect qdm** [**client** *client-id*]

Syntax Description	client	(Optional) Specifies that a specific QDM client will be disconnected.
	<i>client-id</i>	(Optional) Specifies the specific QDM identification number to disconnect. A QDM identification number can be a number from 0 to 2,147,483,647.

**Command Default** This command has no default settings.

**Command Modes** EXEC  
Privileged EXEC

Command History	Release	Modification
	12.1(1)E	This command was introduced.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** Use the **disconnect qdm** command to disconnect all QDM clients that are connected to the router. Use the **disconnect qdm** [**client** *client-id*] command to disconnect a specific QDM client connected to a router. For instance, using the **disconnect qdm client 42** command will disconnect the QDM client with the ID 42.



**Note** For the Cisco 7600 series QDM is not supported on Cisco Optical Services Module (OSM) interfaces.

**Examples** The following example shows how to disconnect all connected QDM clients:

```
Router# disconnect qdm
```

The following example shows how to disconnect a specific QDM client with client ID 9:

```
Router# disconnect qdm client 9
```

Related Commands	Command	Description
	show qdm status	Displays the status of connected QDM clients.

# drop

To configure a traffic class to discard packets belonging to a specific class, use the **drop** command in policy-map class configuration mode. To disable the packet discarding action in a traffic class, use the **no** form of this command.

**drop**

**no drop**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Disabled

**Command Modes** Policy-map class configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Usage Guidelines

Note the following points when configuring the **drop** command to unconditionally discard packets in a traffic class:

- Discarding packets is the only action that can be configured in a traffic class. That is, no other actions can be configured in the traffic class.
- When a traffic class is configured with the **drop** command, a “child” (nested) policy cannot be configured for this specific traffic class through the **service policy** command.
- Discarding packets cannot be configured for the default class known as the class-default class.

## Examples

In the following example a traffic class called “class1” has been created and configured for use in a policy map called “policy1.” The policy map (service policy) is attached to an output serial interface 2/0. All packets matching access-group 101 are placed in a class called “c1.” Packets belonging to this class are discarded.

```
Router(config)# class-map class1
Router(config-cmap)# match access-group 101
Router(config-cmap)# policy-map policy1
Router(config-pmap)# class c1
Router(config-pmap-c)# drop
Router(config-pmap-c)# interface s2/0
Router(config-if)# service-policy output policy1
Router(config-if)# end
```

Related Commands	Command	Description
	<b>show class-map</b>	Displays all class maps and their matching criteria.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# dscp

To change the minimum and maximum packet thresholds for the differentiated services code point (DSCP) value, use the **dscp** command in random-detect-group configuration mode. To return the minimum and maximum packet thresholds to the default for the DSCP value, use the **no** form of this command.

**dscp** *dscp-value min-threshold max-threshold [mark-probability-denominator]*

**no dscp** *dscp-value min-threshold max-threshold [mark-probability-denominator]*

## Syntax Description

<i>dscp-value</i>	Specifies the DSCP value. The DSCP value can be a number from 0 to 63, or it can be one of the following keywords: <b>ef</b> , <b>af11</b> , <b>af12</b> , <b>af13</b> , <b>af21</b> , <b>af22</b> , <b>af23</b> , <b>af31</b> , <b>af32</b> , <b>af33</b> , <b>af41</b> , <b>af42</b> , <b>af43</b> , <b>cs1</b> , <b>cs2</b> , <b>cs3</b> , <b>cs4</b> , <b>cs5</b> , or <b>cs7</b> .
<i>min-threshold</i>	Minimum threshold in number of packets. The value range of this argument is from 1 to 4096. When the average queue length reaches the minimum threshold, Weighted Random Early Detection (WRED) randomly drops some packets with the specified DSCP value.
<i>max-threshold</i>	Maximum threshold in number of packets. The value range of this argument is the value of the <i>min-threshold</i> argument to 4096. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified DSCP value.
<i>mark-probability-denominator</i>	(Optional) Denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, one out of every 512 packets is dropped when the average queue is at the maximum threshold. The value range is from 1 to 65536. The default is 10; one out of every ten packets is dropped at the maximum threshold.

## Command Default

If WRED is using the DSCP value to calculate the drop probability of a packet, all entries of the DSCP table are initialized with the default settings shown in [Table 7](#) of the “Usage Guidelines” section.

## Command Modes

Random-detect-group configuration

## Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

This command must be used in conjunction with the **random-detect-group** command.

Additionally, the **dscp** command is available only if you specified the *dscp-based* argument when using the **random-detect-group** command.

[Table 7](#) lists the DSCP default settings used by the **dscp** command. [Table 7](#) lists the DSCP value, and its corresponding minimum threshold, maximum threshold, and mark probability. The last row of the table (the row labeled “default”) shows the default settings used for any DSCP value not specifically shown in the table.

**Table 7** *dscp Default Settings*

<b>DSCP (Precedence)</b>	<b>Minimum Threshold</b>	<b>Maximum Threshold</b>	<b>Mark Probability</b>
af11	32	40	1/10
af12	28	40	1/10
af13	24	40	1/10
af21	32	40	1/10
af22	28	40	1/10
af23	24	40	1/10
af31	32	40	1/10
af32	28	40	1/10
af33	24	40	1/10
af41	32	40	1/10
af42	28	40	1/10
af43	24	40	1/10
cs1	22	40	1/10
cs2	24	40	1/10
cs3	26	40	1/10
cs4	28	40	1/10
cs5	30	40	1/10
cs6	32	40	1/10
cs7	34	40	1/10
ef	36	40	1/10
rsvp	36	40	1/10
default	20	40	1/10

**Examples**

The following example enables WRED to use the DSCP value af22. The minimum threshold for the DSCP value af22 is 28, the maximum threshold is 40, and the mark probability is 10.

```
Router> enable
Router# configure terminal
Router(config)# random-detect-group class1 dscp-based
Router(cfg-red-group)# dscp af22 28 40 10
Router(cfg-red-group)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>random-detect-group</b>	Enables per-VC WRED or per-VC DWRED.
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

# estimate bandwidth

To estimate the bandwidth needed per traffic class for given quality of service (QoS) targets based on traffic data, use the **estimate bandwidth** command in policy-map class configuration mode. To disable the estimated bandwidth processing, use the **no** form of this command.

**estimate bandwidth** [**drop-one-in** *n*] [**delay-one-in** *n* **milliseconds** *n*]

**no estimate bandwidth**

Syntax Description	drop-one-in <i>n</i>	(Optional) The packet loss rate; for example, a value of 999 means drop no more than one packet out of 999. The range for <i>n</i> is 50 to 1000000 packets.
	<b>delay-one-in</b> <i>n</i> <b>milliseconds</b> <i>n</i>	(Optional) The packet delay time and probability; the range for <i>n</i> is 50 to 1000000 packets. The delay threshold; the range for <i>n</i> is 8 to 1000 milliseconds.

**Defaults** Disabled

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.3(14)T	This command was introduced.

**Usage Guidelines** Use the **estimate bandwidth** command to specify the target drop probability, the delay time and probability, and the timeframe.

If you specify a delay time, you must also specify a delay threshold.

If you issue the **estimate bandwidth** command with no keywords, the default target is drop less than 2 percent, which is the same as entering **estimate bandwidth drop-one-in 500**.

**Examples** In the following example, the QoS targets are drop no more than one packet in 100, and delay no more than one packet in 100 by more than 50 milliseconds:

```
Router(config-pmap-c)# estimate bandwidth drop-one-in 100 delay-one-in 100 milliseconds 50
```

Related Commands	Command	Description
	<b>bandwidth</b> ( <b>policy-map class</b> )	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.

# exponential-weighting-constant

To configure the exponential weight factor for the average queue size calculation for a Weighted Random Early Detection (WRED) parameter group, use the **exponential-weighting-constant** command in random-detect-group configuration mode. To return the exponential weight factor for the group to the default, use the **no** form of this command.

**exponential-weighting-constant** *exponent*

**no exponential-weighting-constant**

## Syntax Description

*exponent* Exponent from 1 to 16 used in the average queue size calculation.

## Command Default

The default weight factor is 9.

## Command Modes

Random-detect-group configuration

## Command History

Release	Modification
11.1(22)CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When used, this command is issued after the **random-detect-group** command is entered.

Use this command to change the exponent used in the average queue size calculation for a WRED parameter group. The average queue size is based on the previous average and the current size of the queue. The formula is:

$$\text{average} = (\text{old\_average} * (1 - 1/2^x)) + (\text{current\_queue\_size} * 1/2^x)$$

where  $x$  is the exponential weight factor specified in this command. Thus, the higher the factor, the more dependent the average is on the previous average.



### Note

The default WRED parameter values are based on the best available data. We recommend that you do not change the parameters from their default values unless you have determined that your applications would benefit from the changed values.

For high values of  $x$ , the previous average becomes more important. A large factor smooths out the peaks and lows in queue length. The average queue size is unlikely to change very quickly. The WRED process will be slow to start dropping packets, but it may continue dropping packets for a time after the actual queue size has fallen below the minimum threshold. The resulting slow-moving average will accommodate temporary bursts in traffic.

If the value of  $x$  gets too high, WRED will not react to congestion. Packets will be sent or dropped as if WRED were not in effect.

For low values of  $x$ , the average queue size closely tracks the current queue size. The resulting average may fluctuate with changes in the traffic levels. In this case, the WRED process will respond quickly to long queues. Once the queue falls below the minimum threshold, the process will stop dropping packets.

If the value of  $x$  gets too low, WRED will overreact to temporary traffic bursts and drop traffic unnecessarily.

### Examples

The following example configures the WRED group called sanjose with a weight factor of 10:

```
random-detect-group sanjose
exponential-weighting-constant 10
```

### Related Commands

Command	Description
<b>protect</b>	Configures a VC or PVC class with protected group or protected VC or PVC status for application to a VC or PVC bundle member.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect-group</b>	Defines the WRED or DWRED parameter group.
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

## fair-queue (class-default)

To specify the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy, use the **fair-queue** command in policy-map class configuration mode. To delete the configured number of dynamic queues from the class-default policy, use the **no** form of this command.

**fair-queue** [*number-of-dynamic-queues*]

**no fair-queue** [*number-of-dynamic-queues*]

### Syntax Description

*number-of-dynamic-queues* (Optional) A power of 2 that specifies the number of dynamic queues. Range is from 16 to 4096.

### Command Default

The number of dynamic queues is derived from the interface or ATM permanent virtual circuit (PVC) bandwidth. See [Table 8](#) in the “Usage Guidelines” section for the default number of dynamic queues that weighted fair queueing (WFQ) and class-based WFQ (CBWFQ) use when they are enabled on an interface. See [Table 9](#) in the “Usage Guidelines” section for the default number of dynamic queues used when WFQ or CBWFQ is enabled on an ATM PVC.

### Command Modes

Policy-map class configuration

### Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

This command can be used for the default class (commonly known as the class-default class) only. You can use it in conjunction with either the **queue-limit** command or the **random-detect** command.

The class-default class is the default class to which traffic is directed if that traffic does not satisfy the match criteria of other classes whose policy is defined in the policy map.

[Table 8](#) lists the default number of dynamic queues that weighted fair queueing (WFQ) and class-based WFQ (CBWFQ) use when they are enabled on an interface.

**Table 8** Default Number of Dynamic Queues as a Function of Interface Bandwidth

Bandwidth Range	Number of Dynamic Queues
Less than or equal to 64 kbps	16
More than 64 kbps and less than or equal to 128 kbps	32
More than 128 kbps and less than or equal to 256 kbps	64

**Table 8** Default Number of Dynamic Queues as a Function of Interface Bandwidth (continued)

Bandwidth Range	Number of Dynamic Queues
More than 256 kbps and less than or equal to 512 kbps	128
More than 512 kbps	256

Table 9 lists the default number of dynamic queues used when WFQ or CBWFQ is enabled on an ATM PVC.

**Table 9** Default Number of Dynamic Queues as a Function of ATM PVC Bandwidth

Bandwidth Range	Number of Dynamic Queues
Less than or equal to 128 kbps	16
More than 128 kbps and less than or equal to 512 kbps	32
More than 512 kbps and less than or equal to 2000 kbps	64
More than 2000 kbps and less than or equal to 8000 kbps	128
More than 8000 kbps	256

## Examples

The following example configures policy for the default class included in the policy map called policy9. Packets that do not satisfy match criteria specified for other classes whose policies are configured in the same service policy are directed to the default class, for which 16 dynamic queues have been reserved. Because the **queue-limit** command is configured, tail drop is used for each dynamic queue when the maximum number of packets are enqueued and additional packets arrive.

```
policy-map policy9
class class-default
fair-queue 16
queue-limit 20
```

The following example configures policy for the default class included in the policy map called policy8. The **fair-queue** command reserves 20 dynamic queues to be used for the default class. For congestion avoidance, Weighted Random Early Detection (WRED) packet drop is used, not tail drop.

```
policy-map policy8
class class-default
fair-queue 64
random-detect
```

## Related Commands

Command	Description
<b>queue-limit</b>	Specifies or modifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
<b>random-detect (interface)</b>	Enables WRED or DWRED.

# fair-queue (DWFQ)

To enable Versatile Interface Processor (VIP)-distributed weighted fair queueing (DWFQ), use the **fair-queue** command in interface configuration mode. To disable DWFQ, use the **no** form of this command.

**fair-queue**

**no fair-queue**

**Syntax Description** This command has no arguments or keywords.

**Command Default** DWFQ is enabled by default for physical interfaces whose bandwidth is less than or equal to 2.048 Mbps.

DWFQ can be configured on interfaces but not subinterfaces. It is not supported on Fast EtherChannel, tunnel, or other logical or virtual interfaces such as Multilink PPP (MLP).

See [Table 10](#) in the “Usage Guidelines” section of this command for a list of the default queue lengths and thresholds.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.1	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** The **fair-queue** (DWFQ) command enables DWFQ on an interface using a VIP2-40 or greater interface processor.

With DWFQ, packets are classified by flow. Packets with the same source IP address, destination IP address, source TCP or User Datagram Protocol (UDP) port, destination TCP or UDP port, and protocol belong to the same flow.

DWFQ allocates an equal share of the bandwidth to each flow.

[Table 10](#) lists the default queue lengths and thresholds.

**Table 10** *Default Fair Queue Lengths and Thresholds*

Queue or Threshold	Default
Congestive discard threshold	64 messages

**Table 10** *Default Fair Queue Lengths and Thresholds (continued)*

Queue or Threshold	Default
Dynamic queues	256 queues
Reservable queues	0 queues

**Examples**

The following example enables DWFQ on the High-Speed Serial Interface (HSSI) interface 0/0/0:

```
interface Hssi0/0/0
description 45Mbps to R2
ip address 10.200.14.250 255.255.255.252
fair-queue
```

**Related Commands**

Command	Description
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>fair-queue aggregate-limit</b>	Sets the maximum number of packets in all queues combined for DWFQ.
<b>fair-queue individual-limit</b>	Sets the maximum individual queue depth for DWFQ.
<b>fair-queue limit</b>	Sets the maximum queue depth for a specific DWFQ class.
<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue (policy-map class)

To specify the number of queues to be reserved for use by a traffic class, use the **fair-queue** command in policy-map class configuration mode. To delete the configured number of queues from the traffic class, use the **no** form of this command.

**fair-queue** [*dynamic-queues*]

**no fair-queue** [*dynamic-queues*]

<b>Syntax Description</b>	<i>dynamic-queues</i>	(Optional) A number specifying the number of dynamic conversation queues. The number can be in the range of 16 to 4096.
---------------------------	-----------------------	---

<b>Command Default</b>	No queues are reserved.
------------------------	-------------------------

<b>Command Modes</b>	Policy-map class configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)T	
12.0(5)XE		This command was integrated into Cisco IOS Release 12.0(5)XE and implemented on Versatile Interface Processor (VIP)-enabled Cisco 7500 series routers.
12.1(5)T		This command was integrated into Cisco IOS Release 12.1(5)T and was implemented on VIP-enabled Cisco 7500 series routers.
12.2(33)SRA		This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX		This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	On a VIP, the <b>fair-queue</b> command can be used for any traffic class (as opposed to non-VIP platforms, which can only use the <b>fair-queue</b> command in the default traffic class). The <b>fair-queue</b> command can be used in conjunction with either the <b>queue-limit</b> command or the <b>random-detect exponential-weighting-constant</b> command.
-------------------------	---

<b>Examples</b>	The following example configures the default traffic class for the policy map called policy9 to reserve ten queues for packets that do not satisfy match criteria specified for other traffic classes whose policy is configured in the same service policy. Because the <b>queue-limit</b> command is configured, tail drop is used for each queue when the maximum number of packets is enqueued and additional packets arrive.
-----------------	---

```
policy-map policy9
  class class-default
    fair-queue 10
    queue-limit 20
```

The following example configures a service policy called policy8 that is associated with a user-defined traffic class called class1. The **fair-queue** command reserves 20 queues to be used for the service policy. For congestion avoidance, Weighted Random Early Detection (WRED) or distributed WRED (DWRED) packet drop is used, not tail drop.

```
policy-map policy8
  class class1
    fair-queue 20
      random-detect exponential-weighting-constant 14
```

**Related Commands**

Command	Description
<b>class class-default</b>	Specifies the default traffic class for a service policy map.
<b>queue-limit</b>	Specifies or modifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.

## fair-queue (WFQ)

To enable weighted fair queueing (WFQ) for an interface, use the **fair-queue** command in interface configuration mode. To disable WFQ for an interface, use the **no** form of this command.

**fair-queue** [*congestive-discard-threshold* [*dynamic-queues* [*reservable-queues*]]]

**no fair-queue**

### Syntax Description

<i>congestive-discard-threshold</i>	(Optional) Number of messages allowed in each queue. The range is 1 to 4096 and the default is 64 messages. When a conversation reaches this threshold, new message packets are discarded.
<i>dynamic-queues</i>	(Optional) Number of dynamic queues used for best-effort conversations (that is, a normal conversation not requiring any special network services). Values are <b>16, 32, 64, 128, 256, 512, 1024, 2048, and 4096</b> . See Table 4 and Table 5 in the <b>fair-queue</b> (class-default) command for the default number of dynamic queues.
<i>reservable-queues</i>	(Optional) Number of reservable queues used for reserved conversations in the range 0 to 1000. The default is 0. Reservable queues are used for interfaces configured for features such as Resource Reservation Protocol (RSVP).

### Command Default

Fair queueing is enabled by default for physical interfaces whose bandwidth is less than or equal to 2.048 Mbps and that do not use the following:

- X.25 and Synchronous Data Link Control (SDLC) encapsulations
- Link Access Procedure, Balanced (LAPB)
- Tunnels
- Loopbacks
- Dialer
- Bridges
- Virtual interfaces

Fair queueing is not an option for the protocols listed above. However, if custom queueing or priority queueing is enabled for a qualifying link, it overrides fair queueing, effectively disabling it. Additionally, fair queueing is automatically disabled if you enable the autonomous or silicon switching engine mechanisms.



#### Note

A variety of queueing mechanisms can be configured using multilink, for example, Multichassis Multilink PPP (MMP). However, if only PPP is used on a tunneled interface—for example, virtual private dialup network (VPND), PPP over Ethernet (PPPoE), or PPP over Frame Relay (PPPoFR)—no queueing can be configured on the virtual interface.

The number of dynamic queues is derived from the interface or ATM permanent virtual circuit (PVC) bandwidth. See [Table 8](#) in the **fair-queue** (class-default) command for the default number of dynamic queues that WFQ and class-based WFQ (CBWFQ) use when they are enabled on an interface. See [Table 9](#) in the **fair-queue** (class-default) command for the default number of dynamic queues used when WFQ and CBWFQ are enabled on an ATM PVC.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.0	This command was introduced.
	12.2(13)T	This command was modified to remove apollo, vines, and xns from the list of protocols and traffic stream discrimination fields. These protocols were removed because Apollo Domain, Banyan VINES, and Xerox Network Systems (XNS) were removed in Release 12.2(13)T.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command enables WFQ. With WFQ, packets are classified by flow. For example, packets with the same source IP address, destination IP address, source TCP or User Datagram Protocol (UDP) port, destination TCP or UDP port, and protocol belong to the same flow; see [Table 11](#) for a full list of protocols and traffic stream discrimination fields.

When enabled for an interface, WFQ provides traffic priority management that automatically sorts among individual traffic streams without requiring that you first define access lists. Enabling WFQ requires use of this command only.

When WFQ is enabled for an interface, new messages for high-bandwidth traffic streams are discarded after the configured or default congestive discard threshold has been met. However, low-bandwidth conversations, which include control message conversations, continue to enqueue data. As a result, the fair queue may occasionally contain more messages than its configured threshold number specifies.

WFQ uses a traffic data stream discrimination registry service to determine which traffic stream a message belongs to. For each forwarding protocol, [Table 11](#) shows the attributes of a message that are used to classify traffic into data streams.

**Table 11**      **Weighted Fair Queueing Traffic Stream Discrimination Fields**

Forwarder	Fields Used
AppleTalk	<ul style="list-style-type: none"> <li>• Source net, node, socket</li> <li>• Destination net, node, socket</li> <li>• Type</li> </ul>
Connectionless Network Service (CLNS)	<ul style="list-style-type: none"> <li>• Source network service access point (NSAP)</li> <li>• Destination NSAP</li> </ul>
DECnet	<ul style="list-style-type: none"> <li>• Source address</li> <li>• Destination address</li> </ul>
Frame Relay switching	<ul style="list-style-type: none"> <li>• Data-link connection identified (DLCI) value</li> </ul>
IP	<ul style="list-style-type: none"> <li>• Type of service (ToS)</li> <li>• IP protocol</li> <li>• Source IP address (if message is not fragmented)</li> <li>• Destination IP address (if message is not fragmented)</li> <li>• Source TCP/UDP port</li> <li>• Destination TCP/UDP port</li> </ul>
Transparent bridging	<ul style="list-style-type: none"> <li>• Unicast: source MAC, destination MAC</li> <li>• Ethertype Service Advertising Protocol (SAP)/Subnetwork Access Protocol (SNAP) multicast: destination MAC address</li> </ul>
Source-route bridging	<ul style="list-style-type: none"> <li>• Unicast: source MAC, destination MAC</li> <li>• SAP/SNAP multicast: destination MAC address</li> </ul>
Novell NetWare	<ul style="list-style-type: none"> <li>• Source/destination network/host/socket</li> <li>• Level 2 protocol</li> </ul>
All others (default)	<ul style="list-style-type: none"> <li>• Control protocols (one queue per protocol)</li> </ul>

It is important to note that IP Precedence, congestion in Frame Relay switching, and discard eligible (DE) flags affect the weights used for queueing.

IP Precedence, which is set by the host or by policy maps, is a number in the range from 0 to 7. Data streams of precedence *number* are weighted so that they are given an effective bit rate of *number*+1 times as fast as a data stream of precedence 0, which is normal.

In Frame Relay switching, message flags for forward explicit congestion notification (FECN), backward explicit congestion notification (BECN), and DE message flags cause the algorithm to select weights that effectively impose reduced queue priority. The reduced queue priority provides the application with “slow down” feedback and sorts traffic, giving the best service to applications within their committed information rate (CIR).

Fair queueing is supported for all LAN and line (WAN) protocols except X.25, including LAPB and SDLC; see the notes in the section “Defaults.” Because tunnels are software interfaces that are themselves routed over physical interfaces, fair queueing is not supported for tunnels. Fair queueing is on by default for interfaces with bandwidth less than or equal to 2 Mbps.

**Note**

For Release 10.3 and earlier releases for the Cisco 7000 and 7500 routers with a Route Switch Processor (RSP) card, if you used the **tx-queue-limit** command to set the transmit limit available to an interface on a Multiport Communications Interface (MCI) or serial port communications interface (SCI) card and you configured custom queueing or priority queueing for that interface, the configured transmit limit was automatically overridden and set to 1. With Cisco IOS Release 12.0 and later releases, for WFQ, custom queueing, and priority queueing, the configured transmit limit is derived from the bandwidth value set for the interface using the **bandwidth** (interface) command. Bandwidth value divided by 512 rounded up yields the effective transmit limit. However, the derived value only applies in the absence of a **tx-queue-limit** command; that is, a configured transmit limit overrides this derivation.

When Resource Reservation Protocol (RSVP) is configured on an interface that supports fair queueing or on an interface that is configured for fair queueing with the reservable queues set to 0 (the default), the reservable queue size is automatically configured using the following method: interface bandwidth divided by 32 kbps. You can override this default by specifying a reservable queue other than 0. For more information on RSVP, refer to the chapter “Configuring RSVP” in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Examples**

The following example enables use of WFQ on serial interface 0, with a congestive threshold of 300. This threshold means that messages will be discarded from the queueing system only when 300 or more messages have been queued and the message is in a data stream that has more than one message in the queue. The transmit queue limit is set to 2, based on the 384-kilobit (Kb) line set by the **bandwidth** command:

```
interface serial 0
 bandwidth 384
 fair-queue 300
```

Unspecified parameters take the default values.

The following example requests a fair queue with a congestive discard threshold of 64 messages, 512 dynamic queues, and 18 RSVP queues:

```
interface Serial 3/0
 ip unnumbered Ethernet 0/0
 fair-queue 64 512 18
```

**Related Commands**

Command	Description
<b>bandwidth (interface)</b>	Sets a bandwidth value for an interface.
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
<b>fair-queue (DWFQ)</b>	Enables DWFQ.
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>priority-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the priority list.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.

<b>Command</b>	<b>Description</b>
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>tx-queue-limit</b>	Controls the number of transmit buffers available to a specified interface on the MCI and SCI cards.

# fair-queue aggregate-limit

To set the maximum number of packets in all queues combined for Versatile Interface Processor (VIP)-distributed weighted fair queueing (DWFQ), use the **fair-queue aggregate-limit** command in interface configuration mode. To return the value to the default, use the **no** form of this command.

**fair-queue aggregate-limit** *aggregate-packets*

**no fair-queue aggregate-limit**

## Syntax Description

<i>aggregate-packets</i>	Total number of buffered packets allowed before some packets may be dropped. Below this limit, packets will not be dropped.
--------------------------	---

## Command Default

The total number of packets allowed is based on the transmission rate of the interface and the available buffer space on the VIP.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1 CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

In general, you should not change the maximum number of packets allows in all queues from the default. Use this command only if you have determined that you would benefit from using a different value, based on your particular situation.

DWFQ keeps track of the number of packets in each queue and the total number of packets in all queues.

When the total number of packets is below the aggregate limit, queues can buffer more packets than the individual queue limit.

When the total number of packets reaches the aggregate limit, the interface starts enforcing the individual queue limits. Any new packets that arrive for a queue that is over its individual queue limit are dropped. Packets that are already in the queue will not be dropped, even if the queue is over the individual limit.

In some cases, the total number of packets in all queues put together may exceed the aggregate limit.

## Examples

The following example sets the aggregate limit to 54 packets:

```
interface Fddi9/0/0
 fair-queue tos
 fair-queue aggregate-limit 54
```

Related Commands	Command	Description
	<b>fair-queue limit</b>	Sets the maximum queue depth for a specific DWFQ class.
	<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
	<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
	<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
	<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue individual-limit

To set the maximum individual queue depth for Versatile Interface Processor (VIP)-distributed weighted fair queueing (DWFQ), use the **fair-queue individual-limit** command in interface configuration mode. To return the value to the default, use the **no** form of this command.

**fair-queue individual-limit** *individual-packet*

**no fair-queue individual-limit**

## Syntax Description

<i>individual-packet</i>	Maximum number of packets allowed in each per-flow or per-class queue during periods of congestion.
--------------------------	---

## Command Default

Half of the aggregate queue limit

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1 CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

In general, you should not change the maximum individual queue depth from the default. Use this command only if you have determined that you would benefit from using a different value, based on your particular situation.

DWFQ keeps track of the number of packets in each queue and the total number of packets in all queues.

When the total number of packets is below the aggregate limit, queues can buffer more packets than the individual queue limit.

When the total number of packets reaches the aggregate limit, the interface starts enforcing the individual queue limits. Any new packets that arrive for a queue that is over its individual queue limit are dropped. Packets that are already in the queue will not be dropped, even if the queue is over the individual limit.

In some cases, the total number of packets in all queues put together may exceed the aggregate limit.

**Examples**

The following example sets the individual queue limit to 27:

```
interface Fddi9/0/0
  mac-address 0000.0c0c.2222
  ip address 10.1.1.1 255.0.0.0
  fair-queue tos
  fair-queue individual-limit 27
```

**Related Commands**

Command	Description
<b>fair-queue (class-default)</b>	Sets the maximum number of packets in all queues combined for DWFQ.
<b>fair-queue limit</b>	Sets the maximum queue depth for a specific DWFQ class.
<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue limit

To set the maximum queue depth for a specific Versatile Interface Processor (VIP)-distributed weighted fair queueing (DWFQ) class, use the **fair-queue limit** command in interface configuration mode. To return the value to the default, use the **no** form of this command.

```
fair-queue { qos-group number | tos number } limit class-packet
```

```
no fair-queue { qos-group number | tos number } limit class-packet
```

## Syntax Description

<b>qos-group number</b>	Number of the QoS group, as assigned by a committed access rate (CAR) policy or the Policy Propagation via Border Gateway Protocol (BGP) feature. The value can range from 1 to 99.
<b>tos number</b>	Two low-order IP Precedence bits of the type of service (ToS) field.
<b>class-packet</b>	Maximum number of packets allowed in the queue for the class during periods of congestion.

## Command Default

The individual queue depth, as specified by the **fair-queue individual-limit** command. If the **fair-queue individual-limit** command is not configured, the default is half of the aggregate queue limit.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1 CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to specify the number queue depth for a particular class for class-based DWFQ. This command overrides the global individual limit specified by the **fair-queue individual-limit** command.

In general, you should not change this value from the default. Use this command only if you have determined that you would benefit from using a different value, based on your particular situation.

## Examples

The following example sets the individual queue limit for ToS group 3 to 20:

```
interface Fddi9/0/0
 mac-address 0000.0c0c.2222
 ip address 10.1.1.1 255.0.0.0
 fair-queue tos
 fair-queue tos 3 limit 20
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>fair-queue (class-default)</b>	Sets the maximum number of packets in all queues combined for DWFQ.
	<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
	<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
	<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
	<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue qos-group

To enable Versatile Interface Processor (VIP)-distributed weighted fair queuing (DWFQ) and classify packets based on the internal QoS-group number, use the **fair-queue qos-group** command in interface configuration mode. To disable QoS-group-based DWFQ, use the **no** form of this command.

**fair-queue qos-group**

**no fair-queue qos-group**

## Syntax Description

This command has no arguments or keywords.

## Command Default

QoS-group-based DWFQ is disabled.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to enable QoS-group-based DWFQ, a type of class-based DWFQ. Class-based DWFQ overrides flow-based DWFQ. Therefore, this command overrides the **fair-queue** (DWFQ) command.

When this command is enabled, packets are assigned to different queues based on their QoS group. A QoS group is an internal classification of packets used by the router to determine how packets are treated by certain QoS features, such as DWFQ and committed access rate (CAR). Use a CAR policy or the QoS Policy Propagation via Border Gateway Protocol (BGP) feature to assign packets to QoS groups.

Specify a weight for each class. In periods of congestion, each group is allocated a percentage of the output bandwidth equal to the weight of the class. For example, if a class is assigned a weight of 50, packets from this class are allocated at least 50 percent of the outgoing bandwidth during periods of congestion.

## Examples

The following example enables QoS-based DWFQ and allocates bandwidth for nine QoS groups (QoS groups 0 through 8):

```
interface Hssi0/0/0
  description 45Mbps to R2
  ip address 10.200.14.250 255.255.255.252
  fair-queue qos-group
  fair-queue qos-group 1 weight 5
  fair-queue qos-group 2 weight 5
  fair-queue qos-group 3 weight 10
```

## ■ fair-queue qos-group

```

fair-queue qos-group 4 weight 10
fair-queue qos-group 5 weight 10
fair-queue qos-group 6 weight 15
fair-queue qos-group 7 weight 20
fair-queue qos-group 8 weight 29

```

### Related Commands

Command	Description
<b>fair-queue (class-default)</b>	Sets the maximum number of packets in all queues combined for DWFQ.
<b>fair-queue limit</b>	Sets the maximum queue depth for a specific DWFQ class.
<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
<b>fair-queue weight</b>	Assigns a weight to a class for DWFQ.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue tos

To enable Versatile Interface Processor (VIP)-distributed weighted fair queuing (DWFQ) and classify packets using the type of service (ToS) field of packets, use the **fair-queue tos** command in interface configuration command. To disable ToS-based DWFQ, use the **no** form of this command.

**fair-queue tos**

**no fair-queue tos**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Disabled

By default, class 0 is assigned a weight of 10; class 1 is assigned a weight of 20; class 2 is assigned a weight of 30; and class 3 is assigned a weight of 40.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to enable ToS-based DWFQ, a type of class-based DWFQ. Class-based DWFQ overrides flow-based DWFQ. Therefore, this command overrides the **fair-queue** (DWFQ) command.

When this command is enabled, packets are assigned to different queues based on the two low-order IP Precedence bits in the ToS field of the packet header.

In periods of congestion, each group is allocated a percentage of the output bandwidth equal to the weight of the class. For example, if a class is assigned a weight of 50, packets from this class are allocated at least 50 percent of the outgoing bandwidth during periods of congestion.

If you wish to change the weights, use the **fair-queue weight** command.

## Examples

The following example enables ToS-based DWFQ on the High-Speed Serial Interface (HSSI) interface 0/0/0:

```
interface Hssi0/0/0
  description 45Mbps to R2
  ip address 10.200.14.250 255.255.255.252
  fair-queue
  fair-queue tos
```

Related Commands	Command	Description
	<b>fair-queue (class-default)</b>	Sets the maximum number of packets in all queues combined for DWFQ.
	<b>fair-queue limit</b>	Sets the maximum queue depth for a specific DWFQ class.
	<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
	<b>fair-queue weight</b>	Assigns a weight to a class for DWFQ.
	<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
	<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# fair-queue weight

To assign a weight to a class for Versatile Interface Processor (VIP)-distributed weighted fair queuing (DWFQ), use the **fair-queue weight** command in interface configuration mode. To remove the bandwidth allocated for the class, use the **no** form of this command.

**fair-queue** { **qos-group** *number* | **tos** *number* } **weight** *weight*

**no fair-queue** { **qos-group** *number* | **tos** *number* } **weight** *weight*

## Syntax Description

<b>qos-group</b> <i>number</i>	Number of the quality of service (QoS) group, as assigned by a committed access rate (CAR) policy or the Policy Propagation via Border Gateway Protocol (BGP) feature. The value range is from 1 to 99.
<b>tos</b> <i>number</i>	Two low-order IP Precedence bits of the type of service (ToS) field. The value range is from 1 to 3.
<i>weight</i>	Percentage of the output link bandwidth allocated to this class. The sum of weights for all classes cannot exceed 99.

## Command Default

For QoS DWFQ, unallocated bandwidth is assigned to QoS group 0.

For ToS-based DWFQ, class 0 is assigned a weight of 10; class 1 is assigned a weight of 20; class 2 is assigned a weight of 30; and class 3 is assigned a weight of 40.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to allocate percentages of bandwidth for specific DWFQ classes. You must also enable class-based DWFQ on the interface with either the **fair-queue qos-group** or **fair-queue tos** command.

Enter this command once for every class to allocate bandwidth to the class.

For QoS-group-based DWFQ, packets that are not assigned to any QoS groups are assigned to QoS group 0. When assigning weights to QoS group class, remember the following guidelines:

- One percent of the available bandwidth is automatically allocated to QoS group 0.
- The total weight for all the other QoS groups combined cannot exceed 99.
- Any unallocated bandwidth is assigned to QoS group 0.

For ToS-based DWFQ, remember the following guidelines:

- One percent of the available bandwidth is automatically allocated to ToS class 0.
- The total weight for all the other ToS classes combined cannot exceed 99.
- Any unallocated bandwidth is assigned to ToS class 0.

### Examples

The following example allocates bandwidth to different QoS groups. The remaining bandwidth (5 percent) is allocated to QoS group 0.

```
interface Fddi9/0/0
  fair-queue qos-group
  fair-queue qos-group 1 weight 10
  fair-queue qos-group 2 weight 15
  fair-queue qos-group 3 weight 20
  fair-queue qos-group 4 weight 20
  fair-queue qos-group 5 weight 30
```

### Related Commands

Command	Description
<b>fair-queue qos-group</b>	Enables DWFQ and classifies packets based on the internal QoS-group number.
<b>fair-queue tos</b>	Enables DWFQ and classifies packets using the ToS field of packets.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.

# feedback

To enable the context-status feedback messages from the interface or link, use the **feedback** command in IPHC-profile configuration mode. To disable the context-status feedback messages, use the **no** form of this command.

**feedback**

**no feedback**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Context-status feedback messages are enabled.

**Command Modes** IPHC-profile configuration

Command History	Release	Modification
	12.4(9)T	This command was introduced.

## Usage Guidelines

### Intended for Use with IPHC Profiles

The **feedback** command is intended for use as part of an IP Header Compression (IPHC) profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

### Restriction

There are two types of IPHC profiles: Internet Engineering Task Force (IETF) profiles and van-jacobson profiles. The **feedback** command is supported for IETF IPHC profiles only. The **feedback** command is not supported for van-jacobson IPHC profiles. For more information about IPHC profile types, see the “Header Compression” section of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

### Prerequisite

Before using the **feedback** command, you must enable either TCP header compression or non-TCP header compression. To enable TCP header compression, use the **tcp** command. To enable non-TCP header compression, use the **non-tcp** command.

### Disabling of Context-Status Messages

During header compression, a session context is defined. For each context, the session state is established and shared between the compressor and the decompressor. The context state consists of the full IP/UDP/RTP, IP/UDP, or IP/TCP headers, a few first-order differential values, a link sequence number, a generation number, and a delta encoding table.

When the decompressor loses synchronization with the compressor, the decompressor sends a context status message to the compressor with a list of context IDs to invalidate. The compressor then sends a full-header packet to the decompressor to reestablish a consistent state. Note that all packets for the invalid context IDs are discarded until a full-header packet is received for that context ID.

You can disable the sending of context-status messages either when the time it takes for the packet to traverse the uplink and the downlink portions of the data path is greater than the refresh period (in which case, the sending of the context-status message would not be useful) or when a feedback path does not exist.

### Examples

The following is an example of an IPHC profile called profile2. In this example, context-status feedback messages have been disabled.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp
Router(config-iphcp)# no feedback
Router(config-iphcp)# end
```

### Related Commands

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.
<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.
<b>tcp</b>	Enables TCP header compression within an IPHC profile.

# frame-relay interface-queue priority

To enable the Frame Relay PVC Interface Priority Queueing (FR PIPQ) feature, use the **frame-relay interface-queue priority** command in interface configuration mode. To disable FR PIPQ, use the **no** form of this command.

**frame-relay interface-queue priority** [*high-limit medium-limit normal-limit low-limit*]

**no frame-relay interface-queue priority**

To assign priority to a permanent virtual circuit (PVC) within a Frame Relay map class, use the **frame-relay interface-queue priority** command in map-class configuration mode. To remove priority from a PVC within a Frame Relay map class, use the **no** form of this command.

**frame-relay interface-queue priority** {**high** | **medium** | **normal** | **low**}

**no frame-relay interface-queue priority**

## Syntax Description

<i>high-limit</i>	(Optional) Size of the high priority queue specified in maximum number of packets.
<i>medium-limit</i>	(Optional) Size of the medium priority queue specified in maximum number of packets.
<i>normal-limit</i>	(Optional) Size of the normal priority queue specified in maximum number of packets.
<i>low-limit</i>	(Optional) Size of the low priority queue specified in maximum number of packets.
<b>high</b>	Assigns high priority to a PVC.
<b>medium</b>	Assigns medium priority to a PVC.
<b>normal</b>	Assigns normal priority to a PVC.
<b>low</b>	Assigns low priority to a PVC.

## Command Default

The default sizes of the high, medium, normal, and low priority queues are 20, 40, 60, and 80 packets, respectively.

When FR PIPQ is enabled on the interface, the default PVC priority is normal priority.

## Command Modes

Interface configuration  
Map-class configuration

## Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

FR PIPQ must be enabled on the interface in order for the map-class configuration of PVC priority to be effective.

Before you configure FR PIPQ using the **frame-relay interface-queue priority** command, the following conditions must be met:

- PVCs should be configured to carry a single type of traffic.
- The network should be configured with adequate call admission control to prevent starvation of any of the priority queues.

You will not be able to configure FR PIPQ if any queueing other than first-in first out (FIFO) queueing is already configured at the interface level. You will be able to configure FR PIPQ when weighted fair queueing (WFQ) is in use, as long as WFQ is the default interface queueing method. Disabling FR PIPQ will restore the interface to dual FIFO queueing if FRF.12 is enabled, FIFO queueing if Frame Relay Traffic Shaping (FRTS) is enabled, or the default queueing method for the interface.

**Examples**

In the following example, FR PIPQ is enabled on serial interface 0, and the limits of the high, medium, normal, and low priority queues are set to 10, 20, 30, and 40 packets, respectively. PVC 100 is assigned high priority, so all traffic destined for PVC 100 will be sent to the high priority interface queue.

```
interface serial0
  encapsulation frame-relay
  frame-relay interface-queue priority 10 20 30 40
  frame-relay interface-dlci 100
    class high_priority_class
  !
map-class frame-relay high_priority_class
frame-relay interface-queue priority high
```

**Related Commands**

Command	Description
<b>debug priority</b>	Displays priority queueing events.
<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# frame-relay ip rtp compression-connections

To specify the maximum number of Real-Time Transport Protocol (RTP) header compression connections that can exist on a Frame Relay interface, use the **frame-relay ip rtp compression-connections** command in interface configuration mode. To restore the default, use the **no** form of this command.

**frame-relay ip rtp compression-connections** *number*

**no frame-relay ip rtp compression-connections**

<b>Syntax Description</b>	<i>number</i>	Maximum number of RTP header compression connections. The range is from 3 to 256.
---------------------------	---------------	---

<b>Command Default</b>	256 header compression connections
------------------------	------------------------------------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

<b>Usage Guidelines</b>	Before you can configure the maximum number of connections, RTP header compression must be configured on the interface using the <b>frame-relay ip rtp header-compression</b> command.
	The number of RTP header compression connections must be set to the same value at each end of the connection.

<b>Examples</b>	The following example shows the configuration of a maximum of 150 RTP header compression connections on serial interface 0:
-----------------	---

```
interface serial 0
 encapsulation frame-relay
 frame-relay ip rtp header-compression
 frame-relay ip rtp compression-connections 150
```

Related Commands	Command	Description
	<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip compress</b>	Enables both RTP and TCP header compression on a link.
	<b>frame-relay map ip rtp header-compression</b>	Enables RTP header compression per DLCI.
	<b>show frame-relay ip rtp header-compression</b>	Displays RTP header compression statistics for Frame Relay.

# frame-relay ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression for all Frame Relay maps on a physical interface, use the **frame-relay ip rtp header-compression** command in interface configuration mode. To disable the compression, use the **no** form of this command.

**frame-relay ip rtp header-compression** [**active** | **passive**] [**periodic-refresh**]

**no frame-relay ip rtp header-compression** [**active** | **passive**] [**periodic-refresh**]

## Syntax Description

<b>active</b>	(Optional) Compresses all outgoing RTP packets.
<b>passive</b>	(Optional) Compresses the outgoing RTP/User Datagram Protocol (UDP)/IP header only if an incoming packet had a compressed header.
<b>periodic-refresh</b>	(Optional) Indicates that the compressed IP header will be refreshed periodically.

## Command Default

Disabled.

By default, whatever type of header compression is configured on the interface will be inherited. If header compression is not configured on the interface, the **active** keyword will be used, but no **header-compression** keyword will appear on the **show running-config** command output.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T. This command was modified to include the <b>periodic-refresh</b> keyword.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When the **frame-relay ip rtp header-compression** command is used on the physical interface, all the interface maps inherit the command; that is, all maps will perform UDP and RTP IP header compression.

## Examples

The following example enables RTP header compression for all Frame Relay maps on a physical interface:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial12/0.1
```

```
Router(config-if)# frame-relay ip rtp header-compression
Router(config-if)# end
```

In the following example, RTP header compression is enabled and the optional **periodic-refresh** keyword is specified:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0.2
Router(config-if)# frame-relay ip rtp header-compression periodic-refresh
Router(config-if)# end
```

#### Related Commands

Command	Description
<b>frame-relay ip rtp compression-connections</b>	Specifies maximum number of RTP header compression connections on a Frame Relay interface.
<b>frame-relay map ip nocompress</b>	Disables both RTP and TCP header compression on a link.
<b>show frame-relay ip rtp header-compression</b>	Displays RTP header compression statistics for Frame Relay.

# frame-relay ip rtp priority

To reserve a strict priority queue on a Frame Relay permanent virtual circuit (PVC) for a set of Real-Time Transport Protocol (RTP) packet flows belonging to a range of User Datagram Protocol (UDP) destination ports, use the **frame-relay ip rtp priority** command in map-class configuration mode. To disable the strict priority queue, use the **no** form of this command.

**frame-relay ip rtp priority** *starting-rtp-port-number port-number-range bandwidth*

**no frame-relay ip rtp priority**

Syntax Description		
<i>starting-rtp-port-number</i>		The starting UDP port number. The lowest port number to which the packets are sent. A port number can be a number from 2000 to 65535.
<i>port-number-range</i>		The range of UDP destination ports. Number, which added to the <i>starting-rtp-port-number</i> argument, yields the highest UDP port number. The range can be from 0 to 16383.
<i>bandwidth</i>		Maximum allowed bandwidth, in kbps. The bandwidth can range from 0 to 2000 kbps.

**Command Default** No default behavior or values

**Command Modes** Map-class configuration

Command History	Release	Modification
	12.0(7)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command is most useful for voice applications, or other applications that are delay-sensitive. To use this command, you must first enter the **map-class frame-relay** command. After the Frame Relay map class has been configured, it must then be applied to a PVC.

This command extends the functionality offered by the **ip rtp priority** command by supporting Frame Relay PVCs. The command allows you to specify a range of UDP ports whose voice traffic is guaranteed strict priority service over any other queues or classes using the same output interface. Strict priority means that if packets exist in the priority queue, they are dequeued and sent first—that is, before packets in other queues are dequeued.

Frame Relay Traffic Shaping (FRTS) and Frame Relay Fragmentation (FRF.12) must be configured before the **frame-relay ip rtp priority** command is used.

Compressed RTP (CRTP) can be used to reduce the bandwidth required per voice call. When using CRTP with Frame Relay, you must use the **encapsulation frame-relay cisco** command instead of the **encapsulation frame-relay ietf** command.

Remember the following guidelines when configuring the *bandwidth* parameter:

- It is always safest to allocate to the priority queue slightly more than the known required amount of bandwidth, to allow room for network bursts.
- The IP RTP Priority admission control policy takes RTP header compression into account. Therefore, while configuring the *bandwidth* parameter of the **ip rtp priority** command you need to configure only for the bandwidth of the compressed call. Because the *bandwidth* parameter is the maximum total bandwidth, you need to allocate enough bandwidth for all calls if there will be more than one call.
- Configure a bandwidth that allows room for Layer 2 headers. The bandwidth allocation takes into account the payload plus the IP, UDP, and RTP headers but does not account for Layer 2 headers. Allowing 25 percent bandwidth for other overhead is conservative and safe.
- The sum of all bandwidth allocation for voice and data flows on an interface cannot exceed 75 percent of the total available bandwidth, unless you change the default maximum reservable bandwidth. To change the maximum reservable bandwidth, use the **max-reserved-bandwidth** command on the interface.

For more information on IP RTP Priority bandwidth allocation, refer to the section “IP RTP Priority” in the chapter “Congestion Management Overview” in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

## Examples

The following example first configures the Frame Relay map class called voip and then applies the map class to PVC 100 to provide strict priority service to matching RTP packets:

```
map-class frame-relay voip
  frame-relay cir 256000
  frame-relay bc 2560
  frame-relay be 600
  frame-relay mincir 256000
  no frame-relay adaptive-shaping
  frame-relay fair-queue
  frame-relay fragment 250
  frame-relay ip rtp priority 16384 16380 210

interface Serial5/0
  ip address 10.10.10.10 255.0.0.0
  no ip directed-broadcast
  encapsulation frame-relay
  no ip mroute-cache
  load-interval 30
  clockrate 1007616
  frame-relay traffic-shaping
  frame-relay interface-dlci 100
    class voip
  frame-relay ip rtp header-compression
  frame-relay intf-type dce
```

In this example, RTP packets on PVC 100 with UDP ports in the range from 16384 to 32764 (32764 = 16384 + 16380) will be matched and given strict priority service.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>encapsulation frame-relay</b>	Enables Frame Relay encapsulation.
	<b>ip rtp priority</b>	Reserves a strict priority queue for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>map-class frame-relay</b>	Specifies a map class to define QoS values for an SVC.
	<b>max-reserved-bandwidth</b>	Changes the percent of interface bandwidth allocated for CBWFQ, LLQ, and IP RTP Priority.
	<b>priority</b>	Gives priority to a class of traffic belonging to a policy map.
	<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
	<b>show traffic-shape queue</b>	Displays information about the elements queued by traffic shaping at the interface level or the DLCI level.

# frame-relay ip tcp compression-connections

To specify the maximum number of TCP header compression connections that can exist on a Frame Relay interface, use the **frame-relay ip tcp compression-connections** command in interface configuration mode. To restore the default, use the **no** form of this command.

**frame-relay ip tcp compression-connections** *number*

**no frame-relay ip tcp compression-connections**

<b>Syntax Description</b>	<i>number</i>	Maximum number of TCP header compression connections. The range is from 3 to 256.
---------------------------	---------------	---

<b>Command Default</b>	256 header compression connections
------------------------	------------------------------------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

<b>Usage Guidelines</b>	<p>Before you can configure the maximum number of connections, TCP header compression must be configured on the interface using the <b>frame-relay ip tcp header-compression</b> command.</p> <p>The number of TCP header compression connections must be set to the same value at each end of the connection.</p>
-------------------------	--

<b>Examples</b>	The following example shows the configuration of a maximum of 150 TCP header compression connections on serial interface 0:
-----------------	---

```
interface serial 0
 encapsulation frame-relay
 frame-relay ip tcp header-compression
 frame-relay ip tcp compression-connections 150
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>frame-relay ip tcp header-compression</b>	Enables TCP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip compress</b>	Enables both RTP and TCP header compression on a link.

Command	Description
<b>frame-relay map ip tcp header-compression</b>	Assigns header compression characteristics to an IP map that differ from the compression characteristics of the interface with which the IP map is associated.
<b>show frame-relay ip tcp header-compression</b>	Displays statistics and TCP/IP header compression information for the interface.

# frame-relay ip tcp header-compression

To configure an interface to ensure that the associated permanent virtual circuit (PVC) will always carry outgoing TCP/IP headers in compressed form, use the **frame-relay ip tcp header-compression** command in interface configuration mode. To disable compression of TCP/IP packet headers on the interface, use the **no** form of this command.

**frame-relay ip tcp header-compression [passive]**

**no frame-relay ip tcp header-compression**

## Syntax Description

**passive** (Optional) Compresses the outgoing TCP/IP packet header only if an incoming packet had a compressed header.

## Command Default

Active TCP/IP header compression; all outgoing TCP/IP packets are subjected to header compression.

## Command Modes

Interface configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command applies to interfaces that support Frame Relay encapsulation, specifically serial ports and High-Speed Serial Interface (HSSI).

Frame Relay must be configured on the interface before this command can be used.

TCP/IP header compression and Internet Engineering Task Force (IETF) encapsulation are mutually exclusive. If an interface is changed to IETF encapsulation, all encapsulation and compression characteristics are lost.

When you use this command to enable TCP/IP header compression, every IP map inherits the compression characteristics of the interface, unless header compression is explicitly rejected or modified by use of the **frame-relay map ip tcp header compression** command.

We recommend that you shut down the interface prior to changing encapsulation types. Although this is not required, shutting down the interface ensures the interface is reset for the new type.

---

**Examples**

The following example configures serial interface 1 to use the default encapsulation (cisco) and passive TCP header compression:

```
interface serial 1
 encapsulation frame-relay
 frame-relay ip tcp header-compression passive
```

---

**Related Commands**

Command	Description
<b>frame-relay map ip tcp header-compression</b>	Assigns header compression characteristics to an IP map different from the compression characteristics of the interface with which the IP map is associated.

---

# frame-relay map ip compress

To enable both Real-Time Transport Protocol (RTP) and TCP header compression on a link, use the **frame-relay map ip compress** command in interface configuration mode.

```
frame-relay map ip ip-address dlc [broadcast] compress [active | passive]
[connections number]
```

Syntax Description		
<i>ip-address</i>		IP address of the destination or next hop.
<i>dlci</i>		Data-link connection identifier (DLCI) number.
<b>broadcast</b>		(Optional) Forwards broadcasts to the specified IP address.
<b>active</b>		(Optional) Compresses all outgoing RTP and TCP packets. This is the default.
<b>passive</b>		(Optional) Compresses the outgoing RTP and TCP header only if an incoming packet had a compressed header.
<b>connections</b> <i>number</i>		(Optional) Specifies the maximum number of RTP and TCP header compression connections. The range is from 3 to 256.

**Command Default** RTP and TCP header compression are disabled.  
The default maximum number of header compression connections is 256.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3	This command was introduced.
	12.1(2)T	This command was modified to enable the configuration of the maximum number of header compression connections.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command does not have a “no” form. That is, a command called **no frame-relay map ip compress** does not exist.

**Examples** The following example enables both RTP and TCP header compression on serial interface 1 and sets the maximum number of RTP and TCP header connections at 16:

```
interface serial 1
 encapsulation frame-relay
 ip address 10.108.175.110 255.255.255.0
 frame-relay map ip 10.108.175.220 180 compress connections 16
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>frame-relay ip rtp compression-connections</b>	Specifies the maximum number of RTP header compression connections on a Frame Relay interface.
	<b>frame-relay ip tcp header-compression</b>	Enables TCP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip nocompress</b>	Disables both RTP and TCP header compression on a link.
	<b>frame-relay map ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
	<b>show frame-relay ip rtp header-compression</b>	Displays RTP header compression statistics for Frame Relay.
	<b>show frame-relay ip tcp header-compression</b>	Displays statistics and TCP/IP header compression information for the interface.

# frame-relay map ip nocompress

To disable both Real-Time Transport Protocol (RTP) and TCP header compression on a link, use the **frame-relay map ip nocompress** command in interface configuration mode.

**frame-relay map ip** *ip-address* *dci* [**broadcast**] **nocompress**

Syntax Description		
	<i>ip-address</i>	IP address of the destination or next hop.
	<i>dci</i>	Data-link connection identifier (DLCI) number.
	<b>broadcast</b>	(Optional) Forwards broadcasts to the specified IP address.

**Command Default** No default behaviors or values

**Command Modes** Interface configuration

Command History	Release	Modification
	11.3	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

**Usage Guidelines** This command does not have a “no” form. That is, a command called **no frame-relay map ip nocompress** does not exist.

**Examples** The following example disables RTP and TCP header compression on DLCI 180:

```
interface serial 1
 encapsulation frame-relay
 frame-relay map ip 10.108.175.220 180 nocompress
```

Related Commands	Command	Description
	<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay ip tcp header-compression</b>	Enables TCP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip compress</b>	Enables RTP and TCP header compression on a link.

<b>Command</b>	<b>Description</b>
<b>show frame-relay ip rtp header-compression</b>	Displays RTP header compression statistics for Frame Relay.
<b>show frame-relay ip tcp header-compression</b>	Displays statistics and TCP/IP header compression information for the interface.

# frame-relay map ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression per data-link connection identifier (DLCI), use the **frame-relay map ip rtp header-compression** command in interface configuration mode. To disable RTP header compression per DLCI and delete the DLCI, use the **no** form of this command.

```
frame-relay map ip ip-address dlc [broadcast] rtp header-compression [active | passive]
[periodic-refresh] [connections number]
```

```
no frame-relay map ip ip-address dlc [broadcast] rtp header-compression [active | passive]
[periodic-refresh] [connections number]
```

Syntax Description		
	<i>ip-address</i>	IP address of the destination or next hop.
	<i>dlci</i>	DLCI number.
	<b>broadcast</b>	(Optional) Forwards broadcasts to the specified IP address.
	<b>active</b>	(Optional) Compresses outgoing RTP packets.
	<b>passive</b>	(Optional) Compresses the outgoing RTP/User Datagram Protocol (UDP)/IP header only if an incoming packet had a compressed header.
	<b>periodic-refresh</b>	(Optional) Refreshes the compressed IP header periodically.
	<b>connections</b> <i>number</i>	(Optional) Specifies the maximum number of RTP header compression connections. The range is from 3 to 256.

## Command Default

Disabled.

By default, whatever type of header compression is configured on the interface will be inherited. If header compression is not configured on the interface, the **active** keyword will be used, but no **header-compression** keyword will appear on the **show running-config** command output.

The default maximum number of header-compression connections is 256.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.
12.1(2)T	This command was integrated into Cisco IOS Release 12.1(2)T. This command was modified to enable the configuration of the maximum number of header compression connections.
12.3(2)T	This command was modified to include the <b>periodic-refresh</b> keyword.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

When this command is configured, the specified maps inherit RTP header compression. You can have multiple Frame Relay maps, with and without RTP header compression. If you do not specify the number of RTP header compression connections, the map will inherit the current value from the interface.

**Examples**

The following example enables RTP header compression on the Serial1/2.1 subinterface and sets the maximum number of RTP header compression connections at 64:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/2.1
Router(config-if)# encapsulation frame-relay
Router(config-if)# ip address 10.108.175.110 255.255.255.0
Router(config-if)# frame-relay map ip 10.108.175.220 180 rtp header-compression
connections 64
Router(config-if)# end
```

In the following example, RTP header compression is enabled on the Serial1/1.0 subinterface, and the optional **periodic-refresh** keyword is included in the configuration:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/1.0
Router(config-if)# encapsulation frame-relay
Router(config-if)# ip address 10.108.175.110 255.255.255.0
Router(config-if)# frame-relay map ip 10.108.175.220 180 rtp header-compression
periodic-refresh
Router(config-if)# end
```

**Related Commands**

Command	Description
<b>frame-relay ip rtp compression-connections</b>	Specifies the maximum number of RTP header compression connections on a Frame Relay interface.
<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
<b>frame-relay map ip compress</b>	Enables both RTP and TCP header compression on a link.
<b>show frame-relay ip rtp header-compression</b>	Displays RTP header compression statistics for Frame Relay.

# identity policy (policy-map)

To create an identity policy, use the **identity policy** command in policy-map class configuration mode. To remove the policy, use the **no** form of this command.

**identity policy** *policy-name*

**no identity policy** *policy-name*

Syntax Description	<i>policy-name</i>	Name of the policy.
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Command Default	An identity policy is not created.
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Command Modes	Policy-map class configuration
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Command History	Release	Modification
	12.4(6)T	This command was introduced.

Usage Guidelines	This command refers to the global identity policy that is configured on the device that contains the access policies that are to be applied. Only a single identity policy can be configured under the policy class configuration submenu. If the identity policy is not defined on the device, an error is generated during the application of the policy.
------------------	---

Examples	The following example shows that an identity policy is being configured:
----------	--

```
Router(config)# policy-map type control tag healthy_pmap
Router(config-pmap)# class healthy_class
Router(config-pmap-class)# identity policy healthy_identity
Router(config-pmap-class)# end
```

In the following example, an identity policy named “healthy\_identity” is being configured:

```
Router(config)# identity policy healthy_identity
Router(config-identity-policy)# access-group healthy_acl
Router(config-identity-policy)# end
```

Related Commands	Command	Description
	<b>class type tag</b>	Associates a class map with a policy map.
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

# ip header-compression disable-feedback

To disable the context-status feedback messages from the interface or link, use the **ip header-compression disable-feedback** command in interface configuration mode. To enable context-status feedback messages from the interface or link, use the **no** form of this command.

**ip header-compression disable-feedback**

**no ip header-compression disable-feedback**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Context-status feedback messages are enabled by default.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.3(2)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.

## Usage Guidelines

The **ip header-compression disable-feedback** command is designed for use with satellite links where the path for the upward link is different from the path for the downward link. When the paths are different, context-status messages are not useful.

The **ip header-compression disable-feedback** command can be used with either Real-Time Transport Protocol (RTP) or TCP header compression.

## Examples

The following example disables the context-status messages on serial interface 2/0:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0
Router(config-if)# ip header-compression disable-feedback
Router(config-if)# end
```

## Related Commands

Command	Description
<b>ip header-compression max-header</b>	Specifies the maximum size of the compressed IP header.
<b>ip header-compression max-period</b>	Specifies the maximum number of compressed packets between full headers.
<b>ip header-compression max-time</b>	Specifies the maximum amount of time to wait before the compressed IP header is refreshed.

# ip header-compression max-header

To specify the maximum amount of time to wait before the compressed IP header is refreshed, use the **ip header-compression max-header** command in interface configuration mode. To return the amount of time to wait before the compressed IP header is refreshed to the default value, use the **no** form of this command.

**ip header-compression max-header** *max-header-size*

**no ip header-compression max-header** *max-header-size*

<b>Syntax Description</b>	<i>max-header-size</i> Size of the IP header, in bytes. The size of the IP header can be in the range of 20 to 168.
---------------------------	---

<b>Defaults</b>	168 bytes
-----------------	-----------

<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.3(2)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.	

<b>Usage Guidelines</b>	The <i>max-header-size</i> argument of the <b>ip header-compression max-header</b> command can be used to restrict the size of the header to be compressed.
-------------------------	---

<b>Examples</b>	In the following example, the <b>ip header-compression max-header</b> command is configured to specify the maximum IP header size of the packet. In this configuration, the maximum IP header size is 100 bytes.
-----------------	--

```
Router> enable
Router# configure terminal
Router(config)# interface Serial12/0
Router(config-if)# ip header-compression max-header 100
Router(config-if)# end
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip header-compression disable-feedback</b>	Disables context-status feedback messages from the interface or link.
<b>ip header-compression max-period</b>	Specifies the maximum number of compressed packets between full headers.	
<b>ip header-compression max-time</b>	Specifies the maximum amount of time to wait before the compressed IP header is refreshed.	

# ip header-compression max-period

To specify the maximum number of compressed packets between full headers, use the **ip header-compression max-period** command in interface configuration mode. To return the number of compressed packets to the default value, use the **no** form of this command.

**ip header-compression max-period** *number-of-packets*

**no ip header-compression max-period** *number-of-packets*

## Syntax Description

*number-of-packets* Specifies a number of packets between full headers. The number can be in the range of 0 to 65535.

## Defaults

256 packets

## Command Modes

Interface configuration

## Command History

Release	Modification
12.3(2)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.

## Usage Guidelines

With the **ip header-compression max-period** command, full IP packet headers are sent in an exponentially increasing period after there has been a change in the context status. This exponential increase in the time period avoids the necessity of exchanging messages between the mechanism compressing the header and the mechanism decompressing the header.

By default, the **ip header-compression max-period** command operates on User Datagram Protocol (UDP) traffic only. However, if the **periodic refresh** keyword of either the **frame-relay ip rtp header-compression** command or the **frame-relay map ip rtp header-compression** command is configured, the **ip header-compression max-period** command operates on both UDP and Real-Time Transport Protocol (RTP) traffic.

## Examples

In the following example, the **ip header-compression max-period** command is configured to specify the number of packets between full header packets. In this configuration, the packet number specified is 160.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0
Router(config-if)# ip header-compression max-period 160
Router(config-if)# end
```

Related Commands	Command	Description
	<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip rtp header-compression</b>	Enables RTP header compression per DLCI.
	<b>ip header-compression disable-feedback</b>	Disables context-status feedback messages from the interface or link.
	<b>ip header-compression max-header</b>	Specifies the maximum size of the compressed IP header.
	<b>ip header-compression max-time</b>	Specifies the maximum amount of time to wait before the compressed IP header is refreshed.

# ip header-compression max-time

To specify the maximum amount of time to wait before the compressed IP header is refreshed, use the **ip header-compression max-time** command in interface configuration mode. To return to the default value, use the **no** form of this command.

**ip header-compression max-time** *length-of-time*

**no ip header-compression max-time** *length-of-time*

<b>Syntax Description</b>	<i>length-of-time</i>	Specifies a different amount of time (other than the default) in seconds to wait before the IP header is refreshed. The range is 0 to 65535.
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<b>Defaults</b>	5 seconds
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<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.3(2)T	This command was introduced.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.	

<b>Usage Guidelines</b>	<p>The <b>ip header-compression max-time</b> command is designed to avoid losing too many packets if the context status of the receiver has been lost.</p> <p>If a packet is to be sent and the maximum amount of time has elapsed since the last time the IP header was refreshed, a full header is sent.</p> <p>By default, the <b>ip header-compression max-time</b> command operates on User Datagram Protocol (UDP) traffic only. However, if the <b>periodic refresh</b> keyword of either the <b>frame-relay ip rtp header-compression</b> command or the <b>frame-relay map ip rtp header-compression</b> command is configured, the <b>ip header-compression max-time</b> command operates on UDP and Real-Time Transport Protocol (RTP) traffic.</p>
-------------------------	--

<b>Examples</b>	<p>In the following example, the <b>ip header-compression max-time</b> command is configured to specify the maximum amount of time to wait before refreshing the compressed IP header. In this configuration the amount of time to wait is 30 seconds.</p>
-----------------	--

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0
Router(config-if)# ip header-compression max-time 30
Router(config-if)# end
```

Related Commands	Command	Description
	<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
	<b>frame-relay map ip rtp header-compression</b>	Enables RTP header compression per DLCI.
	<b>ip header-compression disable-feedback</b>	Disables context-status feedback messages from the interface or link.
	<b>ip header-compression max-header</b>	Specifies the maximum size of the compressed IP header.
	<b>ip header-compression max-period</b>	Specifies the maximum number of compressed packets between full headers.

# ip header-compression recoverable-loss

To enable Enhanced Compressed Real-Time Transport Protocol (ECRTP) on an interface, use the **ip header-compression recoverable-loss** command in interface configuration mode. To disable ECRTP on an interface, use the **no** form of this command.

**ip header-compression recoverable-loss** { **dynamic** | *packet-drops* }

**no ip header-compression recoverable-loss**

## Syntax Description

<b>dynamic</b>	Dynamic recoverable loss calculation.
<i>packet-drops</i>	Maximum number of consecutive packet drops. Ranges from 1 to 8.

## Defaults

When using the keyword **dynamic**, the default value is 4.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.3(11)T	This command was introduced.

## Usage Guidelines

Enhanced CRTP reduces corruption by changing the way the compressor updates the context at the decompressor. The compressor sends changes multiple times to keep the compressor and decompressor synchronized. This method is characterized by the number of *packet-drops* that represent the quality of the link between the hosts. By repeating the updates, the probability of context corruption due to packet loss is minimized.

The *packet-drops* value is maintained independently for each context and is not required to be the same for all contexts.

## Examples

In the following example, a serial interface is configured with Point-to-Point Protocol (PPP) encapsulation, and ECRTP is enabled with dynamic loss recovery:

```
Router(config)# interface serial 2/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression ietf-format
Router(config-if)# ip header-compression recoverable-loss dynamic
Router(config-if)# end
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>debug ip rtp error</b>	Displays RTP header compression errors.
	<b>debug ip rtp header-compression</b>	Displays events specific to RTP header compression.
	<b>ip rtp header-compression</b>	Enables RTP header compression.
	<b>show ip rtp header-compression</b>	Displays RTP header compression statistics.

# ip nbar custom

To extend the capability of network-based application recognition (NBAR) Protocol Discovery to classify and monitor additional static port applications or to allow NBAR to classify nonsupported static port traffic, use the **ip nbar custom** command in global configuration mode. To disable NBAR from classifying and monitoring additional static port application or classifying nonsupported static port traffic, use the **no** form of this command.

```
ip nbar custom name [offset [format value]] [variable field-name field-length]
[source | destination] [tcp | udp] [range start end | port-number]
```

```
no ip nbar custom name [offset [format value]] [variable field-name field-length]
[source | destination] [tcp | udp] [range start end | port-number]
```

## Syntax Description

<i>name</i>	The name given to the custom protocol. This name is reflected wherever the name is used, including NBAR Protocol Discovery, the <b>match protocol</b> command, the <b>ip nbar port-map</b> command, and the NBAR Protocol Discovery MIB.  The name must be no longer than 24 characters and can only contain uppercase and lowercase letters, digits, and the underscore (_) character.
<i>offset</i>	(Optional) A digit representing the byte location for payload inspection. The offset function is based on the beginning of the payload directly after the TCP or User Datagram Protocol (UDP) header.
<i>format value</i>	(Optional) Defines the format of the value and the length of the value that is being inspected in the packet payload. Current format options are <b>ascii</b> , <b>hex</b> , and <b>decimal</b> . The length of the value is dependent on the chosen <i>format</i> . The length restrictions for each format are listed below: <ul style="list-style-type: none"> <li>• <b>ascii</b>—Up to 16 characters can be searched. Regular expressions are not supported.</li> <li>• <b>hex</b>—Up to 4 bytes.</li> <li>• <b>decimal</b>—Up to 4 bytes.</li> </ul>
<b>variable</b> <i>field-name</i> <i>field-length</i>	(Optional) When the <b>variable</b> keyword is entered, a specific portion of the custom protocol can be treated as an NBAR-supported protocol (for example, a specific portion of the custom protocol can be tracked using class-map statistics and can be matched using the <b>class-map</b> command). If the <b>variable</b> keyword is entered, the following fields must be defined: <ul style="list-style-type: none"> <li>• <i>field-name</i>—Provides a name for the field to search in the payload. After a custom protocol is configured using a variable, this <i>field-name</i> can be used with up to 24 different values per router configuration.</li> <li>• <i>field-length</i>—Enters the field length in bytes. The field length can be up to 4 bytes, so the <i>field-length</i> value can be entered as <b>1</b>, <b>2</b>, <b>3</b>, or <b>4</b>.</li> </ul>
<i>source</i>   <i>destination</i>	(Optional) Specifies the direction in which packets are inspected. If source or destination is not specified, all packets traveling in either direction are monitored by NBAR.
<b>tcp</b>   <b>udp</b>	(Optional) Specifies the TCP or the UDP implemented by the application.

<b>range</b> <i>start end</i>	(Optional) Specifies a range of ports that the custom application monitors. The start is the first port in the range, and the end is the last port in the range. One range of up to 1000 ports can be specified for each custom protocol.
<i>port-number</i>	(Optional) The port that the custom application monitors. Up to 16 individual ports can be specified as a single custom protocol.

**Defaults**

If source or destination is not specified, traffic flowing in both directions is inspected if the custom protocol is enabled in NBAR.

**Command Modes**

Global configuration

**Command History**

Release	Modification
12.3(4)T	This command was introduced.
12.3(11)T	The <b>variable</b> <i>field-name field-length</i> keyword-argument group was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.

**Usage Guidelines**

More than 30 custom applications can be created on the router.

NBAR can support up to 128 protocols total.

If the **variable** keyword is entered while you configure the custom protocol, traffic statistics for the variable appear in some NBAR class map **show** outputs.

Up to 24 variable values per custom protocol can be expressed in class maps. For instance, in the following configuration, 4 variables are used and 20 more “scid” values could be used.

```
Router(config)# ip nbar custom ftdd 23 variable scid 1 tcp range 5001 5005
```

```
Router(config)# class-map match-any active-craft
Router(config-cmap)# match protocol ftdd scid 0x15
Router(config-cmap)# match protocol ftdd scid 0x21
```

```
Router(config)# class-map match-any passive-craft
Router(config-cmap)# match protocol ftdd scid 0x11
Router(config-cmap)# match protocol ftdd scid 0x22
```

**Examples**

In the following example, the custom protocol “app\_sales1” identifies TCP packets that have a source port of 4567 and that contains the term “SALES” in the fifth byte of the payload:

```
Router(config)# ip nbar custom app_sales1 5 ascii SALES source tcp 4567
```

In the following example, the custom protocol “virus\_home” identifies UDP packets that have a destination port of 3000 and that contains “0x56” in the seventh byte of the payload:

```
Router(config)# ip nbar custom virus_home 7 hex 0x56 destination udp 3000
```

In the following example, the custom protocol “media\_new” identifies TCP packets that have a destination or source port of 4500 and have a value of 90 in the sixth byte of the payload:

```
Router(config)# ip nbar custom media_new 6 decimal 90 tcp 4500
```

In the following example, the custom protocol “msn1” looks for TCP packets that have a destination or source port of 6700:

```
Router(config)# ip nbar custom msn1 tcp 6700
```

In the following example, the custom protocol “mail\_x” looks for UDP packets that have a destination port of 8202.

```
Router(config)# ip nbar custom mail_x destination udp 8202
```

In the following example, the custom protocol “mail\_y” looks for UDP packets that have destination ports between 3000 and 4000, inclusive:

```
Router(config)# ip nbar custom mail_y destination udp range 3000 4000
```

In the following example, the custom protocol “ftdd” is created by using a variable. A class map matching this custom protocol based on the variable is also created. In this example, class map “matchscidinfthdd” matches all traffic that has the value “804” at byte 23 entering or leaving TCP ports 5001 to 5005. The variable scid is 2 bytes in length.

```
Router(config)# ip nbar custom ftdd 23 variable scid 2 tcp range 5001 5005
```

```
Router(config)# class-map matchscidinfthdd
Router(config-cmap)# match protocol ftdd scid 804
```

The same example above can also be done using hexadecimal values in the class map as follows:

```
Router(config)# ip nbar custom ftdd 23 variable scid 2 tcp range 5001 5005
```

```
Router(config)# class-map matchscidinfthdd
Router(config-cmap)# match protocol ftdd scid 0x324
```

In the following example, the **variable** keyword is used while you create a custom protocol, and class maps are configured to classify different values within the variable field into different traffic classes. Specifically, in the example below, variable scid values 0x15, 0x21, and 0x27 are classified into class map “active-craft” while scid values 0x11, 0x22, and 0x25 are classified into class map “passive-craft.”

```
Router(config)# ip nbar custom ftdd 23 variable scid 1 tcp range 5001 5005
```

```
Router(config)# class-map match-any active-craft
Router(config-cmap)# match protocol ftdd scid 0x15
Router(config-cmap)# match protocol ftdd scid 0x21
Router(config-cmap)# match protocol ftdd scid 0x27
```

```
Router(config)# class-map match-any passive-craft
Router(config-cmap)# match protocol ftdd scid 0x11
Router(config-cmap)# match protocol ftdd scid 0x22
Router(config-cmap)# match protocol ftdd scid 0x25
```

# ip nbar pdlm

To extend or enhance the list of protocols recognized by network-based application recognition (NBAR) through a Cisco-provided Packet Description Language Module (PDLM), use the **ip nbar pdlm** command in global configuration mode. To unload a PDLM previously loaded, use the **no** form of this command.

**ip nbar pdlm** *pdlm-name*

**no ip nbar pdlm** *pdlm-name*

## Syntax Description

*pdlm-name* URL at which the PDLM can be found on the flash card.

## Command Default

No default behavior or values

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(5)XE2	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

The **ip nbar pdlm** command is used to extend the list of protocols recognized by a given version of NBAR or to enhance an existing protocol recognition capability. NBAR can be given an external PDLM at run time. In most cases, the PDLM enables NBAR to recognize new protocols without requiring a new Cisco IOS image or a router reload. Only Cisco can provide you with a new PDLM.

A list of the available PDLMs can be viewed online at [Cisco.com](http://Cisco.com).

## Examples

The following example configures NBAR to load the citrix.pdlm PDLM from flash memory on the router:

```
ip nbar pdlm flash://citrix.pdlm
```

## Related Commands

Command	Description
<b>show ip nbar pdlm</b>	Displays the current PDLM in use by NBAR.

## ip nbar port-map

To configure network-based application recognition (NBAR) to search for a protocol or protocol name using a port number other than the well-known port, use the **ip nbar port-map** command in global configuration mode. To look for the protocol name using only the well-known port number, use the **no** form of this command.

**ip nbar port-map** *protocol-name* [**tcp** | **udp**] *port-number*

**no ip nbar port-map** *protocol-name* [**tcp** | **udp**] *port-number*

Syntax Description	
<i>protocol-name</i>	Name of protocol known to NBAR.
<b>tcp</b>	(Optional) Specifies that a TCP port will be searched for the specified <i>protocol-name</i> argument.
<b>udp</b>	(Optional) Specifies that a User Datagram Protocol (UDP) port will be searched for the specified <i>protocol-name</i> argument.
<i>port-number</i>	Assigned port for named protocol. The <i>port-number</i> argument is either a UDP or a TCP port number, depending on which protocol is specified in this command line. Up to 16 <i>port-number</i> arguments can be specified in one command line. Port number values can range from 0 to 65535.

**Command Default** No default behavior or values

**Command Modes** Global configuration

Command History	Release	Modification
	12.0(5)XE2	This command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** The **ip nbar port-map** command is used to tell NBAR to look for the protocol or protocol name, using a port number or numbers other than the well-known Internet Assigned Numbers Authority (IANA)-assigned) port number. For example, use this command to configure NBAR to look for Telnet on a port other than 23. Up to 16 ports can be specified with this command.

Some of the NBAR protocols look at the ports as well as follow the heuristic approach for traffic classification. If you apply different ports to a protocol using the **ip nbar port-map** command, the heuristic nature of the protocol does not change. The advantage to adding a port number is better performance.

You can remove well-known ports from a predefined port map only if you first set the predefined port map to a port not belonging to any existing port map. For example, if you want to define a custom port map X and also associate it with port 20, you get an error saying that it is not possible. However, if you associate port map A with another port first, such as port 100, and then remove its association with port 20, you can associate custom port map X with port 20.

---

### Examples

The following example configures NBAR to look for the protocol Structured Query Language (SQL)\*NET on port numbers 63000 and 63001 instead of on the well-known port number:

```
ip nbar port-map sqlnet tcp 63000 63001
```

---

### Related Commands

Command	Description
<b>show ip nbar port-map</b>	Displays the current protocol-to-port mappings in use by NBAR.

# ip nbar protocol-discovery

To configure networked-based application recognition (NBAR) to discover traffic for all protocols known to NBAR on a particular interface, use the **ip nbar protocol-discovery** command in interface configuration mode. To disable traffic discovery, use the **no** form of this command.

**ip nbar protocol-discovery**

**no ip nbar protocol-discovery**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Traffic discovery is disabled.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(5)XE2	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Use the **ip nbar protocol-discovery** command to configure NBAR to keep traffic statistics for all protocols known to NBAR. Protocol discovery provides an easy way to discover application protocols transiting an interface so that QoS policies can be developed and applied. The protocol discovery feature discovers any protocol traffic supported by NBAR. Protocol discovery can be used to monitor both input and output traffic and may be applied with or without a service policy enabled.

## Examples

The following example configures protocol discovery on an Ethernet interface:

```
interface ethernet 1/3
 ip nbar protocol-discovery
```

## Related Commands

Command	Description
<b>show ip nbar protocol-discovery</b>	Displays the statistics gathered by the NBAR Protocol Discovery feature.

## ip nbar resources

The **ip nbar resources** command is replaced by the **ip nbar resources protocol** and the **ip nbar resources system** commands. See the **ip nbar resources protocol** and the **ip nbar resources system** commands for more information.

# ip nbar resources protocol

To set the expiration time for network-based application recognition (NBAR) flow-link tables on a protocol basis, use the **ip nbar resources protocol** command in global configuration mode. To set the expiration time to its default value, use the **no** form of this command.

**ip nbar resources protocol** *link-age* [*protocol-name*]

**no ip nbar resources protocol**

## Syntax Description

<i>link-age</i>	Time, in seconds, at which the links for a protocol are aged (expire). The range of values is from 1 to 1000000000. The default is 30.
	<b>Note</b> The <i>link-age</i> argument must be a multiple of the value currently set in the <b>ip nbar resources system</b> <i>system-link-age</i> command. For example, if you set the <i>system-link-age</i> argument to 30, then the range of values for the <i>link-age</i> argument is 30, 60, 90, 120, and so on.
<i>protocol-name</i>	(Optional) Name of the protocol as registered in a loaded Protocol Description Language (PDL) module.
	<b>Note</b> To display a list of supported protocols, enter the <b>match protocol ?</b> or the <b>show ip nbar port-map</b> commands.

## Command Default

The default link age for all protocols is 120 seconds upon NBAR activation.

## Command Modes

Global configuration

## Command History

Release	Modification
12.4(6)T	This command was introduced.

## Usage Guidelines

You must enter a value for the *link-age* argument that is a multiple of the *system-link-age* argument that you set using the **ip nbar resources system** command. In other words, the protocol link age is dependent upon the system link age.

The system link age defaults to 30 seconds, and each protocol defaults to 120 seconds. Internally, each protocol then has a link age value of 4 seconds; that is, 120/30. If you change the system link age, the protocol link age becomes whatever the new system link age is times 4. For example, if the system link age is 30 and each protocol is set to 240, the internal protocol link age is 8; that is, 240/30. Then if you change the system link age, the protocol link age becomes whatever the new system link age is times 8.

If you enter an invalid value for the *link-age* argument, the following error message displays:

```
%NBAR ERROR: protocol link age entered must be an even multiple of the system link age,
<system link age>
```

The **no** form of this command must include the *link-age* argument to set the protocol link age of the specific protocol or all protocols with the specified link age to zero.

If you omit the optional *protocol-name* argument, all protocols update to the specified link age value.

If you enter a protocol name that does not exist, the following error message displays:

```
%NBAR ERROR: <entered string> is not a valid protocol
```

In addition to resetting the link age in all state nodes associated with a specified protocol, the protocol name along with its link age is saved in NVRAM for potential router system resets.

---

## Examples

In the following example, the link age for the kazaa2 protocol is set to 180 seconds:

```
Router# configure terminal
Router(config)# ip nbar resources protocol 180 kazaa2
```

In the following example, the link age for all protocols is set to 360 seconds:

```
Router# configure terminal
Router(config)# ip nbar resources protocol 360
```

---

## Related Commands

Command	Description
<b>ip nbar resources system</b>	Sets the expiration time and memory requirements for NBAR flow-link tables on a systemwide basis.

# ip nbar resources system

To set the expiration time and memory requirements for network-based application recognition (NBAR) flow-link tables on a systemwide basis, use the **ip nbar resources system** command in global configuration mode. To remove the active links, use the **no** form of this command.

**ip nbar resources system** *system-link-age initial-memory exp-memory*

**no ip nbar resources system**

## Syntax Description

<i>system-link-age</i>	Time, in seconds, at which the links for a system are aged (expire). The range of values is from 10 to 86400. The default is 30.
<i>initial-memory</i>	Size of memory, in kilobytes, allocated for the links at initialization. The range of values is from 1 to 30000. The default is 10 percent of the total amount of free memory at system initialization and varies from platform to platform.
<i>exp-memory</i>	Size of memory, in kilobytes, that can be expanded if NBAR detects that more space is needed for the links. The range of values is from 0 to 112. The default is 112.
<b>Note</b>	The default is based on the size of an internal NBAR structure and may change in future releases.

## Command Default

The default system link age is 30 seconds upon NBAR activation.

## Command Modes

Global configuration

## Command History

Release	Modification
12.4(6)T	This command was introduced.

## Usage Guidelines

Because the **ip nbar resources system** command affects NBAR on a systemwide basis, you should not change the parameters arbitrarily. Doing so may cause NBAR to perform inefficiently or incorrectly. The default values are effective in most instances.

## Examples

In the following example, the system link age is 30 seconds, the initial memory is 200 kilobytes, and the expanded memory is 112 kilobytes:

```
Router# configure terminal
Router(config)# ip nbar resources system 30 200 112
```

Related Commands	Command	Description
	<b>ip nbar resources protocol</b>	Sets the expiration time for NBAR flow-link tables on a protocol basis.

# ip options

To drop or ignore IP options packets that are sent to the router, use the **ip options** command in global configuration mode. To disable this functionality and allow all IP options packets to be sent to the router, use the **no** form of this command.

**ip options {drop | ignore}**

**no ip options {drop | ignore}**

## Syntax Description

<b>drop</b>	Router drops all IP options packets that it receives.
<b>ignore</b>	Router ignores all options and treats the packets as though they did not have any IP options. (The options are not removed from the packet—just ignored.)
<b>Note</b>	This option is not available on the Cisco 10000 series router.

## Defaults

This command is not enabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
12.3(19)	This command was integrated into Cisco IOS Release 12.3(19).
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2 for the PRE3.

## Usage Guidelines

The **ip options** command allows you to filter IP options packets, mitigating the effects of IP options on the router, and on downstream routers and hosts.

Drop and ignore modes are mutually exclusive; that is, if the drop mode is configured and you configure the ignore mode, the ignore mode overrides the drop mode.

### Cisco 10720 Internet Router

The **ip options ignore** command is not supported. Only drop mode (the **ip options drop** command) is supported.

### Cisco 10000 Series Router

This command is only available on the PRE3. The PRE2 does not support this command.

The **ip options ignore** command is not supported. The router supports only the **ip options drop** command.

---

**Examples**

The following example shows how to configure the router (and downstream routers) to drop all options packets that enter the network:

```
ip options drop
```

```
% Warning:RSVP and other protocols that use IP Options packets may not function in drop or ignore modes.  
end
```

# ip rsvp admission-control compression predict

To configure Resource Reservation Protocol (RSVP) admission control compression prediction, use the **ip rsvp admission-control compression predict** command in interface configuration mode. To disable compression prediction, use the **no** form of this command.

```
ip rsvp admission-control compression predict [method {rtp | udp} [bytes-saved N]]
```

```
no ip rsvp admission-control compression predict [method {rtp | udp} [bytes-saved N]]
```

## Syntax Description

<b>method</b>	(Optional) Type of compression used.
<b>rtp   udp</b>	Real-Time Transport Protocol (RTP) or User Data Protocol (UDP) compression schemes.
<b>bytes-saved N</b>	(Optional) Predicted number of bytes saved per packet when RSVP predicts that compression will occur using the specified method. Values for <i>N</i> for RTP are 1 to 38; for UDP, 1 to 26.

## Defaults

This command is enabled by default. The default value of bytes saved for RTP is 36; for UDP, 20.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(15)T	This command was introduced.

## Usage Guidelines

Use the **ip rsvp admission-control compression predict** command to disable or enable the RSVP prediction of compression for a specified method or all methods if neither **rtp** nor **udp** is selected. You can adjust the default compressibility parameter that RSVP uses to compute the compression factor for each flow.

If you use the **ip rsvp admission-control compression predict** command to change the compression method or the number of bytes saved per packet, these values affect only new flows, not existing ones.

There are two approaches to compression—conservative and aggressive. When you predict compression conservatively, you assume savings of fewer bytes per packet, but receive a higher likelihood of guaranteed quality of service (QoS). You are allowed more bandwidth per call, but each link accommodates fewer calls. When you predict compression aggressively, you assume savings of more bytes per packet, but receive a lower likelihood of guaranteed QoS. You are allowed less bandwidth per call, but each link accommodates more calls.

## Examples

The following command sets the compressibility parameter for flows using the RTP method to 30 bytes saved per packet:

```
Router(config-if)# ip rsvp admission-control compression predict method rtp bytes-saved 30
```

The following command sets the compressibility parameter for flows using the UDP method to 20 bytes saved per packet:

```
Router(config-if)# ip rsvp admission-control compression predict method udp bytes-saved 20
```

The following command disables RTP header compression prediction:

```
Router(config-if)# no ip rsvp admission-control compression predict method rtp
```

The following command disables UDP header compression prediction:

```
Router(config-if)# no ip rsvp admission-control compression predict method udp
```

**Note**


---

Disabling the compressibility parameter affects only those flows using the specified method.

---

**Related Commands**

Command	Description
<code>show ip rtp header-compression</code>	Displays statistics about RTP header compression.

# ip rsvp aggregation ip

To enable Resource Reservation Protocol (RSVP) aggregation on a router, use the **ip rsvp aggregation ip** command in global configuration mode. To disable RSVP aggregation, use the **no** form of this command.

**ip rsvp aggregation ip**

**no ip rsvp aggregation ip**

## Syntax Description

This command has no arguments or keywords.

## Command Default

RSVP aggregation is disabled.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
12.2(33)SRC	This command was introduced.

## Usage Guidelines

When you enable aggregation on a router, the router can act as an aggregator, a deaggregator, or an interior router. To perform aggregator and deaggregator functions, the RSVP process must see messages with the RSVP-E2E-IGNORE protocol type (134) on a router; otherwise, the messages are forwarded as data by the router's data plane. The **ip rsvp aggregation ip** command enables RSVP to identify messages with the RSVP-E2E-IGNORE protocol. You then configure additional commands to specify the aggregation and deaggregation behavior of end-to-end (E2E) reservations.

The **ip rsvp aggregation ip** command registers a router to receive RSVP-E2E-IGNORE messages. It is not necessary to issue this command on interior routers because they are only processing RSVP aggregate reservations. If you do so, you may decrease performance because the interior router will then unnecessarily process all the RSVP-E2E-IGNORE messages.



### Note

If you enable RSVP aggregation globally on an interior router, then you should configure all interfaces as interior. Otherwise, interfaces default to exterior and discard RSVP-E2E-IGNORE packets.

## Examples

The following example shows how to enable RSVP aggregation on a router:

```
Router(config)# ip rsvp aggregation ip
```

## ■ ip rsvp aggregation ip

Related Commands	Command	Description
	<b>show ip rsvp aggregation ip</b>	Displays RSVP summary aggregation information.

# ip rsvp aggregation ip map

To configure Resource Reservation Protocol (RSVP) aggregation rules that tell a router how to map end-to-end (E2E) reservations onto aggregate reservations, use the **ip rsvp aggregation ip map** command in global configuration mode. To disable RSVP aggregation mapping rules, use the **no** form of this command.

**ip rsvp aggregation ip map** { **access-list** { *acl-number* } | **any** } **dscp** *value*

**no ip rsvp aggregation ip map** { **access-list** { *acl-number* } | **any** } **dscp** *value*

Syntax Description	
<b>access-list</b>	Specifies an access control list (ACL).
<i>acl-number</i>	Number of the ACL. Values are 1 to 199.
<b>any</b>	Indicates the match criteria used if all reservations between an aggregator and a deaggregator are to be aggregated onto a single DSCP.
<b>dscp</b> <i>value</i>	Specifies the differentiated services code point (DSCP). Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af1 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>

**Command Default** No aggregation mapping rules are configured.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	12.2(33)SRC	This command was introduced.

**Usage Guidelines** Use the **ip rsvp aggregation ip map** command to configure a single global rule for mapping E2E reservations onto aggregates.

Before using the **ip rsvp aggregation ip map** command, you should configure an ACL to define a group of RSVP endpoints whose reservations are to be aggregated onto a single DSCP. The ACL can be a standard or extended ACL and matches as follows:

#### Standard ACLs

- IP address matches the RSVP PATH message sender template or RSVP RESV message filter spec; this is the IP source address or the RSVP sender.

**Extended ACLs**

The ACLs used within the **ip rsvp aggregation ip map** command match the RSVP message objects as follows for an extended ACL:

- Source IP address and port match the RSVP PATH message sender template or RSVP RESV message filter spec; this is the IP source or the RSVP sender.
- Destination IP address and port match the RSVP PATH/RESV message session object IP address; this is the IP destination address or the RSVP receiver.
- Protocol matches the RSVP PATH/RESV message session object protocol; if protocol = IP, then it matches the source or destination address as above.

**Note**

In classic (unaggregated) RSVP, a session is identified in the reservation message session object by the destination IP address and protocol information. In RSVP aggregation, a session is identified by the destination IP address and DSCP within the session object of the aggregate RSVP message. E2E reservations are mapped onto a particular aggregate RSVP session identified by the E2E reservation session object alone or a combination of the session object and sender template or filter spec.

**Examples**

In the following example, access list 1 is defined for all RSVP messages whose RSVP PATH message session object destination address is in the 10.1.0.0 subnet so that the deaggregator maps those reservations onto an aggregate reservation for the DSCP associated with the AF41 per hop behavior:

```
Router(config)# access-list 1 permit host 10.1.0.0 0.0.255.255
Router(config)# ip rsvp aggregation ip map access-list 1 dscp af41
```

In the following example, all reservations between an aggregator and a deaggregator are to be aggregated onto a single DSCP:

```
Router(config)# ip rsvp aggregation ip map any dscp af41
```

**Related Commands**

Command	Description
<b>ip rsvp aggregation ip</b>	Enables RSVP aggregation on a router.
<b>show ip rsvp aggregation ip</b>	Displays RSVP summary aggregation information.

# ip rsvp aggregation ip reservation dscp traffic-params static rate

To configure Resource Reservation Protocol (RSVP) aggregate reservation attributes (also called token bucket parameters) on a per-differentiated services code point (DSCP) basis, use the **ip rsvp aggregation ip reservation dscp traffic-params static rate** command in global configuration mode. To remove aggregation reservation attributes, use the **no** form of this command.

```
ip rsvp aggregation ip reservation dscp value [aggregator agg-ip-address] traffic-params static rate data-rate [burst burst-size] [peak peak-rate]
```

```
no ip rsvp aggregation ip reservation dscp value [aggregator agg-ip-address] traffic-params static rate data-rate [burst burst-size] [peak peak-rate]
```

Syntax Description	
<i>value</i>	The differentiated services code point (DSCP) for aggregate reservations. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>
<b>aggregator</b> <i>agg-ip-address</i>	(Optional) Specifies the IP address of the aggregator for which the <i>data-rate</i> , <i>burst-size</i> , and <i>peak-rate</i> traffic parameters apply. <p><b>Note</b> If omitted, all aggregate reservations to an deaggregator use the same token bucket parameters.</p>
<i>data-rate</i>	The average data rate, which is a bandwidth number of kilobits per second from 1 to 10000000.
<i>burst-size</i>	(Optional) The data burst size, which is a number of kilobytes from 1 to 8192. <p><b>Note</b> If omitted, this value is equal to the aggregate rate value.</p>
<i>peak-rate</i>	(Optional) The peak data rate, which is a bandwidth number of kilobits per second from 1 to 10000000. <p><b>Note</b> If omitted, this value is equal to the aggregate rate value.</p>

**Command Default** No aggregation reservation attributes (token bucket parameters) are configured.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	12.2(33)SRC	This command was introduced.

**Usage Guidelines**

Because Cisco IOS Release 12.2(33)SRC does not support dynamic resizing of aggregate reservations, you issue the **ip rsvp aggregation ip reservation dscp traffic-params static rate** command to configure the token bucket parameters statically.

The *data-rate*, *burst-size*, and *peak-rate* parameters are required on deaggregators to help construct the flowspec object for aggregate RESV messages. Existing RSVP procedures specify that the size of a reservation established for a flow is set to the minimum of the PATH sender\_tspec and the RESV flowspec. So if the aggregate PATH sender\_tspec *data-rate*, *burst-size*, or *peak-rate* parameters are greater than the *data-rate*, *burst-size*, or *peak-rate* parameters configured on the deaggregator, the aggregate RESV flowspec object will contain the minimum of *data-rate*, *burst-size*, and *peak-rate* from the PATH message and the configured values.

When the aggregate reservation size is changed to a value less strict than the total bandwidth of the end-to-end (E2E) reservations mapped to the aggregate, preemption may occur.

When the aggregate bandwidth is lowered, if preemption is required and has not been enabled by issuing the **ip rsvp policy preempt** command, then the change is rejected and the following messages may appear:

```
RSVP:AGG: Command not accepted.
RSVP:AGG: This change requires some E2E reservations to be removed and
RSVP:AGG: preemption is not enabled. Issue 'ip rsvp policy preempt'
RSVP:AGG: in order to make this change.
```

**Examples**

In the following example, the aggregate RESV message for an aggregate reservation established with aggregator 10.10.10.10 for DSCP = AF11 includes a flowspec that requests an average rate and peak rate of 100K bps and a burst size of 8 KB:

```
Router(config)# ip rsvp aggregation ip reservation dscp af11 aggregator 10.10.10.10
traffic-params static rate 10 burst 8 peak 10
```

**Related Commands**

Command	Description
<b>ip rsvp aggregation ip</b>	Enables RSVP aggregation on a router.
<b>ip rsvp policy preempt</b>	Redistributes bandwidth from lower-priority reservations to high-priority reservations.
<b>show ip rsvp aggregation ip</b>	Displays RSVP summary aggregation information.

# ip rsvp aggregation ip role interior

To configure Resource Reservation Protocol (RSVP) aggregation on aggregator and deaggregator interior routers facing an aggregation region, use the **ip rsvp aggregation ip role interior** command in interface configuration mode. To disable RSVP aggregation on aggregator and deaggregator routers, use the **no** form of this command.

**ip rsvp aggregation ip role interior**

**no ip rsvp aggregation ip role interior**

## Syntax Description

This command has no arguments or keywords.

## Command Default

RSVP aggregation is not configured on aggregator and deaggregator interior routers.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(33)SRC	This command was introduced.

## Usage Guidelines

This command does not have any effect on a router until end-to-end (E2E) messages arrive on an interface.

If a router is an interior node for all E2E flows, you do not have to configure any aggregation commands. RSVP will not get notifications on any of the RSVP-E2E-IGNORE messages that are forwarded as IP datagrams; however, because the router is loaded with an image that supports aggregation, the router will process aggregate signaling messages correctly.

If you enable aggregation on an interior node, all its interfaces must be configured as interior. Otherwise, all the interfaces have the exterior role, and any E2E Path (E2E-IGNORE) messages arriving at the router are discarded.

In summary, there are two options for an interior router:

- No RSVP aggregation configuration commands are entered.
- Aggregation is enabled and all interfaces are configured as interior.

If the interior role of an interface is unconfigured, all aggregate and E2E reservations installed on that interface are brought down.

### Additional Required Configuration Commands

If you enable aggregation on any RSVP interface on an aggregator or deaggregator as well as interfaces of interior routers, you must also configure the following commands:

- **ip rsvp resource-provider none**
- **ip rsvp data-packet classification none**

The reason for configuring these commands is because Cisco IOS Release 12.2(33)SRC supports control plane aggregation only. The RSVP data packet classifier does not support aggregation. Data plane aggregation must be achieved by using the RSVP Scalability Enhancements feature.

### Examples

The following example shows how to configure the Ethernet 0/0 interface on an aggregator or deaggregator interior router:

```
Router(config)# interface Ethernet0/0
Router(config-if)# ip rsvp aggregation ip role interior
```

### Related Commands

Command	Description
<b>ip rsvp aggregation ip</b>	Enables RSVP aggregation on a router.
<b>ip rsvp data-packet classification none</b>	Disables RSVP data packet classification.
<b>ip rsvp resource-provider none</b>	Configures a resource provider for an aggregate flow.
<b>show ip rsvp aggregation ip</b>	Displays RSVP summary aggregation information.

# ip rsvp atm-peak-rate-limit

To set a limit on the peak cell rate (PCR) of reservations for all newly created Resource Reservation Protocol (RSVP) switched virtual circuits (SVCs) established on the current interface or any of its subinterfaces, use the **ip rsvp atm-peak-rate-limit** command in interface configuration mode. To remove the current peak rate limit, in which case the reservation peak rate is limited by the line rate, use the **no** form of this command.

**ip rsvp atm-peak-rate-limit** *limit*

**no ip rsvp atm-peak-rate-limit**

<b>Syntax Description</b>	<i>limit</i>	The peak rate limit of the reservation specified, in KB. The minimum value allowed is 1 KB; the maximum value allowed is 2 GB.
---------------------------	--------------	--

<b>Command Default</b>	The peak rate of a reservation defaults to the line rate.
------------------------	---

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	Each RSVP reservation corresponds to an ATM SVC with a certain peak cell rate (PCR), sustainable cell rate (SCR), and maximum burst size. The PCR, also referred to as the peak rate, can be configured by the user or allowed to default to the line rate.
-------------------------	---

RSVP controlled-load reservations do not define any peak rate for the data. By convention, the allowable peak rate in such reservations is taken to be infinity, which is usually represented by a very large number. Under these circumstances, when a controlled-load reservation is converted to an ATM SVC, the PCR for the SVC becomes correspondingly large and may be out of range for the switch. You can use the **ip rsvp atm-peak-rate-limit** command to limit the peak rate.

The following conditions determine the peak rate limit on the RSVP SVC:

- The peak rate defaults to the line rate.
- If the peak rate is greater than the configured peak rate limiter, the peak rate is lowered to the peak rate limiter.
- The peak rate cannot be less than the reservation bandwidth. If this is the case, the peak rate is raised to the reservation bandwidth.

**Note**


---

Bandwidth conversions applied to the ATM space from the RSVP space are also applied to the peak rate.

The peak rate limit is local to the router; it does not affect the normal messaging of RSVP. Only the SVC setup is affected. Large peak rates are sent to the next host without modification.

For RSVP SVCs established on subinterfaces, the peak rate limit applied to the subinterface takes effect on all SVCs created on that subinterface. If a peak rate limit is applied to the main interface, the rate limit has no effect on SVCs created on a subinterface of the main interface even if the limit value on the main interface is lower than the limit applied to the subinterface.

For a given interface or subinterface, a peak rate limit applied to that interface affects only new SVCs created on the interface, not existing SVCs.

**Note**


---

This command is available only on interfaces that support the **ip rsvp svc-required** command.

Use the **show ip rsvp atm-peak-rate-limit** command to determine the peak rate limit set for an interface or subinterface, if one is configured.

**Examples**

The following configuration sample sets the peak rate limit for ATM interface 2/0/0.1 to 100 KB:

```
interface atm2/0/0.1
 ip rsvp atm-peak-rate-limit 100
```

**Related Commands**

Command	Description
<b>ip rsvp svc-required</b>	Enables creation of an SVC to service any new RSVP reservation made on the interface or subinterface.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

# ip rsvp authentication

To activate Resource Reservation Protocol (RSVP) cryptographic authentication, use the **ip rsvp authentication** command in interface configuration mode. To deactivate authentication, use the **no** form of this command.

**ip rsvp authentication**

**no ip rsvp authentication**

## Syntax Description

This command has no arguments or keywords.

## Command Default

RSVP cryptographic authentication is deactivated.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication** command to deactivate and then reactivate RSVP authentication without reentering the other RSVP authentication configuration commands. You should not enable authentication unless you have previously configured a key. If you issue this command before the **ip rsvp authentication key** command, you get a warning message indicating that RSVP discards all messages until you specify a key. The **no ip rsvp authentication** command disables RSVP cryptographic authentication. However, the command does not automatically remove any other authentication parameters that you have configured. You must issue a specific **no ip rsvp authentication** command; for example, **no ip rsvp authentication key**, **no ip rsvp authentication type**, or **no ip rsvp authentication window-size**, if you want to remove them from the configuration.

The **ip rsvp authentication** command is similar to the **ip rsvp neighbor** command. However, the **ip rsvp authentication** command provides better authentication and performs system logging.

## Examples

The following command activates authentication on an interface:

```
Router(config-if)# ip rsvp authentication
```

The following command deactivates authentication on an interface:

```
Router(config-if)# no ip rsvp authentication
```

Related Commands	Command	Description
	<b>ip rsvp authentication key</b>	Specifies the key (string) for the RSVP authentication algorithm.
	<b>ip rsvp authentication type</b>	Specifies the algorithm used to generate cryptographic signatures in RSVP messages.
	<b>ip rsvp authentication window-size</b>	Specifies the maximum number of RSVP authenticated messages that can be received out of order.
	<b>ip rsvp neighbor</b>	Enables neighbors to request a reservation.

# ip rsvp authentication challenge

To make Resource Reservation Protocol (RSVP) perform a challenge-response handshake with any new RSVP neighbors on a network, use the **ip rsvp authentication challenge** command in interface configuration mode. To disable the challenge-response handshake, use the **no** form of this command.

**ip rsvp authentication challenge**

**no ip rsvp authentication challenge**

## Syntax Description

This command has no arguments or keywords.

## Command Default

The challenge-response handshake initiated by this command is disabled.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

The **ip rsvp authentication challenge** command requires RSVP to perform a challenge-response handshake with any new RSVP neighbors that are discovered on a network. Such a handshake allows the router to thwart RSVP message replay attacks while booting, especially if there is a long period of inactivity from trusted RSVP neighbors following the reboot. If messages from trusted RSVP neighbors arrive very quickly after the router reboots, then challenges may not be required because the router will have reestablished its security associations with the trusted nodes before the untrusted nodes can attempt replay attacks.

If you enable RSVP authentication globally on an interface over which a Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) label switched path (LSP) travels and the router on which authentication is enabled experiences a stateful switchover (SSO), the following occurs:

- If challenges are disabled (you did not specify the **ip rsvp authentication challenge** command), the LSP recovers properly.
- If challenges are enabled (you specified the **ip rsvp authentication challenge** command), more RSVP signaling messages are required and the LSP takes longer to recover or the forwarding state may time out and the LSP does not recover. If a timeout occurs, data packet forwarding is interrupted while the headend router signals a new LSP.

If you enable RSVP authentication challenges, you should consider enabling RSVP refresh reduction by using the **ip rsvp signalling refresh reduction** command. While a challenge handshake is in progress, the receiving router that is initiating the handshake discards all RSVP messages from the node that is being challenged until the handshake-initiating router receives a valid challenge response.

**Note**

If a neighbor does not reply to the first challenge message after 1 second, the Cisco IOS software sends another challenge message and waits 2 seconds. If no response is received to the second challenge, the Cisco IOS software sends another and waits 4 seconds. If no response to the third challenge is received, the Cisco IOS software sends a fourth challenge and waits 8 seconds. If there is no response to the fourth challenge, the Cisco IOS software stops the current challenge to that neighbor, logs a system error message, and does not create a security association for that neighbor. This kind of exponential backoff is used to recover from challenges dropped by the network or busy neighbors.

Activating refresh reduction enables the challenged node to resend dropped messages more quickly once the handshake has completed. This causes RSVP to reestablish reservation state faster when the router reboots.

Enable authentication challenges wherever possible to reduce the router's vulnerability to replay attacks.

**Examples**

The following command shows how to enable RSVP to perform a challenge-response handshake:

```
Router(config-if)# ip rsvp authentication challenge
```

**Related Commands**

Command	Description
<b>ip rsvp signalling refresh reduction</b>	Enables RSVP refresh reduction.

# ip rsvp authentication key

To specify the key (string) for the Resource Reservation Protocol (RSVP) authentication algorithm, use the **ip rsvp authentication key** command in interface configuration mode. To disable the key, use the **no** form of this command.

**ip rsvp authentication key** *pass-phrase*

**no ip rsvp authentication key**

## Syntax Description

*pass-phrase* Phrase that ranges from 8 to 40 characters. See “Usage Guidelines” for additional information.

## Command Default

No key is specified.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication key** command to select the key for the authentication algorithm. This key is a passphrase of 8 to 40 characters. It can include spaces; quotes are not required if spaces are used. The key can consist of more than one word. We recommend that you make the passphrase as long as possible. This key must be the same for all RSVP neighbors on this interface. As with all passwords, you should choose them carefully so that attackers cannot easily guess them.

Here are some guidelines:

- Use a mixture of upper- and lowercase letters, digits, and punctuation.
- If using just a single word, do not use a word contained in any dictionary of any language, spelling lists, or other lists of words.
- Use something easily remembered so you do not have to write it down.
- Do not let it appear in clear text in any file or script or on a piece of paper attached to a terminal.

By default, RSVP authentication keys are stored in clear text in the router configuration file, but they can optionally be stored as encrypted text in the configuration file. To enable key encryption, use the global configuration **key config-key 1** *string* command. After you enter this command, the passphrase parameter of each **ip rsvp authentication key** command is encrypted with the Data Encryption Standard (DES) algorithm when you save the configuration file. If you later issue a **no key config-key 1** *string* command, the RSVP authentication key is stored in clear text again when you save the configuration.

The *string* argument is not stored in the configuration file; it is stored only in the router's private NVRAM and will not appear in the output of a **show running-config** or **show config** command. Therefore, if you copy the configuration file to another router, any encrypted RSVP keys in that file will not be successfully decrypted by RSVP when the router boots and RSVP authentication will not operate correctly. To recover from this, follow these steps on the new router:

1. For each RSVP interface with an authentication key, issue a **no ip rsvp authentication key** command to clear the old key.
2. For that same set of RSVP interfaces, issue an **ip rsvp authentication key** command to reconfigure the correct clear text keys.
3. Issue a global **key config-key 1 string** command to reencrypt the RSVP keys for the new router.
4. Save the configuration.

### Examples

The following command sets the passphrase to 11223344 in clear text:

```
Router(config-if)# ip rsvp authentication key 11223344
```

To encrypt the authentication key, issue the **key config-key 1 string** command as follows:

```
Router# configure terminal
Router(config)# key config-key 1 11223344
Router(config)# end
```

### Related Commands

Command	Description
<b>key config-key</b>	Defines a private DEF key for the router.

# ip rsvp authentication key-chain

To specify a list of keys for the Resource Reservation Protocol (RSVP) neighbors, use the **ip rsvp authentication key-chain** command in global configuration mode. To disable the key chain, use the **no** form of this command. To set the key chain to its default, use the **default** form of this command.

**ip rsvp authentication key-chain** *string*

**no ip rsvp authentication key-chain**

**default ip rsvp authentication key-chain**

## Syntax Description

<i>string</i>	Name of key chain; must have at least one key, but can have up to 2,147,483,647 keys.
---------------	---

## Command Default

No key chain is specified.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication key-chain** command to select the key chain.



### Note

You cannot use the **ip rsvp authentication key** and the **ip rsvp authentication key-chain** commands on the same router interface. The commands supersede each other; however, no error message is generated.

## Examples

The following commands set the key chain to RSVPkey for neighbor authentication:

```
Router(config)# ip rsvp authentication neighbor address 10.1.1.1 key-chain RSVPkey
```

or

```
Router(config)# ip rsvp authentication neighbor access-list 1 key-chain RSVPkey
```

The following command sets the global default key chain to RSVPkey:

```
Router(config)# ip rsvp authentication key-chain RSVPkey
```

## ■ ip rsvp authentication key-chain

Related Commands	Command	Description
	<b>ip rsvp authentication key</b>	Specifies the interface key (string) for the RSVP authentication algorithm.
	<b>show key chain</b>	Displays authentication key information.

# ip rsvp authentication lifetime

To control how long Resource Reservation Protocol (RSVP) maintains security associations with other trusted RSVP neighbors, use the **ip rsvp authentication lifetime** command in interface configuration mode. To disable the lifetime setting, use the **no** form of this command.

**ip rsvp authentication lifetime** *hh:mm:ss*

**no ip rsvp authentication lifetime** *hh:mm:ss*

## Syntax Description

*hh:mm:ss* Hours: minutes: seconds that RSVP maintains security associations with other trusted RSVP neighbors. The range is 1 second to 24 hours. The default is 30 minutes.

## Command Default

If you do not specify a security association lifetime setting, 30 minutes is used.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication lifetime** command to indicate when to end security associations with RSVP trusted neighbors. If an association's lifetime expires, but at least one valid, RSVP authenticated message was received in that time period, RSVP resets the security association's lifetime to this configured value. When a neighbor stops sending RSVP signaling messages (that is, the last reservation has been torn down), the memory used for the security association is freed as well as when the association's lifetime period ends. The association can be re-created if that RSVP neighbor resumes its signaling. Setting the lifetime to shorter periods allows memory to be recovered faster when the router is handling a lot of short-lived reservations. Setting the lifetime to longer periods reduces the workload on the router when establishing new authenticated reservations.

Use the **clear ip rsvp authentication** command to free security associations before their lifetimes expire.

## Examples

The following command sets the lifetime period for 30 minutes and 5 seconds:

```
Router(config-if)# ip rsvp authentication lifetime 00:30:05
```

## ■ ip rsvp authentication lifetime

Related Commands	Command	Description
	<b>clear ip rsvp authentication</b>	Eliminates RSVP security associations before their lifetimes expire.

# ip rsvp authentication neighbor

To activate Resource Reservation Protocol (RSVP) cryptographic authentication for a neighbor, use the **ip rsvp authentication neighbor** command in global configuration mode. To deactivate authentication for a neighbor, use the **no** form of this command. To set this command to the global default, use the **default** form of this command.

```
ip rsvp authentication neighbor [{access-list acl-name-or-number} | {address address}] [challenge]
[key-chain name] [type {md5 | sha-1}] [window-size number-of-messages]
```

```
no ip rsvp authentication neighbor
```

```
default ip rsvp authentication neighbor
```

## Syntax Description

<b>access-list</b> <i>acl-name-or-number</i>	A standard numbered or named IP access list that describes the set of neighbor IP addresses that share this key.
<b>address</b> <i>address</i>	A single IP address for a specific neighbor; usually one of the neighbor's physical or logical (loopback) interfaces.
<b>challenge</b>	(Optional) Requires RSVP to perform a challenge-response handshake with an RSVP neighbor for which RSVP does not have an existing security association in memory.
<b>key-chain</b> <i>name</i>	(Optional) The name of a key chain that contains the set of keys to be used to communicate with the neighbor.
<b>type</b>	(Optional) The algorithm to generate cryptographic signatures in RSVP messages.
<b>md5</b>	(Optional) RSA Message Digest 5 algorithm.
<b>sha-1</b>	(Optional) National Institute of Standards and Technologies (NIST) Secure Hash Algorithm-1; it is newer and more secure than <b>md5</b> .
<b>window-size</b> <i>number-of-messages</i>	(Optional) The maximum number of authenticated messages that can be received out of order. The range is 1 to 64, with a default of 1.

## Command Default

Neighbor cryptographic authentication is disabled.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

If you omit the optional keywords, the **ip rsvp authentication neighbor** command enables RSVP cryptographic authentication for a neighbor. Using the optional keywords inherits the global defaults.

In order to enable per-neighbor authentication, you must issue the **ip rsvp authentication neighbor** command (or the **no ip rsvp authentication neighbor** command to disable authentication). If you issue the **ip rsvp authentication** command without **neighbor**, then this command enables authentication for all neighbors and interfaces, regardless of whether there are any per-neighbor or per-interface keys defined. If you issue the **ip rsvp authentication neighbor** command, then authentication is enabled only for that neighbor.

### Access Control Lists

A single ACL can describe all the physical and logical interfaces that one neighbor can use to receive RSVP messages from a router; this can be useful when multiple routes exist between two neighbors. One ACL could also specify a number of different neighbors who, along with your router, will share the same key(s); however, this is generally not considered to be good network security practice.

If numbered, the ACL must be in the 1 to 99 range or the 1300 to 1999 range, giving a total of 798 numbered ACLs that can be used to configure neighbor keys (assuming some of them are not being used for other purposes). There is no enforced limit on the number of standard named IP ACLs. The IP addresses used in the ACL should contain at least the neighbor's physical interface addresses; router ID addresses can be added if necessary, especially when using Multi-Protocol Label Switching (MPLS) Traffic Engineering (TE).

The existing **ip access-list standard** command must be used for creating named or numbered standard IP ACLs for RSVP neighbors because standard ACLs deal with just source or destination addresses while extended ACLs deal with five tuples and are more complex to configure. The RSVP CLI returns an error message if any type of ACL other than standard is specified; for example,

```
Router(config)# ip rsvp authentication neighbor access-list 10 key-chain wednesday
```

```
% Invalid access list name.
RSVP error: unable to find/create ACL
```

Named standard IP ACLs are also recommended because you can include the neighbor router's hostname as part of the ACL name, thereby making it easy to identify the per-neighbor ACLs in your router configuration.

The RSVP CLI displays an error message if a valid named or numbered ACL is specified, but a nonexistent or invalid key chain has not been associated with it, since the lack of a key chain could cause RSVP messages to or from that neighbor to be dropped; for example,

```
Router(config)# ip rsvp authentication neighbor access-list myneighbor key-chain xyz
```

```
RSVP error: Invalid argument(s)
```

### Key Chains

In the key-chain parameter, the keys are used in order of ascending expiration deadlines. The only restriction on the name is that it cannot contain spaces. The key-chain parameter is optional; that is, you could omit it if you were trying to change other optional authentication parameters for the RSVP neighbor. However, when searching for a key, RSVP ignores any **ip rsvp authentication neighbor access-list** command that does not include a key-chain parameter that refers to a valid key chain with at least one unexpired key.

### Error and Warning Conditions

The RSVP CLI returns an error if any of the key IDs in the chain are duplicates of key IDs in any other chains already assigned to RSVP; for example,

```
Router(config)# ip rsvp authentication neighbor access-list myneighbor key-chain abc
```

```
RSVP error: key chains abc and xyz contain duplicate key ID 1
RSVP error: Invalid argument(s)
```

The RSVP CLI returns an error if the specified key chain does not exist or does not contain at least one unexpired key.

If a key chain is properly defined and RSVP later tries to send a message to that neighbor, but cannot find a valid, unexpired per-neighbor or per-interface key, RSVP generates the `RSVP_AUTH_NO_KEYS_LEFT` system message indicating that a key could not be obtained for that neighbor.

If the key chain contains keys with finite expiration times, RSVP generates the `RSVP_AUTH_ONE_KEY_EXPIRED` message to indicate when each key has expired.

If RSVP receives a message from a neighbor with the wrong digest type, it generates the `RSVP_MSG_AUTH_TYPE_MISMATCH` system message indicating that there is a digest type mismatch with that neighbor.

If RSVP receives a message that is a duplicate of a message already in the window or is outside the window, RSVP logs the `BAD_RSVP_MSG_RCVD_AUTH_DUP` or the `BAD_RSVP_MSG_RCVD_AUTH_WIN` error message indicating that the message sequence number is invalid.

If a challenge of a neighbor fails or times out, RSVP generates the `BAD_RSVP_MSG_RCVD_AUTH_COOKIE` system message or the `RSVP_MSG_AUTH_CHALLENGE_TIMEOUT` message, indicating that the specified neighbor failed to respond successfully to a challenge.

### Examples

In the following example, an access list and a key chain are created for neighbors V, Y, and Z and authentication is enabled globally using inheritance for all other authentication parameters:

```
Router# configure terminal
Router(config)# ip access-list standard neighbor_V
Router(config-std-nacl)# permit 10.0.0.2
Router(config-std-nacl)# permit 10.1.16.1
Router(config-std-nacl)# exit
Router(config)# ip access-list standard neighbor_Y
Router(config-std-nacl)# permit 10.0.1.2
Router(config-std-nacl)# permit 10.16.0.1
Router(config-std-nacl)# exit
Router(config)# ip access-list standard neighbor_Z
Router(config-std-nacl)# permit 10.16.0.2
Router(config-std-nacl)# permit 10.1.0.2
Router(config-std-nacl)# permit 10.0.1.2
Router(config-std-nacl)# exit
Router(config)# ip rsvp authentication neighbor access-list neighbor_V key-chain
neighbor_V
Router(config)# ip rsvp authentication neighbor access-list neighbor_Y key-chain
neighbor_Y
Router(config)# ip rsvp authentication neighbor access-list neighbor_Z key-chain
neighbor_Z
Router(config)# ip rsvp authentication
Router(config)# end
```

In the following example, an access list and a key chain are created for neighbors V, Y, and Z and authentication is explicitly enabled for each neighbor:

```
Router(config)# ip rsvp authentication neighbor access-list neighbor_V key-chain
neighbor_V
Router(config)# ip rsvp authentication neighbor access-list neighbor_V
Router(config)# ip rsvp authentication neighbor access-list neighbor_Y key-chain
neighbor_Y
Router(config)# ip rsvp authentication neighbor access-list neighbor_Y
Router(config)# ip rsvp authentication neighbor access-list neighbor_Z key-chain
neighbor_Z
Router(config)# ip rsvp authentication neighbor access-list neighbor_Z
Router(config)# end
```

---

**Related Commands**

Command	Description
<b>ip rsvp authentication</b>	Activates RSVP cryptographic authentication.

---

# ip rsvp authentication type

To specify the type of algorithm used to generate cryptographic signatures in Resource Reservation Protocol (RSVP) messages, use the **ip rsvp authentication type** command in interface configuration or global configuration mode. To specify that no type of algorithm is used, use the **no** form of this command. To remove the type from your configuration, use the **default** form of this command.



## Note

Before you use the **no ip rsvp authentication type** command, see the “Usage Guidelines” section for more information.

### Syntax for T Releases

```
ip rsvp authentication type { md5 | sha-1 }
```

```
no ip rsvp authentication type
```

```
default ip rsvp authentication type
```

### Syntax for 12.0S and 12.2S Releases

```
ip rsvp authentication type { md5 | sha-1 }
```

```
default ip rsvp authentication type
```

## Syntax Description

<b>md5</b>	RSA Message Digest 5 algorithm.
<b>sha-1</b>	National Institute of Standards and Technologies (NIST) Secure Hash Algorithm-1; it is newer and more secure than MD5.

## Command Default

If no algorithm is specified, **md5** is used.

## Command Modes

Interface configuration (config-if)  
Global configuration (config)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.0(29)S	This command was introduced in global configuration mode for all neighbors. A <b>default</b> form of the command was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication type** command to specify the algorithm to generate cryptographic signatures in RSVP messages. If you do not specify an algorithm, **md5** is used.

If you use the **ip rsvp authentication type** command rather than the **ip rsvp authentication neighbor type** command, the global default for type changes.

The **no ip rsvp authentication type** command is not supported in Cisco IOS Releases 12.0S and 12.2S because every security association must have a digest type, and you cannot disable it. Use the default **ip rsvp authentication type** command to remove the authentication type from a configuration and force the type to its default.

Although the **no ip rsvp authentication type** command is supported in Cisco IOS T releases, the **default ip rsvp authentication type** command is recommended to remove the authentication type from a configuration and force the type to its default.

## Examples

### T Releases Example

The following command sets the type to **sha-1 for interface authentication**:

```
Router(config-if)# ip rsvp authentication type sha-1
```

### 12.0S and 12.2S Releases Examples

The following commands set the type to **sha-1 for neighbor authentication**:

```
Router(config)# ip rsvp authentication neighbor address 10.1.1.1 type sha-1
```

or

```
Router(config)# ip rsvp authentication neighbor access-list 1 type sha-1
```

The following command sets the global default type to **sha-1 for authentication**:

```
Router(config)# ip rsvp authentication type sha-1
```

### Default Command Example

The following command removes the type from your configuration and forces the type to its default:

```
Router(config)# default ip rsvp authentication type
```

## Related Commands

Command	Description
<b>ip rsvp authentication key</b>	Specifies the key (string) for the RSVP authentication algorithm.
<b>ip rsvp authentication neighbor type</b>	Sets the type for a specific neighbor.

# ip rsvp authentication window-size

To specify the maximum number of Resource Reservation Protocol (RSVP) authenticated messages that can be received out of order, use the **ip rsvp authentication window-size** command in interface configuration mode. To disable the window size (or to use the default value of 1), use the **no** form of this command.

**ip rsvp authentication window-size** *[number-of-messages]*

**no ip rsvp authentication window-size**

## Syntax Description

*number-of-messages* (Optional) Maximum number of authenticated messages that can be received out of order. The range is 1 to 64; the default value is 1.

## Command Default

If no window size is specified, a value of 1 is used.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp authentication window-size** command to specify the maximum number of RSVP authenticated messages that can be received out of order. All RSVP authenticated messages include a sequence number that is used to prevent replays of RSVP messages.

With a default window size of one message, RSVP rejects any duplicate authenticated messages because they are assumed to be replay attacks. However, sometimes bursts of RSVP messages become reordered between RSVP neighbors. If this occurs on a regular basis, and you can verify that the node sending the burst of messages is trusted, you can use the **ip rsvp authentication window-size** command option to allow for the burst size such that RSVP will not discard such reordered bursts. RSVP will still check for duplicate messages within these bursts.

## Examples

The following command sets the window size to 2:

```
Router(config-if)# ip rsvp authentication window-size 2
```

## Related Commands

Command	Description
<b>ip rsvp authentication</b>	Activates RSVP cryptographic authentication.

## ip rsvp bandwidth

To enable Resource Reservation Protocol (RSVP) for IP on an interface, use the **ip rsvp bandwidth** command in interface configuration mode. To disable RSVP completely, use the **no** form of this command. To eliminate only the subpool portion of the bandwidth, use the **no** form of this command with the **sub-pool** keyword.

```
ip rsvp bandwidth [interface-kbps] [single-flow-kbps] [ [rdm kbps { [subpool kbps] | [bc1 subpool] } ] | [mam max-reservable-bw kbps bc0 kbps bc1 kbps ] ]
```

```
no ip rsvp bandwidth [interface-kbps] [single-flow-kbps] [ [rdm kbps { [subpool kbps] | [bc1 subpool] } ] | [mam max-reservable-bw kbps bc0 kbps bc1 kbps ] ]
```

### Syntax Description

<i>interface-kbps</i>	(Optional) Maximum amount of bandwidth, in kbps, that may be allocated by RSVP flows. The range is from 1 to 10,000,000.
<i>single-flow-kbps</i>	(Optional) Maximum amount of bandwidth, in kbps, that may be allocated to a single flow. The range is from 1 to 10,000,000. [This value is ignored by the Diff-Serv-aware MPLS Traffic Engineering feature].
<b>rdm</b> <i>kbps</i>	Russian Doll Model for DiffServ-aware traffic engineering. The keyword is optional.
<b>subpool</b> <i>kbps</i>	This keyword and value are used in the traditional (pre-IETF-Standard) implementation of DS-TE to specify the amount of bandwidth, in kbps, on the interface that is to be reserved to a portion of the total. The range is from 1 to the value of the smaller of the <i>interface-kbps</i> and <b>rdm</b> <i>kbps</i> arguments.
<b>bc1</b> <i>subpool</i>	This keyword and value are used in the IETF-Standard implementation of DS-TE to specify the same bandwidth portion as <b>subpool</b> <i>kbps</i> , namely the amount of bandwidth, in kbps, on the interface that is to be reserved to a portion of the total. The range is from 1 to the value of the smaller of the <i>interface-kbps</i> and <b>rdm</b> <i>kbps</i> arguments.
<b>mam</b>	Maximum Allocation Model for DiffServ-aware traffic engineering.
<b>max-reservable-bw</b> <i>kbps</i>	The maximum reservable bandwidth — this sets a limit on the size of the total pool.
<b>bc0</b> <i>kbps</i>	Amount of bandwidth, in kbps, on the interface to be reserved to the total (formerly called “global pool”). The range is from 1 to the value of the <b>max-reservable-bw</b> <i>kbps</i> argument.
<b>bc1</b> <i>kbps</i>	Amount of bandwidth, in kbps, on the interface to be reserved to a portion of the total. (Formerly this portion was called the “subpool”). The range is from 1 to the value of the <b>max-reservable-bw</b> <i>kbps</i> argument.

### Command Default

RSVP is disabled by default.

If the **ip rsvp bandwidth** command is entered but no bandwidth values are supplied (for example, **ip rsvp bandwidth** is entered followed by pressing the Enter key), a default bandwidth value (that is, 75% of the link bandwidth) is assumed for both the *interface-kbps* and *single-flow-kbps* arguments.

### Command Modes

Interface configuration

Command History	Release	Modification
	11.2	This command was introduced.
	12.0(11)ST	This command was integrated into Cisco IOS Release 12.0(11)ST, and the <b>sub-pool</b> keyword was added.
	12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T. This command was implemented on the Cisco 7500 series and the ATM-permanent virtual circuit (PVC) interface.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
	12.2(18)SXD	This command was integrated into Cisco IOS Release 12.2(18)SX.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SRB	The IETF Standard for DiffServ-aware traffic engineering (DS-TE) was added through the keyword alternatives <b>rdm</b> (Russian Dolls Model) and <b>mam</b> (Maximum Allocation Model), and their subsidiary arguments.

### Usage Guidelines

RSVP cannot be configured with distributed Cisco Express Forwarding (dCEF).

RSVP is disabled by default to allow backward compatibility with systems that do not implement RSVP.

Weighted Random Early Detection (WRED) or fair queueing must be enabled first.

When you issue the **ip rsvp bandwidth** command, the RSVP bandwidth pool adjusts dynamically when the bandwidth of the interface changes.

When using this command for DiffServ-aware traffic engineering (DS-TE) in IETF Standard mode, you must use either **rdm** and its arguments or **mam** and its arguments; you cannot use both. For more details about each alternative, see *Russian Dolls Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering* ed. by F. Le Faucheur (RFC 4127) and *Maximum Allocation Bandwidth Constraints Model for Diffserv-aware MPLS Traffic Engineering* by F. Le Faucheur & W. Lai (RFC 4125).

### Examples

The following example shows a T1 (1536 kbps) link configured to permit RSVP reservation of up to 1158 kbps, but no more than 100 kbps for any given flow on serial interface 0. Fair queueing is configured with 15 reservable queues to support those reserved flows, should they be required.

```
Router(config)# interface serial 0
Router(config-if)# fair-queue 64 256 15
Router(config-if)# ip rsvp bandwidth 1158 100
```

### Related Commands

Command	Description
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>ip rsvp neighbor</b>	Enables neighbors to request a reservation.
<b>ip rsvp reservation</b>	Enables a router to behave like it is receiving and forwarding RSVP RESV messages.
<b>ip rsvp sender</b>	Enables a router to behave like it is receiving and forwarding RSVP PATH messages.

Command	Description
<b>ip rsvp udp-multicasts</b>	Instructs the router to generate UDP-encapsulated RSVP multicasts whenever it generates an IP-encapsulated multicast packet.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>show ip rsvp installed</b>	Displays RSVP-related installed filters and corresponding bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp reservation</b>	Displays RSVP-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp bandwidth percent

To enable Resource Reservation Protocol (RSVP) for IP on an interface and to specify a percentage of the total interface bandwidth as available in the RSVP bandwidth pool, use the **ip rsvp bandwidth percent** command in interface configuration mode. To disable RSVP on an interface, use the **no** form of this command.

**ip rsvp bandwidth percent** *percentage max-flow-bw*

**no ip rsvp bandwidth percent**

Syntax Description	percentage	Percentage of bandwidth configured. The range is from 1 to 100.
	max-flow-bw	Maximum amount of bandwidth, in kbps, configured for a single flow. The range is from 1 to 10000000; however, the amount you can configure depends on how much bandwidth remains in the pool.

**Command Default** RSVP is disabled by default; therefore, no percentage of bandwidth is set.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(33)SRB	This command was introduced.

**Usage Guidelines**

RSVP cannot be configured with distributed Cisco Express Forwarding (dCEF).  
 RSVP is disabled by default to allow backward compatibility with systems that do not implement RSVP. Weighted Random Early Detection (WRED) or fair queueing must be enabled first.

Use the **ip rsvp bandwidth percent** command to set the RSVP bandwidth pool to a specified percentage of interface bandwidth. When you issue the **ip rsvp bandwidth percent** command, the RSVP bandwidth pool adjusts dynamically whenever the bandwidth of the interface changes.

**Examples** The following example shows a serial link configured to permit an RSVP reservation of up to 90 percent of interface bandwidth but no more than 1000 kbps for any given flow on serial interface 0:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface serial 0
Router(config-if)# ip rsvp bandwidth percent 90 1000
```

Related Commands	Command	Description
	<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
	<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
	<b>ip rsvp neighbor</b>	Enables neighbors to request a reservation.
	<b>ip rsvp reservation</b>	Enables a router to behave as though it were receiving and forwarding RSVP RESV messages.
	<b>ip rsvp sender</b>	Enables a router to behave as though it were receiving and forwarding RSVP PATH messages.
	<b>ip rsvp udp-multicasts</b>	Instructs the router to generate UDP-encapsulated RSVP multicasts whenever it generates an IP-encapsulated multicast packet.
	<b>random-detect (interface)</b>	Enables WRED or DWRED.
	<b>show ip rsvp installed</b>	Displays RSVP-related installed filters and corresponding bandwidth information.
	<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
	<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
	<b>show ip rsvp reservation</b>	Displays RSVP-related receiver information currently in the database.
	<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp burst policing

To configure a burst factor within the Resource Reservation Protocol (RSVP) token bucket policer on a per-interface basis, use the **ip rsvp burst policing** command in interface configuration mode. To return to the default value, enter the **no** form of this command.

**ip rsvp burst policing** [*factor*]

**no ip rsvp burst policing**

<b>Syntax Description</b>	<i>factor</i>	(Optional) Indicates a burst factor value as a percentage of the requested burst of the receiver.
---------------------------	---------------	---

<b>Command Default</b>	The default value is 200; the minimum value is 100, and the maximum value is 700.
------------------------	---

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	You configure the burst police factor per interface, not per flow. The burst factor controls how strictly or loosely the traffic of the sender is policed with respect to burst.
-------------------------	--

The burst factor applies to all RSVP flows installed on a specific interface. You can configure each interface independently for burst policing.

<b>Examples</b>	Here is an example of the <b>ip rsvp burst policing</b> command with a burst factor of 200:
-----------------	---

```
ip rsvp burst policing 200
```

# ip rsvp data-packet classification none

To turn off (disable) Resource Reservation Protocol (RSVP) data packet classification, use the **ip rsvp data-packet classification none** command in interface configuration mode. To turn on (enable) data-packet classification, use the **no** form of this command.

**ip rsvp data-packet classification none**

**no ip rsvp data-packet classification none**

**Syntax Description** This command has no arguments or keywords.

**Command Default** RSVP data packet classification is disabled.

**Command Modes** Interface configuration

## Command History

Release	Modification
12.2(2)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(18)SXF2	This command was integrated into Cisco IOS Release 12.2(18)SXF2.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Use the **ip rsvp data-packet classification none** command when you do not want RSVP to process every packet. Configuring RSVP so that not every packet is processed eliminates overhead and improves network performance and scalability.

## Examples

This section contains two examples of the **ip rsvp data-packet classification none** command. In the first example, data packet classification is turned off (disabled), as follows:

```
Router# configure terminal
Router(config)# interface atm6/0
Router(config-if)# ip rsvp data-packet classification none
```

In the second example, data packet classification is turned on (enabled), as follows:

```
Router# configure terminal
Router(config)# interface atm6/0
Router(config-if)# no ip rsvp data-packet classification none
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

# ip rsvp dsbm candidate

To configure an interface as a Designated Subnetwork Bandwidth Manager (DSBM) candidate, use the **ip rsvp dsbm candidate** command in interface configuration mode. To disable DSBM on an interface, which exempts the interface as a DSBM candidate, use the **no** form of this command.

**ip rsvp dsbm candidate** [*priority*]

**no ip rsvp dsbm candidate**

## Syntax Description

<i>priority</i>	(Optional) A value in the range from 64 to 128. Among contenders for the DSBM, the interface with the highest priority number wins the DSBM election process.
-----------------	---

## Command Default

An interface is not configured as a DSBM contender by default. If you use this command to enable the interface as a DSBM candidate and you do not specify a priority, the default priority of 64 is assumed.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.1(1)T	This command was integrated into Cisco IOS Release 12.1(1)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

SBM protocol entities, any one of which can manage resources on a segment, can reside in Layer 2 or Layer 3 devices. Many SBM-capable devices may be attached to a shared Layer 2 segment. When more than one SBM exists on a given segment, one of the SBMs is elected to be the DSBM. The elected DSBM is responsible for exercising admission control over requests for resource reservations on a segment, which, in the process, becomes a managed segment. A managed segment includes those interconnected parts of a shared LAN that are not separated by DSBMs. In all circumstances, only one, if any, DSBM exists for each Layer 2 segment.

You can configure an interface to have a DSBM priority in the range from 64 to 128. You can exempt an interface from participation in the DSBM election on a segment but still allow the system to interact with the DSBM if a DSBM is present on the segment. In other words, you can allow a Resource Reservation Protocol (RSVP)-enabled interface on a router connected to a managed segment to be managed by the DSBM even if you do not configure that interface to participate as a candidate in the DSBM election process. To exempt an interface from DSBM candidacy, do not issue the **ip rsvp dsbm candidate** command on that interface.

RSVP cannot be configured with Versatile Interface Processor (VIP)-distributed Cisco Express Forwarding (dCEF).

**Examples**

The following example configures Ethernet interface 2 as a DSBM candidate with a priority of 100:

```
interface Ethernet2
 ip rsvp dsbm candidate 100
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>debug ip rsvp</b>	Displays information about SBM message processing, the DSBM election process, and standard RSVP enabled message processing information.
<b>debug ip rsvp detail</b>	Displays detailed information about RSVP and SBM.
<b>debug ip rsvp detail sbm</b>	Displays detailed information about SBM messages only, and SBM and DSBM state transitions.
<b>ip rsvp dsbm non-resv-send-limit</b>	Configures the NonResvSendLimit object parameters.
<b>show ip rsvp sbm</b>	Displays information about an SBM configured for a specific RSVP-enabled interface or for all RSVP-enabled interfaces on the router.

# ip rsvp dsbm non-resv-send-limit

To configure the NonResvSendLimit object parameters, use the **ip rsvp dsbm non-resv-send-limit** command in interface configuration mode. To use the default NonResvSendLimit object parameters, use the **no** form of this command.

```
ip rsvp dsbm non-resv-send-limit { rate kbps | burst kilobytes | peak kbps | min-unit bytes | max-unit bytes }
```

```
no ip rsvp dsbm non-resv-send-limit { rate kbps | burst kilobytes | peak kbps | min-unit bytes | max-unit bytes }
```

## Syntax Description

<b>rate</b> <i>kbps</i>	The average rate, in kbps, for the Designated Subnetwork Bandwidth Manager (DSBM) candidate. The average rate is a number from 1 to 2147483.
<b>burst</b> <i>kilobytes</i>	The maximum burst size, in kb, for the DSBM candidate. The maximum burst size is a number from 1 to 2147483.
<b>peak</b> <i>kbps</i>	The peak rate, in kbps, for the DSBM candidate. The peak rate is a number from 1 to 2147483.
<b>min-unit</b> <i>bytes</i>	The minimum policed unit, in bytes, for the DSBM candidate. The minimum policed unit is a number from 1 to 2147483647.
<b>max-unit</b> <i>bytes</i>	The maximum packet size, in bytes, for the DSBM candidate. The maximum packet size is a number from 1 to 2147483647.

## Command Default

The default for the **rate**, **burst**, **peak**, **min-unit**, and **max-unit** keywords is unlimited; all traffic can be sent without a valid Resource Reservation Protocol (RSVP) reservation.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.1(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

To configure the per-flow limit on the amount of traffic that can be sent without a valid RSVP reservation, configure the **rate**, **burst**, **peak**, **min-unit**, and **max-unit** values for finite values greater than 0.

To allow all traffic to be sent without a valid RSVP reservation, configure the **rate**, **burst**, **peak**, **min-unit**, and **max-unit** values for unlimited traffic. To configure the parameters for unlimited traffic, you can either omit the command, or enter the **no** form of the command (for example, **no ip rsvp dsbm non-resv-send-limit rate**). Unlimited is the default value.

The absence of the NonResvSendLimit object allows any amount of traffic to be sent without a valid RSVP reservation.

RSVP cannot be configured with VIP-distributed Cisco Express Forwarding (dCEF).

**Examples**

The following example configures Ethernet interface 2 as a DSBM candidate with a priority of 100, an average rate of 500 kbps, a maximum burst size of 1000 KB, a peak rate of 500 kbps, and unlimited minimum and maximum packet sizes:

```
interface Ethernet2
 ip rsvp dsbm candidate 100
 ip rsvp dsbm non-resv-send-limit rate 500
 ip rsvp dsbm non-resv-send-limit burst 1000
 ip rsvp dsbm non-resv-send-limit peak 500
```

**Related Commands**

Command	Description
<b>ip rsvp dsbm candidate</b>	Configures an interface as a DSBM candidate.
<b>show ip rsvp sbm</b>	Displays information about an SBM configured for a specific RSVP-enabled interface or for all RSVP-enabled interfaces on the router.

# ip rsvp flow-assist

To enable Resource Reservation Protocol (RSVP) to integrate with the Cisco Express Forwarding (CEF) path for flow classification, policing, and marking, use the **ip rsvp flow-assist** command in interface configuration mode. To disable integration of RSVP with CEF for this purpose, use the **ip rsvp data-packet classification none** command.

## ip rsvp flow-assist

**Syntax Description** This command has no arguments or keywords.

**Command Default** This command is on by default; RSVP integrates with CEF for classification, policing, and marking of data packets.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(3)T	This command was introduced.
	12.4	The behavior of this command was modified. See the “Usage Guidelines” section for additional information.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** To police and mark data packets of a reserved flow, RSVP must interact with the underlying packet forwarding mechanism, which is CEF.

In Cisco IOS Release 12.4, the **no** form of the **ip rsvp flow-assist** command is no longer supported since you can use the existing **ip rsvp data-packet classification none** command to disable RSVP from integrating with any mechanism for handling data packets.

**Examples** The following example enables RSVP on ATM interface 2/0/0:

```
interface atm2/0/0
 ip rsvp flow-assist
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp data-packet classification none</b>	Avoids integrating RSVP with the data plane.
<b>ip rsvp precedence</b>	Allows you to set the IP Precedence values to be applied to packets that either conform to or exceed the RSVP flowspec.
<b>ip rsvp svc-required</b>	Enables creation of an SVC to service any new RSVP reservation made on the interface or subinterface.
<b>ip rsvp tos</b>	Allows you to set the ToS values to be applied to packets that either conform to or exceed the RSVP flowspec.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

# ip rsvp layer2 overhead

To control the overhead accounting performed by Resource Reservation Protocol (RSVP)/weighted fair queueing (WFQ) when a flow is admitted onto an ATM permanent virtual circuit (PVC), use the **ip rsvp layer2 overhead** command in interface configuration mode. To disable the overhead accounting, use the **no** form of this command.

**ip rsvp layer2 overhead** [*h c n*]

**no ip rsvp layer2 overhead** [*h c n*]

## Syntax Description

<i>h</i>	(Optional) Layer 2 encapsulation header plus trailer size applied to each Layer 3 packet in bytes. Valid sizes are numbers from 0 to 65535.
<i>c</i>	(Optional) Layer 2 cell header size applied to each Layer 2 cell in bytes. Valid sizes are numbers from 0 to 65535.
<i>n</i>	(Optional) Layer 2 payload size in bytes. Valid sizes are numbers from 0 to 65534.

## Defaults

This command is enabled by default on ATM interfaces that are running RSVP and WFQ. You can also use this command on non-ATM interfaces.

The default version of the command, which you specify by entering the default prefix, **default ip rsvp layer2 overhead**, or by omitting the parameters (*h*, *c*, and *n*) and entering the **ip rsvp layer2 overhead** command causes RSVP to determine the overhead values automatically, based on the interface/PVC encapsulation. (Currently, RSVP recognizes ATM Adaptation Layer 5 (AAL5) subnetwork access protocol (SNAP) and MUX (multiplexer) encapsulations.)

On non-ATM/PVC interfaces, the configured *h*, *c*, and *n* parameters determine the values that RSVP uses for its overhead.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(2)T	This command was introduced.

## Usage Guidelines

When an IP flow traverses a link, the overhead of Layer 2 encapsulation can increase the amount of bandwidth that the flow requires to exceed the advertised (Layer 3) rate.

In many cases, the additional bandwidth a flow requires because of Layer 2 overhead is negligible and can be transmitted as part of the 25 percent of the link, which is unreservable and kept for routing updates and Layer 2 overhead. This situation typically occurs when the IP flow uses large packet sizes or when the Layer 2 encapsulation allows for frames of variable size (such as in Ethernet and Frame Relay encapsulations).

However, when a flow's packet sizes are small and the underlying Layer 2 encapsulation uses fixed-size frames, the Layer 2 encapsulation overhead can be significant, as is the case when Voice Over IP (VoIP) flows traverse ATM links.

To avoid oversubscribing ATM PVCs, which use AAL5 SNAP or AAL5 MUX encapsulations, RSVP automatically accounts for the Layer 2 overhead when admitting a flow. For each flow, RSVP determines the total amount of bandwidth required, including Layer 2 overhead, and uses this value for admission control with the WFQ bandwidth manager.

**Note**

The **ip rsvp layer2 overhead** command does not affect bandwidth requirements of RSVP flows on ATM switched virtual circuits (SVCs).

**Examples**

In the following example, the total amount of bandwidth reserved with WFQ appears:

```
Router# show ip rsvp installed detail
```

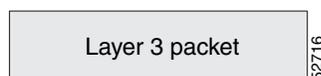
```
RSVP:ATM6/0 has the following installed reservations
RSVP Reservation. Destination is 10.1.1.1, Source is 10.1.1.1,
  Protocol is UDP, Destination port is 1000, Source port is 1000
  Reserved bandwidth:50K bits/sec, Maximum burst:1K bytes, Peak rate:50K bits/sec
  Min Policed Unit:60 bytes, Max Pkt Size:60 bytes
  Resource provider for this flow:
    WFQ on ATM PVC 100/101 on AT6/0: PRIORITY queue 40. Weight:0, BW 89 kbps
  Conversation supports 1 reservations
  Data given reserved service:0 packets (0M bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 9 seconds
  Long-term average bitrate (bits/sec):0M reserved, 0M best-effort
```

In the preceding example, the flow's advertised Layer 3 rate is 50 kbps. This value is used for admission control with the **ip rsvp bandwidth** value. The actual bandwidth required, inclusive of Layer 2 overhead, is 89 kbps. WFQ uses this value for admission control.

Typically, you should not need to configure or disable the Layer 2 overhead accounting. RSVP uses the advertised Layer 3 flow rate, minimum packet size, and maximum unit size in conjunction with the Layer 2 encapsulation characteristics of the ATM PVC to compute the required bandwidth for admission control. However, you can disable or customize the Layer 2 overhead accounting (for any link type) with the **ip rsvp layer2 overhead** command. The parameters of this command are based on the following steps that show how a Layer 3 packet is fragmented and encapsulated for Layer 2 transmission.

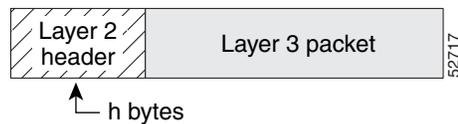
**Step 1** Start with a Layer 3 packet, as shown in [Figure 1](#), which includes an IP header and a payload.

**Figure 1** Layer 3 Packet



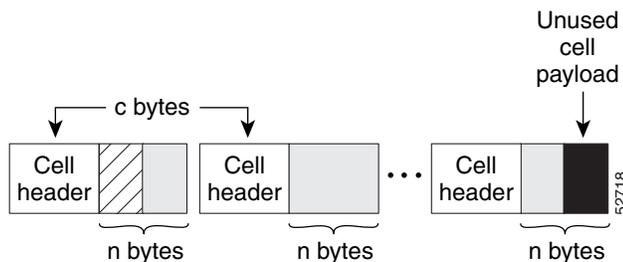
**Step 2** Add an encapsulation header or trailer, as shown in [Figure 2](#), of size  $h$ .

**Figure 2** Layer 3 Packet with Layer 2 Header



**Step 3** Segment the resulting packet into fixed-sized cells, as shown in [Figure 3](#), with a cell header of  $c$  bytes and a cell payload of  $n$  bytes.

**Figure 3** Segmented Packet



**Step 4** Transmit the resulting Layer 2 cells.

### More Configuration Examples

In the following example, Layer 2 overhead accounting is disabled for all reservations on the interface and its PVCs:

```
Router(config-if)# no ip rsvp layer2 overhead
```

In the following example, Layer 2 overhead accounting is configured with ATM AAL5 SNAP encapsulation:

```
Router(config-if)# no ip rsvp layer2 overhead 8 5 48
```

In the following example, Layer 2 overhead accounting is configured with ATM AAL5 MUX encapsulation:

```
Router(config-if)# ip rsvp layer2 overhead 0 5 48
```

In the following example, Layer 2 overhead accounting is configured with Ethernet V2.0 encapsulation (including 8-byte preamble, 6-byte source-active (SA) messages, 6-byte destination-active (DA) messages, 2-byte type, and 4-byte frame check sequence (FCS) trailer):

```
Router(config-if)# ip rsvp layer2 overhead 26 0 1500
```

### Related Commands

Command	Description
<b>show ip rsvp installed</b>	Displays RSVP-related installed filters and corresponding bandwidth information.

# ip rsvp listener

To configure a Resource Reservation Protocol (RSVP) router to listen for PATH messages, use the **ip rsvp listener** command in global configuration mode. To disable listening, use the **no** form of this command.

```
ip rsvp listener dst {udp | tcp | any | number} {any | dst-port} {announce | reply | reject}
```

```
no ip rsvp listener dst {udp | tcp | any | number} {any | dst-port} {announce | reply | reject}
```

## Syntax Description

<i>dst</i>	IP address of the receiving interface.
<b>udp</b>	UDP for the receiving interface.
<b>tcp</b>	TCP for the receiving interface.
<b>any</b>	Protocol for the receiving interface.
<i>number</i>	Source port number from 0 to 255; the protocol is IP.
<b>any</b>	Destination port for the receiving interface.
<i>dst-port</i>	Port number from 0 to 65535 for the receiving interface.
<b>announce</b>	Receiver announces the arrival of the flow at its destination, but does not send a RESV message in response.
<b>reply</b>	Sender requests a reply when the flow is received and sends a RESV message when a matching PATH message arrives.
<b>reject</b>	Router sends a PATHERROR (reject) message in response to an incoming PATH message that matches specified listener parameters.

## Command Default

This command is disabled by default; therefore, no listeners are configured.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.
12.4(6)T	Support for RSVP application identity (ID) was added.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Use the **ip rsvp listener** command to allow a router to send a matching RESV message when a PATH message arrives with the desired destination address, port, and protocol. This command copies the application ID and preemption priority value, if present, from the PATH message and includes them in the RESV message.

This command is similar to the **ip rsvp reservation** and **ip rsvp reservation-host** commands. However, they do not allow you to specify more than one port or protocol per command; so you may have to enter many commands to proxy for a set of ports and protocols. In contrast, the **ip rsvp listener** command allows you to use a wildcard for a set of ports and protocols by using just that one command.

You can use the **debug ip rsvp api** command to look for a matching PATH message, but no RESV message will be sent.

---

**Examples**

In the following example, the sender is requesting that the receiver reply with a RESV message for the flow if the PATH message destination is 192.168.2.1:

```
Router# configure terminal  
Router(config)# ip rsvp listener 192.168.2.1 any any reply
```

---

**Related Commands**

Command	Description
<b>ip rsvp reservation</b>	Enables a router to simulate receiving and forwarding RSVP RESV messages.
<b>ip rsvp reservation-host</b>	Enables a router to simulate a host generating RSVP RESV messages.
<b>show ip rsvp listeners</b>	Displays configured RSVP listeners.

# ip rsvp listener outbound

To configure a Resource Reservation Protocol (RSVP) router to listen for PATH messages sent through a specified interface, use the **ip rsvp listener outbound** command in interface configuration mode. To disable listening, use the **no** form of this command.

**ip rsvp listener outbound {reply | reject}**

**no ip rsvp listener outbound {reply | reject}**

Syntax Description	reply	reject
	<p>For a PATH message that usually exits from a specified interface, the router does the following:</p> <ul style="list-style-type: none"> <li>• Installs local PATH state for the message.</li> <li>• Terminates the PATH message and does not forward it downstream.</li> <li>• Generates and sends a RESV (reply) message upstream on behalf of the PATH message with the following. <ul style="list-style-type: none"> <li>– The objects in the RESV message are the same as those in the PATH message.</li> <li>– The policy objects, such as preemption and application IDs, are echoed back.</li> <li>– Shared explicit style is used.</li> </ul> </li> </ul>	<p>For a PATH message that usually exits from a specified interface, the router does the following:</p> <ul style="list-style-type: none"> <li>• Terminates the PATH message and does not forward it downstream.</li> <li>• Generates and sends a PATHERROR (reject) message upstream.</li> <li>• Does not install local PATH state and discards the PATH message.</li> </ul>

**Command Default** This command is disabled by default; therefore, no listeners are configured.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(18)SFX5	This command was introduced.
	12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Use the **ip rsvp listener outbound** command to match all PATH messages that are being sent from a specified interface.

When you configure an interface-based receiver proxy to reply, RSVP performs Call Admission Control (CAC) on the outbound (or egress) interface for the flow. If CAC fails, the reservation is not generated. This is the same behavior as for the global RSVP receiver proxy command.

The outbound interface that a flow uses is determined when the flow is set up, and the interface-based receiver proxy is consulted at that time. The interface-based receiver proxy is not consulted if there is a change in routing for an existing flow.

If the interface-based receiver proxy receives a RESVERR message with an admission control failure error or a policy reject error, the interface-based receiver proxy generates a PATHERR message with the same error to provide explicit notification to the sender of the reservation failure.

**Examples**

In the following example, PATH messages sent through Ethernet interface 3/0 are rejected and PATHERROR messages are generated:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface Ethernet3/0
Router(config-if)# ip rsvp listener outbound reject
```

**Related Commands**

Command	Description
<b>ip rsvp listener</b>	Configures an RSVP router to listen for PATH messages.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving and forwarding RSVP RESV messages.
<b>ip rsvp reservation-host</b>	Enables a router to simulate a host generating RSVP RESV messages.
<b>show ip rsvp listeners</b>	Displays configured RSVP listeners.

# ip rsvp msg-pacing

To set up message pacing (that is, to control the transmission rate for Resource Reservation Protocol (RSVP) messages), use the **ip rsvp msg-pacing** command in global configuration mode. To disable this feature, use the **no** form of this command.

```
ip rsvp msg-pacing [period ms [burst msgs [maxsize qsize]]]
```

```
no rsvp msg-pacing
```

## Syntax Description

<b>period</b> <i>ms</i>	(Optional) Length of the interval, in milliseconds, during which a router can send the number of RSVP messages specified in the <i>burst</i> keyword. The value can be from 1 to 1000 milliseconds.
<b>burst</b> <i>msgs</i>	(Optional) Maximum number of RSVP messages that a router can send to an output interface during each interval specified in the <i>period</i> keyword. The value can be from 1 to 2000.
<b>maxsize</b> <i>qsize</i>	(Optional) Size of per-interface output queues in the sending router. Valid values are from 1 to 2000.

## Command Default

RSVP messages are not paced.

If you enter the command without the optional arguments, the transmission rate for RSVP messages is limited to 200 messages per second per outgoing interface.

The default output queue size, specified in the **maxsize** keyword, is 500.

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(14)ST	This command was introduced.
12.2(11)S	This command was integrated into Cisco IOS Release 12.2(11)S.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You can use this command to prevent a burst of RSVP traffic engineering signaling messages from overflowing the input queue of a receiving router, which would cause the router to drop some messages. Dropped messages substantially delay the completion of signaling for LSPs for which messages have been dropped.

---

**Examples**

In the following example, a router can send a maximum of 150 RSVP traffic engineering signaling messages in 1 second to a neighbor, and the size of the output queue is 750:

```
Router(config)# ip rsvp msg-pacing period 1 burst 150 maxsize 750
```

---

**Related Commands**

Command	Description
<code>clear ip rsvp msg-pacing</code>	Clears the RSVP message pacing output from the <code>show ip rsvp neighbor</code> command.

---

# ip rsvp neighbor

To enable neighbors to request a reservation, use the **ip rsvp neighbor** command in interface configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp neighbor** *access-list-number*

**no ip rsvp neighbor** *access-list-number*

## Syntax Description

<i>access-list-number</i>	Number of a standard or extended IP access list. It can be any number in the range from 1 to 199.
---------------------------	---

## Command Default

The router accepts messages from any neighbor.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to allow only specific Resource Reservation Protocol (RSVP) neighbors to make a reservation. If no limits are specified, any neighbor can request a reservation. If an access list is specified, only neighbors meeting the specified access list requirements can make a reservation.

RSVP cannot be configured with Versatile Interface Processor (VIP)-distributed Cisco Express Forwarding (dCEF).

## Examples

The following example allows neighbors meeting access list 1 requirements to request a reservation:

```
interface ethernet 0
 ip rsvp neighbor 1
```

## Related Commands

Command	Description
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving and forwarding RSVP RESV messages.

Command	Description
<b>ip rsvp sender</b>	Enables a router to simulate receiving and forwarding RSVP PATH messages.
<b>ip rsvp udp-multicasts</b>	Instructs the router to generate UDP-encapsulated RSVP multicasts whenever it generates an IP-encapsulated multicast packet.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>show ip rsvp installed</b>	Displays RSVP-related installed filters and corresponding bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp reservation</b>	Displays RSVP-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp policy cops minimal

To lower the load of the Common Open Policy Service (COPS) server and to improve latency times for messages on the governed router, use the **ip rsvp policy cops minimal** command in global configuration mode to restrict the COPS RSVP policy to adjudicate only PATH and RESV messages. To turn off the restriction, use the **no** form of this command.

**ip rsvp policy cops minimal**

**no ip rsvp policy cops minimal**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The default state is OFF, causing all adjudicable RSVP messages to be processed by the configured COPS policy.

**Command Modes** Global configuration

Command History	Release	Modification
	12.1(1)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** When this command is used, COPS does not attempt to adjudicate PATHERROR and RESVERROR messages. Instead, those messages are all accepted and forwarded.

**Examples** In the following example, COPS authentication is restricted to PATH and RESV messages:

```
ip rsvp policy cops minimal
```

In the following example, that restriction is removed:

```
no ip rsvp policy cops minimal
```

# ip rsvp policy cops report-all

To enable a router to report on its success and failure with outsourcing decisions, use the **ip rsvp policy cops report-all** command in global configuration mode. To return the router to its default, use the **no** form of this command.

**ip rsvp policy cops report-all**

**no ip rsvp policy cops report-all**

## Syntax Description

This command has no arguments or keywords.

## Command Default

The default state of this command is to send reports to the Policy Decision Point (PDP) about configuration decisions only.

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

In the default state, the router reports to the PDP when the router has succeeded or failed to implement Resource Reservation Protocol (RSVP) configuration decisions.

A *configuration decision* contains at least one of the following:

- A RESV ALLOC context (with or without additional contexts)
- A stateless or named decision object

A decision that does not contain at least one of those elements is an *outsourcing decision*.

Some brands of policy server might expect reports about RSVP messaging, which the default state of the Cisco Common Open Policy Service (COPS) for RSVP does not issue. In such cases, use the **ip rsvp policy cops report-all** command to ensure interoperability between the router and the policy server. Doing so does not adversely affect policy processing on the router.

Unicast FF reservation requests always stimulate a report from the router to the PDP, because those requests contain a RESV ALLOC context (combined with an IN CONTEXT and an OUT CONTEXT).

## Examples

In order to show the Policy Enforcement Point (PEP)-to-PDP reporting process, the **debug cops** command in the following example already is enabled when a new PATH message arrives at the router:

```
Router(config)# ip rsvp policy cops report-all
```

```
00:02:48:COPS:** SENDING MESSAGE **
Contents of router's request to PDP:
  COPS HEADER:Version 1, Flags 0, Opcode 1 (REQ), Client-type:1, Length:216
  HANDLE (1/1) object. Length:8.    00 00 02 01
  CONTEXT (2/1) object. Length:8.   R-type:5.    M-type:1
  IN_IF (3/1) object. Length:12.   Address:10.1.2.1.  If_index:4
  OUT_IF (4/1) object. Length:12.  Address:10.33.0.1. If_index:3
  CLIENT SI (9/1) object. Length:168.  CSI data:
  [A 27-line Path message omitted here]
00:02:48:COPS:Sent 216 bytes on socket,
00:02:48:COPS:Message event!
00:02:48:COPS:State of TCP is 4
00:02:48:In read function
00:02:48:COPS:Read block of 96 bytes, num=104 (len=104)
00:02:48:COPS:** RECEIVED MESSAGE **
Contents of PDP's decision received by router:
  COPS HEADER:Version 1, Flags 1, Opcode 2 (DEC), Client-type:1, Length:104
  HANDLE (1/1) object. Length:8.    00 00 02 01
  CONTEXT (2/1) object. Length:8.   R-type:1.    M-type:1
  DECISION (6/1) object. Length:8.  COMMAND cmd:1, flags:0
  DECISION (6/3) object. Length:56.  REPLACEMENT
  [A 52-byte replacement object omitted here]
  CONTEXT (2/1) object. Length:8.   R-type:4.    M-type:1
  DECISION (6/1) object. Length:8.  COMMAND cmd:1, flags:0
00:02:48:Notifying client (callback code 2)
00:02:48:COPS:** SENDING MESSAGE **
Contents of router's report to PDP:
  COPS HEADER:Version 1, Flags 1, Opcode 3 (RPT), Client-type:1, Length:24
  HANDLE (1/1) object. Length:8.    00 00 02 01
  REPORT (12/1) object. Length:8.   REPORT type COMMIT (1)
00:02:48:COPS:Sent 24 bytes on socket,
```

# ip rsvp policy cops servers

To specify that Resource Reservation Protocol (RSVP) should use Common Open Policy Service (COPS) policy for remote adjudication, use the **ip rsvp policy cops servers** command in global configuration mode. To turn off the use of COPS for RSVP, use the **no** form of this command.

```
ip rsvp policy cops [acl] servers server-ip [server-ip]
```

```
no ip rsvp policy cops [acl] servers
```

## Syntax Description

<i>acl</i>	(Optional) Specifies the access control list (ACL) whose sessions will be governed by the COPS policy.
<i>server-ip</i>	(Optional) Specifies the IP addresses of the servers governing the COPS policy. As many as eight servers can be specified, with the first being treated as the primary server.

## Command Default

If no ACL is specified, the default behavior is for all reservations to be governed by the specified policy servers.

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

If more than one server is specified, the first server is treated by RSVP as the primary server, and functions as such for *all* ACLs specified.

All servers in the list must have the same policy configuration.

If the connection of the router to the server breaks, the router tries to reconnect to that same server. If the reconnection attempt fails, the router then obeys the following algorithm:

If the connection to the Policy Decision Point (PDP) is closed (either because the PDP closed the connection, a TCP/IP error occurred, or the keepalives failed), the Policy Enforcement Point (PEP) issues a CLIENT-CLOSE message and then attempts to reconnect to the same PDP. If the PEP receives a CLIENT-CLOSE message containing a PDP redirect address, the PEP attempts to connect to the redirected PDP.

Note the following points:

- If either attempt fails, the PEP attempts to connect to the PDPs previously specified in the **ip rsvp policy cops servers** configuration command, obeying the sequence of servers given in that command, always starting with the first server in that list.
- If the PEP reaches the end of the list of servers without connecting, it waits a certain time (called the *reconnect delay*) before trying again to connect to the first server in the list. This reconnect delay is initially 30 seconds, and doubles each time the PEP reaches the end of the list without having connected, until the reconnect delay becomes its maximum of 30 minutes. As soon as a connection is made, the delay is reset to 30 seconds.

The **no** form of this command need not contain any server IP addresses, but it must contain *all* the previously specified access lists (see the last example in the following section).

---

## Examples

This first example applies the COPS policy residing on server 172.27.224.117 to all reservations passing through router-9. It also identifies the backup COPS server for this router as the one at address 172.27.229.130:

```
Router(config)# ip rsvp policy cops servers 172.27.224.117 172.27.229.130
```

The next example applies the COPS policy residing on server 172.27.224.117 to reservations passing through router-9 only if they match access lists 40 and 160. Other reservations passing through that router will not be governed by this server. The command statement also identifies the backup COPS server for that router to be the one at address 172.27.229.130:

```
Router(config)# ip rsvp policy cops 40 160 servers 172.27.224.117 172.27.229.130
```

The following example turns off COPS for the previously specified access lists 40 and 160 (you cannot turn off just one of the previously specified lists):

```
Router(config)# no ip rsvp policy cops 40 160 servers
```

# ip rsvp policy cops timeout

To configure the amount of time the Policy Enforcement Point (PEP) router will retain policy information after losing connection with the Common Open Policy Service (COPS) server, use the **ip rsvp policy cops timeout** command in global configuration mode. To restore the router to the default value (5 minutes), use the **no** form of this command.

**ip rsvp policy cops timeout** *policy-timeout*

**no ip rsvp policy cops timeout**

<b>Syntax Description</b>	<i>policy-timeout</i>	Duration of timeout, from 1 to 10,000 seconds.
---------------------------	-----------------------	--

<b>Command Default</b>	Timeout default is 300 seconds (5 minutes).
------------------------	---

<b>Command Modes</b>	Global configuration
----------------------	----------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

<b>Examples</b>	The following example configures the router to time out all policy information relating to a lost server in 10 minutes:
-----------------	---

```
ip rsvp policy cops timeout 600
```

The following example resets the timeout to the default value:

```
no ip rsvp policy cops timeout
```

# ip rsvp policy default-reject

To reject all messages that do not match the policy access control lists (ACLs), use the **ip rsvp policy default-reject** command in global configuration mode. To restore the default behavior, which passes along all messages that do not match the ACLs, use the **no** form of this command.

**ip rsvp policy default-reject**

**no ip rsvp policy default-reject**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Without this command, the default behavior of Resource Reservation Protocol (RSVP) is to accept, install, or forward all unmatched RSVP messages. Once this command is invoked, all unmatched RSVP messages are rejected.

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(1)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

If COPS is configured without an ACL, or if any policy ACL is configured to use the **permit ip any any** command, the behavior of that ACL will take precedence, and no session will go unmatched.



### Note

This command makes one exception to its blocking of unmatched messages. It forwards RESVERROR and PATHERROR messages that were generated by its own rejection of RESV and PATH messages. That is done to ensure that the default-reject operation does not remain totally hidden from network managers.



### Caution

Be extremely careful with this command. It will shut down *all* RSVP processing on the router if access lists are too narrow or if no Common Open Policy Service (COPS) server has been specified. (Use the **ip rsvp policy cops servers** command to specify a COPS server.)

## Examples

The following example configures RSVP to reject all unmatched reservations:

```
ip rsvp policy default-reject
```

The following example configures RSVP to accept all unmatched reservations:

```
no ip rsvp policy default-reject
```

# ip rsvp policy identity

To define Resource Reservation Protocol (RSVP) application identities (IDs), use the **ip rsvp policy identity** command in global configuration mode. To delete RSVP application IDs, use the **no** form of this command.

**ip rsvp policy identity** *alias* **policy-locator** *locator*

**no ip rsvp policy identity** *alias* [**policy-locator** *locator*]

## Syntax Description

<i>alias</i>	A string used within the router to reference the identity in RSVP configuration commands and <b>show</b> displays. The string can have as many as 64 printable characters (in the range 0x20 to 0x7E).
<b>Note</b>	If you use the “ ” or ? characters as part of the alias or locator string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.
<b>policy-locator</b> <i>locator</i>	A string that is signaled in RSVP messages and contains application IDs in X.500 Distinguished Name (DN) format. (See the “ <b>Usage Guidelines</b> ” section for detailed information.)

## Command Default

This command is disabled by default; therefore, no RSVP application identities are defined.

## Command Modes

Global configuration

## Command History

Release	Modification
12.4(6)T	This command was introduced.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

You can use RSVP identities as criteria for matching RSVP PATH and RESV messages to local policies. Identities can also be used to configure static senders and receivers. When you use an RSVP identity as the match criterion for a local policy, RSVP treats the *policy locator* string as a type of pattern-matching string known as a regular expression. Regular expressions allow you to configure a single identity for use with a local policy that can match multiple X.500 DNs. Regular expressions, by default, are not exact matches unless you add appropriate control characters to the expression to force it to be an exact match.

In Cisco IOS software, the *locator* is the primary piece of information that the router uses to find the correct policy to apply to RSVP messages that contain application IDs. This string assumes the format of an X.500 DN and includes the following attributes as recommended in RFC 2872:

- APP = Application identifier, a required attribute.
- VER = Version number of the application, a required attribute.

- SAPP = Subapplication identifier, an optional attribute. An arbitrary number of subapplication elements can be included.
- GUID = Global unique identifier, an optional attribute.

Here are some examples:

- APP = CCM, VER = 1.1, SAPP = Voice
- GUID = http://www.cisco.com/apps, APP = VideoConference, VER = 1.2.3

You can create a maximum of 100 identities on a router. If you attempt to create more, the command fails and the following error message is generated: “RSVP error: maximum number of identities already created”.

When you use the **ip rsvp policy identity** command, be aware of the following behavior:

- If you specify *alias* or *locator* strings that are empty or invalid, the command is rejected and an error message is generated.
- Cisco IOS software automatically adds quotes to the *alias* or *locator* strings in the configuration if quotes are required.
- If you specify the optional **policy-locator** keyword in the **no** version of this command, the command is rejected if *locator* does not match the configured *locator* string for the *alias* being deleted.
- If you specify an *alias* that is missing, empty, or contains invalid characters, the command is rejected and an error message is generated.
- RSVP does not check the *locator* string to see if it is a valid X.500 DN; therefore, the *locator* string can be anything that you want. (Future versions of Cisco IOS software may force RSVP messages to contain valid X.500 DNs.)

#### Command Restrictions

- User identities are not supported in Cisco IOS Release 12.4(6)T.
- You cannot configure a single router with more than 100 identities at a time.

## Examples

### Exact Application ID Match

The following example shows an application ID for RSVP messages containing a locator string whose contents are the exact string “APP=Voice”:

```
Router# configure terminal
Router(config)# ip rsvp policy identity "rsvp-voice" policy-locator "^APP=Voice$"
Router(config-rsvp-id)# end
```

### Wildcard (or Partial) Application ID Match

The following example shows an application ID that is a partial match for RSVP messages containing a locator string with the substring “APP=Voice” anywhere in the signaled application ID:

```
Router# configure terminal
Router(config)# ip rsvp policy identity "rsvp-voice" policy-locator ".*APP=Voice.*"
Router(config-rsvp-id)# end
```

Related Commands	Command	Description
	<b>ip rsvp policy local</b>	Creates a local procedure that determines the use of RSVP resources in a network.
	<b>show ip rsvp policy identity</b>	Displays selected RSVP identities in a router configuration.
	<b>show ip rsvp policy local</b>	Displays selected local policies that have been configured.

## ip rsvp policy local

To determine how to perform authorization on Resource Reservation Protocol (RSVP) requests and enter local policy configuration mode, use the **ip rsvp policy local** command in global configuration or interface configuration mode. To disable this function, use the **no** form of this command.

```
ip rsvp policy local {acl acl1 [acl2...acl8] | dscp-ip value1 [value2...value8] | default | identity
alias1 [alias2...alias4] | origin-as as1 [as2...as8]}
```

```
no ip rsvp policy local {acl acl1 [acl2...acl8] | dscp-ip value1 [value2...value4] | default | identity
alias1 [alias2...alias4] | origin-as as1 [as2...as8]}
```

### Syntax Description

<b>acl</b> <i>acl1</i> [ <i>acl2...acl8</i> ]	Specifies an access control list (ACL). Values for each ACL are 1 to 199. <b>Note</b> You must associate at least one ACL with an ACL-based policy. However, you can associate as many as eight.
<b>dscp-ip</b> <i>value1</i> [ <i>value2...value8</i> ]	Specifies the differentiated services code point (DSCP) for matching aggregate reservations. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul> <b>Note</b> You must associate at least one DSCP with a DSCP-based policy. However, you can associate as many as eight.
<b>default</b>	Specifies a default when an RSVP message does not match any ACL, DSCP, identity, or autonomous system.
<b>identity</b> <i>alias1</i> [ <i>alias2...alias4</i> ]	Specifies an application ID alias for an application ID previously configured using the <b>ip rsvp policy identity</b> command. <b>Note</b> You must associate at least one alias with an application-ID-based policy. However, you can associate as many as four.
<b>origin-as</b> <i>as1</i> [ <i>as2...as8</i> ]	Specifies an autonomous system. Values for each autonomous system are 1 to 65535. <b>Note</b> You must associate at least one autonomous system with an autonomous-system-based policy. However, you can associate as many as eight.

### Command Default

This command is disabled by default; therefore, no local policies are configured.

### Command Modes

Global configuration (config)  
Interface configuration (config-if)

**Command History**

Release	Modification
12.2(13)T	This command was introduced.
12.0(29)S	The <b>origin-as</b> <i>as</i> keyword and argument combination and new submode commands were added.
12.0(30)S	This command was modified so that you can no longer use 0 as the protocol when you configure an ACL.
12.4(4)T	This command was integrated into Cisco IOS Release 12.4(4)T.
12.4(6)T	The command was modified as follows: <ul style="list-style-type: none"> <li>Interface configuration mode was added to support per-interface local policies.</li> <li>The <b>identity</b> <i>alias</i> keyword and argument combination was added.</li> <li>The <b>maximum</b> submode command was changed to support RESV messages.</li> </ul>
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The <b>dscp-ip</b> <i>value</i> keyword and argument combination was added.

**Usage Guidelines**

Use the **ip rsvp policy local** command to determine how to perform authorization on RSVP requests.

**Note**

Before entering the **origin-as** *as* keyword and argument combination, you must have Border Gateway Protocol (BGP) running; otherwise, an RSVP warning message appears stating that the autonomous-system-based policy will be ineffective.

You can use all types of match criteria with non-Traffic-Engineering (TE) reservations. You can use all types of match criteria except application ID with TE reservations because TE PATH and RESV messages sent by Cisco routers do not contain application IDs.

There are five types of local policies—one default local policy, one or more ACL-based policies, one or more autonomous-system-based policies, one or more application-ID-based policies, and one or more DSCP-based policies. The default policy is used when an RSVP message does not match any ACL-, autonomous-system-, application-ID-, or DSCP-based policies.

You can configure a mixture of local policy types including ACL, autonomous system, application ID, DSCP, or default on the same interface or globally. Policies have the following priority (from highest to lowest):

- Nondefault interface policies
- Default interface policy
- Nondefault global policies
- Global default policy

**Note**

If you configure an ACL to use with a TE tunnel, do not use 0 as the protocol because RSVP cannot accept any messages since they do not match the ACL.

### Policy-Match Criteria



#### Note

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You cannot specify a policy-match criteria more than once using the **ip rsvp policy local** command.

---

An ACL-based policy must have at least one ACL associated with it, but it can optionally have up to eight ACLs. The ACLs can be standard or extended IP ACLs. They are matched against source/destination addresses/ports based on RSVP objects inside RSVP signaling messages as described below.

- ACL source address—Matched against the source address in the SENDER\_TEMPLATE object in RSVP messages. If this object is not present, the source address in the IP header is used.
- ACL destination address—Matched against the destination address in the SESSION object in RSVP messages. If this object is not present, the destination address in the IP header is used.
- ACL source port—Matched against the source port in the SENDER\_TEMPLATE object in RSVP messages. If this object is not present, the source port of 0 is used.
- ACL destination port—Matched against the destination port in the SESSION object in RSVP messages. If this object is not present, the destination port of 0 is used.
- ACL IP protocol—Matched against the IP protocol in the SESSION object in RSVP messages. If this object is not present, the IP protocol of 0 is used. If the IP protocol is for a TE session, then the ACL IP protocol should be UDP.
- ACL differentiated services code point (DSCP) values—Matched against the DSCP value in the IP header of the RSVP message.



#### Note

---

These same policy-match criteria apply when you create ACLs for the **debug ip rsvp filter** command except the command does not use DSCP and the protocol is ignored for TE sessions.

---

An autonomous-system-based policy must have at least one autonomous system associated with it, but it can optionally have up to eight autonomous systems. They are matched against the incoming interface/source IP address contained in RSVP objects inside RSVP signaling messages, not on the IP headers of the RSVP messages.

An application-ID-based policy must have at least one application ID associated with it, but it can optionally have up to four application IDs. They are matched against the incoming interface/source IP address contained in RSVP objects inside RSVP signaling messages, not on the IP headers of the RSVP messages.

A DSCP-based policy must have at least one DSCP associated with it, but it can optionally have up to four DSCPs. RSVP extracts the DSCP from the aggregate message SESSION object and applies the local policy that matches the DSCP criteria.

### Command Restrictions

- You cannot configure more than 300 local policies per router. This limit is independent of policy location (global or per interface) or match criteria such as application IDs, access control lists, or autonomous systems.
- You cannot configure a single local policy with more than four RSVP identities.

### CLI Submodes

Once you type the **ip rsvp policy local** command, you enter the local policy CLI submode where you define the properties of the local policy that you are creating.

**Note**

The local policy that you create automatically rejects all RSVP messages unless you enter a submode command that instructs RSVP on the types of messages to accept or forward.

The submode commands are as follows:

- **accept**—Accepts, but does not forward RSVP messages.

**accept** { **all** | **path** | **path-error** | **resv** | **resv-error** }

- **all**—Accepts all incoming RSVP messages.
- **path**—Accepts incoming PATH messages that meet the match criteria for this policy, which includes ACL(s), autonomous system(s), application ID(s), or default(s). If you omit this command, incoming PATH messages that meet the policy-match criteria are rejected and a PATHERROR message is sent in reply. However, the PATHERROR reply is also subject to local policy.
- **path-error**—Accepts incoming PATHERROR messages that meet the match criteria for this policy. If you omit this command, incoming, including locally-generated, PATHERROR messages that meet the policy-match criteria are rejected.
- **resv**—Accepts incoming RESV messages that meet the match criteria for this policy and performs any required admission control. If you omit this command, incoming RESV messages that meet the policy-match criteria are rejected and a RESVERROR message is sent in reply. However, the RESVERROR reply is also subject to local policy.

The default bandwidth for a policy is unlimited. Therefore, if the policy has no configured bandwidth, a RESV message is always accepted by the local policy because any bandwidth request is less than or equal to unlimited. However, the RESV message may subsequently fail admission control if there is insufficient bandwidth in the RSVP pool on the input interface to which the RESV message applies. (See the **ip rsvp bandwidth** command for more information.) If the bandwidth requested by the RESV messages is too large, a RESVERROR message that is also subject to local policy is transmitted to the RESV sender.

- **resv-error**—Accepts incoming RESVERROR messages that meet the policy-match criteria for this policy. If you omit this command, the incoming, including locally-generated, RESVERROR messages that meet the policy-match criteria are rejected.
- **default**—Sets a command to its defaults.
- **exit**—Exits local policy configuration mode.
- **fast-reroute**—Allows TE LSPs that request Fast Reroute service. The default value is accept.
- **forward**—Accepts and forwards RSVP messages.

**forward** { **all** | **path** | **path-error** | **resv** | **resv-error** }

- **all**—Accepts and forwards all RSVP messages.
- **path**—Accepts and forwards PATH messages that meet the match criteria for this policy. If you omit this command, PATH messages that meet the policy-match criteria are not forwarded to the next (downstream) hop.
- **path-error**—Accepts and forwards PATHERROR messages that meet the match criteria for this policy. If you omit this command, the PATHERROR messages that meet the match criteria are not forwarded to the previous (upstream) hop. You may want to reject outbound PATHERROR messages if you are receiving PATH messages from an untrusted node because someone could be trying to port-scan for RSVP. If you reply with a PATHERROR message, the untrusted node knows that you support RSVP and your IP address. Such information could be used to attempt RSVP-based attacks.

- **resv**—Accepts and forwards RESV messages that meet the match criteria for this policy. If you omit this command, RESV messages that meet the match criteria are not forwarded to the previous (upstream) hop.
- **resv-error**—Accepts and forwards RESVERROR messages that meet the match criteria for this policy. If you omit this command, the RESVERROR messages that meet the match criteria are not forwarded to the next (downstream) hop. You may want to reject outbound RESVERROR messages if you are receiving RESV messages from an untrusted node because someone could be trying to port-scan for RSVP. If you reply with a RESVERROR message, then the untrusted node knows that you support RSVP and your IP address. Such information could be used to attempt RSVP-based attacks.
- **local-override**—Overrides any other policy sources by enforcing this local policy. Finalizes any decisions by this policy. If local-override is omitted, RSVP holds onto the local policy decision to see if another local or remote policy exists that will make a decision on the RSVP message, and only if there is no other policy decision will the local policy decision be enforced.
- **maximum [bandwidth [group *x*] [single *y*] | senders *n*]**—Sets the limits for resources.
  - **bandwidth [group *x*] [single *y*]**—Indicates bandwidth limits for RSVP reservations. The **group** keyword specifies the amount of bandwidth that can be requested by all reservations covered by this policy. The **single** keyword specifies the maximum bandwidth that can be requested by any specific RSVP reservation covered by this policy. The *x* and *y* values are in kilobits per second and can range from 1 to 10,000,000 (similar in concept to the existing interface mode **ip rsvp bandwidth** command). Absence of a bandwidth command implies that there is no policy limit on bandwidth requests.

Previously, the **maximum bandwidth** command applied only to PATH messages. However, as part of the application ID enhancement, this command now applies only to RESV messages. This change has the following benefits:

Allows the local policy bandwidth limit to be used by RSVP's admission control process for both shared and nonshared reservations. Previous releases that performed group bandwidth checks on PATH messages could not account for bandwidth sharing, and, as a result, you had to account for sharing by creating a larger maximum group bandwidth for the policy.

Allows a local policy to trigger preemption during the admission control function if there is insufficient policy bandwidth to meet the needs of an incoming RESV message.

- **senders *n***—Limits the number of RSVP senders affected by this policy that can be active at the same time on this router. The value for *n* ranges from 1 to 50,000 with a default of 1000.




---

**Note** If you do not configure the **ip rsvp policy preempt** command, the **maximum** command may be rejected, resulting in the following error message: “RSVP error: insufficient preemptable bandwidth” if there are reservations admitted against the policy, and you try to reduce the group bandwidth to less than the amount of admitted bandwidth on the policy.

---

- **no**—Negates a command or sets its defaults.
- **preempt-priority [traffic-eng *x*] setup-priority [hold-priority]**—Specifies the RSVP QoS priorities to be inserted into PATH and RESV messages if they were not signaled from an upstream or downstream neighbor or local client application, and the maximum setup or hold priority that RSVP QoS or MPLS/TE sessions can signal. A PATHERROR, RESVERROR, or local application error is returned if these limits are exceeded.

The  $x$  value indicates the upper limit of the priority for TE reservations. The range of  $x$  values is 0 to 7 in which the smaller the number, the higher the reservation's priority. For non-TE reservations, the range of  $x$  values is 0 to 65535 in which the higher the number, the higher the reservation's priority.

The *setup-priority* argument indicates the priority of a reservation when it is initially installed. The optional *hold-priority* argument indicates the priority of a reservation after it has been installed; if omitted, it defaults to the *setup-priority*. Values for the *setup-priority* and *hold-priority* arguments range from 0 to 7 where 0 is considered the highest priority.

If the incoming message has a preemption priority that requests a priority higher than the policy allows, the message is rejected. Use the **tunnel mpls traffic-eng priority** command to configure preemption priority for TE tunnels.

A single policy can contain a **preempt-priority traffic-eng** and a **preempt-priority** command, which may be useful if the policy is bound to an ACL that identifies a subnet containing a mix of TE and non-TE endpoints or midpoints.

**Note**

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If you exit local policy configuration mode without entering any submode commands, the policy that you have created rejects *all* RSVP messages.

---

**Per-Interface Local Policies**

All the local policy submode commands are also supported on a per-interface basis. You simply enter Cisco IOS interface configuration mode for the selected interface and type in any number and mix of the submode commands.

Per-interface local policies take precedence over global local policies. However, if there is a default local policy configured for an interface, the router does not try to match any RSVP messages arriving on that interface to any of the global local policies. Policies have the following priority (from highest to lowest):

- Nondefault interface policies
- Default interface policy
- Nondefault global policies
- Global default policy

There are some important points to note about per-interface local policies:

- Per-interface local policies do not take the place of the **ip rsvp bandwidth** command. The **ip rsvp bandwidth** command indicates if RSVP is enabled on an interface as well as the size of the RSVP bandwidth pool. The **ip rsvp bandwidth** pool is used by the admission control function of RSVP; per-interface policies are used by the policy control function of RSVP. Policy control is the third phase of RSVP message processing, which consists of validation, authentication, policy control (authorization), and admission control.
- The sum of the group bandwidth of all the local policies assigned to an interface can be greater than the maximum total bandwidth configured in the **ip rsvp bandwidth** command. However, the **ip rsvp bandwidth** command makes the final decision as to whether there is sufficient bandwidth to admit the reservation.

**Examples****ACL-, Default-, and Autonomous-System-Based Policies**

In the following example, any RSVP nodes in the 192.168.101.0 subnet can initiate or respond to reservation requests, but all other nodes can respond to reservation requests only. This means that any 192.168.101.x node can send and receive PATH, PATHERROR, RESV, or RESVERROR messages. All other nodes can send only RESV or RESVERROR messages, and all reservations for autonomous system 1 are rejected.

```
Router# configure terminal
Router(config)# access-list 104 permit ip 192.168.101.0 0.0.0.255 any
Router(config)# ip rsvp policy local acl 104
Router(config-rsvp-policy-local)# forward all
Router(config-rsvp-policy-local)# exit
Router(config)# ip rsvp policy local default
Router(config-rsvp-policy-local)# forward resv
Router(config-rsvp-policy-local)# forward resverror
Router(config-rsvp-policy-local)# exit
Router(config)# ip rsvp policy local origin-as 1
Router(config-rsvp-policy-local)# end
```

**Application-ID-Based Policy**

RSVP matches incoming RSVP messages with IDs to configured IDs and policies. The following example configures a global RSVP local policy that limits voice calls to 200 kbps for the whole router regardless of which interface the RSVP signaling occurs on:

```
Router# configure terminal
Router(config)# ip rsvp policy local identity rsvp-voice policy-locator
"GUID=www.cisco.com, APP=Voice"
Router(config)# ip rsvp policy local identity rsvp-voice
Router(config-rsvp-local-policy)# forward all
Router(config-rsvp-local-policy)# maximum bandwidth group 200
Router(config-rsvp-local-policy)# end
```

**Per-Interface Application ID-Based Policy**

The following example configures a local policy that limits all RSVP voice calls on serial interface 2/0/0 to a total of 200 kbps:

```
Router# configure terminal
Router(config)# ip rsvp policy local identity rsvp-voice policy-locator APP=Voice
Router(config)# interface serial2/0/0
Router(config-if)# ip rsvp policy local identity rsvp-voice
Router(config-rsvp-local-policy)# forward all
Router(config-rsvp-local-policy)# maximum bandwidth group 200
Router(config-rsvp-local-policy)# exit
Router(config-if)# ip rsvp policy local default
Router(config-rsvp-local-policy)# forward all
Router(config-rsvp-local-policy)# maximum bandwidth group 50
Router(config-rsvp-local-policy)# end
```

**DSCP-Based Policy**

The following example configures a local policy to match RSVP aggregation reservations with an RSVP session object DSCP value of 46 and sets the preempt-priority with a setup and hold priority equal to 5.

```
Router# configure terminal
Router(config)# ip rsvp policy local dscp-ip 46
Router(config-rsvp-local-policy)# forward all
Router(config-rsvp-local-policy)# preempt-priority 5 5
Router(config-rsvp-local-policy)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp policy preempt</b>	Enables RSVP to redistribute bandwidth from lower-priority reservations to new, higher-priority reservations.
<b>show ip rsvp policy</b>	Displays the configured local policies.
<b>show ip rsvp policy cops</b>	Displays the policy server addresses, ACL IDs, and current state of the router's TCP connections to COPS servers.
<b>show ip rsvp policy local</b>	Displays selected local policies that have been configured.
<b>tunnel mpls traffic-eng priority</b>	Configures the setup and reservation priority for an MPLS traffic engineering tunnel.

# ip rsvp policy preempt

To enable Resource Reservation Protocol (RSVP) to take bandwidth from lower-priority reservations and give it to new, higher-priority reservations, use the **ip rsvp policy preempt** command in global configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp policy preempt**

**no ip rsvp policy preempt**

**Syntax Description** This command has no arguments or keywords.

**Command Default** RSVP does not reassign bandwidth from lower-priority reservations to higher-priority reservations.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **ip rsvp policy preempt** command to enable or disable the preemption parameter for all configured local and remote policies without setting the preemption parameter for each policy individually. This command allows you to give preferential quality of service (QoS) treatment to one group of RSVP hosts or applications over another.

**Examples** The following example enables preemption:

```
Router(config)# ip rsvp policy preempt
```

The following example disables preemption:

```
Router(config)# no ip rsvp policy preempt
```

Related Commands	Command	Description
	<b>show ip rsvp policy</b>	Displays the configured local policies.

## ip rsvp pq-profile

To specify the criteria for Resource Reservation Protocol (RSVP) to use to determine which flows to direct into the priority queue (PQ) within weighted fair queuing (WFQ), use the **ip rsvp pq-profile** command in global configuration mode. To disable the specified criteria, use the **no** form of this command.

**ip rsvp pq-profile** [*voice-like* | *r'* [*b'* [*p-to-r'* | *ignore-peak-value*]]]

**no ip rsvp pq-profile**

Syntax Description		
<i>voice-like</i>		(Optional) Indicates pq-profile parameters sufficient for most voice flows. The default values for <i>r'</i> , <i>b'</i> , and <i>p-to-r'</i> are used. These values should cause all voice flows generated from Cisco IOS applications and most voice flows from other RSVP applications, such as Microsoft NetMeeting, to be directed into the PQ.
<i>r'</i>		(Optional) Indicates maximum rate of a flow in bytes per second. Valid range is from 1 to 1048576 bytes per second.
<i>b'</i>		(Optional) Indicates maximum burst of a flow in bytes. Valid range is from 1 to 8192 bytes.
<i>p-to-r'</i>		(Optional) Indicates maximum ratio of peak rate to average rate as a percentage. Valid range is from 100 to 4000 percent.
<i>ignore-peak-value</i>		(Optional) Indicates that the peak rate to average rate ratio of the flow is not evaluated when RSVP identifies flows.

Command Default	
	The default value for <i>r'</i> is 12288 bytes per second.
	The default value for <i>b'</i> is 592 bytes.
	The default value for <i>p-to-r'</i> is 110 percent.

Command Modes	
	Global configuration

Command History	Release	Modification
	12.1(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** Use this command to define the profile of RSVP flows to be placed in the PQ within the WFQ system. You can have only one profile in effect at a time. Changes to this configuration affect only new flows, not existing flows.

This command applies only on interfaces that are running RSVP and WFQ.

RSVP recognizes voice flows based upon the r, b, and p values within the flowspec of a receiver. A reserved flow is granted to the PQ as long as the flowspec parameters of a receiver meet the following default criteria:

$(r \leq r') \text{ AND } (b \leq b') \text{ AND } (p/r \leq p\text{-to-}r')$

## Examples

In the following example, voice-like flows (with the default criteria for voice) are put into the PQ:

```
Router(config)# ip rsvp pq-profile
Router(config)# ip rsvp pq-profile voice-like
Router(config)# ip rsvp pq-profile 12288 592 110
Router(config)# default ip rsvp pq-profile
Router# show running-config | include pq-profile
```

In the following example, all flows matching the voice criteria are put into the PQ:

```
Router(config)# ip rsvp pq-profile 10240 512 100
Router# show running-config | include pq-profile
```

```
ip rsvp pq-profile 10240 512 100
```

In the following example, no flows are put into the PQ:

```
Router(config)# no ip rsvp pq-profile
Router# show running-config | include pq-profile
```

```
no ip rsvp pq-profile
```

In the following example, flows with the criteria given for r' and b' and the default value for p-to-r' are put into the PQ:

```
Router(config)# ip rsvp pq-profile 9000 300
Router# show running-config | include pq-profile
```

```
ip rsvp pq-profile 9000 300 110
```

In the following example, flows with the criteria given for r' and b' and ignoring the peak value of the flow are put into the PQ:

```
Router(config)# ip rsvp pq-profile 9000 300 ignore-peak-value
Router# show running-config | include pq-profile
```

```
ip rsvp pq-profile 9000 300 ignore-peak-value
```

In the following example, Microsoft NetMeeting voice flows with G.711 or adaptive differential pulse code modulation (ADPCM) codecs are put into the PQ:

```
Router(config)# ip rsvp pq-profile 10200 1200
```

# ip rsvp precedence

To enable the router to mark the IP Precedence value of the type of service (ToS) byte for packets in a Resource Reservation Protocol (RSVP) reserved path using the specified values for packets that either conform to or exceed the RSVP flowspec, use the **ip rsvp precedence** command in interface configuration mode. To remove existing IP Precedence settings, use the **no** form of this command.

```
ip rsvp precedence { conform precedence-value | exceed precedence-value }
```

```
no ip rsvp precedence [conform | exceed]
```

## Syntax Description

**conform** *precedence-value* Specifies an IP Precedence value in the range from 0 to 7 for traffic that conforms to the RSVP flowspec. The IP Precedence value is written to the three high-order bits (bits 5 to 7) of the ToS byte in the IP header of a packet. Either the **conform** or **exceed** keyword is required; both keywords may be specified.

When used with the **no** form of the command, the **conform** keyword is optional.

**exceed** *precedence-value* Specifies an IP Precedence value in the range from 0 to 7 for traffic that exceeds the RSVP flowspec. The IP Precedence value is written to the three high-order bits (bits 5 to 7) of the ToS byte in the IP header of a packet. Either the **conform** or **exceed** keyword is required; both keywords may be specified.

When used with the **no** form of the command, the **exceed** keyword is optional.

## Command Default

The IP Precedence bits of the ToS byte are left unmodified when this command is not used. The default state is equivalent to execution of the **no ip rsvp precedence** command.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Packets in an RSVP reserved path are divided into two classes: those that conform to the reservation flowspec and those that correspond to a reservation but that exceed, or are outside, the reservation flowspec.

The **ip rsvp precedence** command allows you to set the IP Precedence values to be applied to packets belonging to these two classes. You must specify the IP Precedence value for at least one class of traffic when you use this command. You can use a single instance of the command to specify values for both classes, in which case you can specify the **conform** and **exceed** keywords in either order.

As part of its input processing, RSVP uses the **ip rsvp precedence** command to set the IP Precedence bits on conforming and nonconforming packets. If per-VC DWRED is configured, the system uses the IP Precedence and ToS bit settings on the output interface in its packet drop process. The IP Precedence setting of a packet can also be used by interfaces on downstream routers.

Execution of the **ip rsvp precedence** command causes IP Precedence values for all preexisting reservations on the interface to be modified.

**Note**

RSVP must be enabled on an interface before you can use this command; that is, use of the **ip rsvp bandwidth** command must precede use of the **ip rsvp precedence** command. RSVP cannot be configured with VIP-distributed Cisco Express Forwarding (dCEF).

RSVP receives packets from the underlying forwarding mechanism. Therefore, before you use the **ip rsvp precedence** command to set IP Precedence, one of the following features is required:

- Weighted fair queueing (WFQ) must be enabled on the interface.
- RSVP switched virtual circuits (SVCs) must be used.
- NetFlow must be configured to assist RSVP.

**Note**

Use of the **no** form of this command is not equivalent to giving the **ip rsvp precedence 0** command, which sets all precedence on the packets to 0, regardless of previous precedence setting.

**Examples**

The following example sets the IP Precedence value to 3 for all traffic on the ATM interface 0 that conforms to the RSVP flowspec and to 2 for all traffic that exceeds the flowspec:

```
interface atm0
 ip rsvp precedence conform 3 exceed 2
```

The following example sets the IP Precedence value to 2 for all traffic on ATM interface 1 that conforms to the RSVP flowspec. The IP Precedence values of those packets that exceed the flowspec are not altered in any way.

```
interface ATM1
 ip rsvp precedence conform 2
```

**Related Commands**

Command	Description
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp policy cops minimal</b>	Lowers the COPS server's load and improves latency times for messages on the governed router.
<b>ip rsvp tos</b>	Allows you to set the ToS values to be applied to packets that either conform to or exceed the RSVP flowspec.
<b>show ip rsvp</b>	Displays the IP Precedence and ToS bit values to be applied to packets that either conform to or exceed the RSVP flowspec for a given interface.

# ip rsvp qos

To enable Resource Reservation Protocol (RSVP) quality of service (QoS) flows on a router running Multiprotocol Label Switching Traffic Engineering (MPLS TE), use the **ip rsvp qos** command in global configuration mode. To disable RSVP QoS flows, use the **no** form of this command.

**ip rsvp qos**

**no ip rsvp qos**

**Syntax Description** This command has no keywords or arguments.

**Command Default** RSVP QoS flows are not enabled.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	12.2(33)SRC	This command was introduced.

**Usage Guidelines** If RSVP QoS flows and MPLS TE are enabled, the router processes and installs RSVP label-switched path (LSP) and IPv4 messages such as PATH and RESV. If RSVP QoS flows and MPLS TE are then disabled with IPv4 and LSP states installed, all installed IPv4 states are immediately cleared. LSP states remain unmodified. Further refreshes or new IPv4 RSVP messages are forwarded unmodified.

Use the **show ip rsvp** command to see the status of the **ip rsvp qos** command.

**Examples** The following example configures RSVP QoS flows on a router running MPLS TE:

```
Router(config)# ip rsvp qos
```

Related Commands	Command	Description
	<b>show ip rsvp</b>	Displays specific information for RSVP categories.

## ip rsvp reservation

To enable a router to simulate receiving Resource Reservation Protocol (RSVP) RESV messages from a downstream host, use the **ip rsvp reservation** command in global configuration mode. To disable this function, use the **no** form of this command.

```
ip rsvp reservation session-ip-address sender-ip-address {tcp | udp | ip-protocol} session-d-port
sender-s-port next-hop-ip-address next-hop-interface {ff | se | wf} {rate | load} bandwidth
burst-size [identity alias]
```

```
no ip rsvp reservation session-ip-address sender-ip-address {tcp | udp | ip-protocol}
session-d-port sender-s-port next-hop-ip-address next-hop-interface {ff | se | wf} {rate | load}
bandwidth burst-size [identity alias]
```

### Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver; for multicast sessions, this is the IP multicast address of the session.
<i>sender-ip-address</i>	IP address of the sender.
<b>tcp</b>   <b>udp</b>   <i>ip-protocol</i>	TCP, UDP, or IP protocol in the range from 0 to 255.
<i>session-d-port</i> <i>sender-s-port</i>	<i>The session-d-port</i> argument is the destination port. The <i>sender-s-port</i> argument is the source port. Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If the destination is zero, the source must be zero, and the implication is that ports are not checked. If the destination is nonzero, the source must be nonzero (except for <b>wf</b> reservations, for which the source port is always ignored and can therefore be zero).
<i>next-hop-ip-address</i>	Hostname or address of the receiver or the router closest to the receiver.
<i>next-hop-interface</i>	Next-hop interface or subinterface type and number. Interface type can be <b>ethernet</b> , <b>loopback</b> , <b>null</b> , or <b>serial</b> .
<b>ff</b>   <b>se</b>   <b>wf</b>	Reservation style: <ul style="list-style-type: none"> <li>Fixed Filter (<b>ff</b>) is single reservation.</li> <li>Shared Explicit (<b>se</b>) is shared reservation, limited scope.</li> <li>Wildcard Filter (<b>wf</b>) is shared reservation, unlimited scope.</li> </ul>
<b>rate</b>   <b>load</b>	QoS guaranteed bit rate service or controlled load service.
<i>bandwidth</i>	Average bit rate, in kbps, to reserve up to 75 percent of the total on the interface. The range is from 1 to 10000000.
<i>burst-size</i>	Maximum burst size (kbps of data in queue). The range is from 1 to 65535.
<b>identity alias</b>	(Optional) Specifies an application ID alias. An alias is a string that can have as many as 64 printable characters (in the range 0x20 to 0x7E). <p><b>Note</b> If you use the “ ” or ? characters as part of the alias or locator string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.</p>

### Command Default

The router does not simulate receiving RSVP RESV messages.

**Command Modes** Global configuration

Command History	Release	Modification
	11.2	This command was introduced.
	12.4(6)T	The optional <b>identity alias</b> keyword and argument combination was added.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Use the **ip rsvp reservation** command to make the router simulate receiving RSVP RESV messages from a downstream host and to proxy RSVP RESV messages for that host. By giving a local (loopback) next-hop address and next-hop interface, you can also use this command to proxy RSVP for the router that you are configuring or you can use the **ip rsvp reservation-host** command.

An alias must reference an RSVP identity that you created by using the **ip rsvp identity** command. The policy-locator string associated with this identity is signaled in the RESV message. This identity overrides any application ID that is contained in the matching PATH message.

If the matching PATH message has an application ID, but you have not specified an application ID using the **ip rsvp reservation** command, the RESV message will not contain an application ID. However, the RESV message proxied by the **ip rsvp listener** command does put the matching PATH message application ID into the proxied RESV message.

### Examples

The following example specifies the use of a Shared Explicit style of reservation and the controlled load service, with token buckets of 100 or 150 kbps and 60 or 65 kbytes maximum queue depth:

```
Router(config)# ip rsvp reservation 239.250.0.2 172.16.1.1 udp 20 30 172.16.4.1 Ethernet1
se load 100 60
```

```
Router(config)# ip rsvp reservation 239.250.0.2 172.16.2.1 tcp 20 30 172.16.4.1 Ethernet1
se load 150 65
```

The following example specifies the use of a Wildcard Filter style of reservation and the guaranteed bit rate service, with token buckets of 300 or 350 kbps, 60 or 65 kbytes maximum queue depth, and an application ID:

```
Router(config)# ip rsvp reservation 239.250.0.3 0.0.0.0 udp 20 0 172.16.4.1 Ethernet1 wf
rate 300 60 identity xyz
```

```
Router(config)# ip rsvp reservation 239.1.1.1 0.0.0.0 udp 20 0 172.16.4.1 Ethernet1 wf
rate 350 65 identity xyz
```

Note that the wildcard filter does not admit the specification of the sender; it accepts all senders. This action is denoted by setting the source address and port to zero. If, in any filter style, the destination port is specified to be zero, RSVP does not permit the source port to be anything else; it understands that such protocols do not use ports or that the specification applies to all ports.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp identity</b>	Defines RSVP application IDs.
<b>ip rsvp neighbor</b>	Enables a router to control who its authorized neighbors are.
<b>ip rsvp reservation-host</b>	Enables a router to simulate a host generating RSVP RESV messages.
<b>ip rsvp sender</b>	Enables a router to simulate receiving RSVP PATH messages.
<b>ip rsvp sender-host</b>	Enables a router to simulate a host generating RSVP PATH messages.
<b>show ip rsvp installed</b>	Displays RSVP-related bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp policy identity</b>	Displays selected RSVP identities in a router configuration.
<b>show ip rsvp reservation</b>	Displays RSVP RESV-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp reservation-host

To enable a router to simulate a host generating Resource Reservation Protocol (RSVP) RESV messages, use the **ip rsvp reservation-host** command in global configuration mode. To disable this function, use the **no** form of this command.

```
ip rsvp reservation-host session-ip-address sender-ip-address {tcp | udp | ip-protocol}
session-d-port sender-s-port {ff | se | wf} {rate | load} bandwidth burst-size [identity alias]
```

```
no ip rsvp reservation-host session-ip-address sender-ip-address {tcp | udp | ip-protocol}
session-d-port sender-s-port {ff | se | wf} {rate | load} bandwidth burst-size [identity alias]
```

## Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver. IP multicast addresses cannot be used with this argument. It must be a logical address configured on an interface on the router that you are configuring.
<i>sender-ip-address</i>	IP address of the sender.
<b>tcp</b>   <b>udp</b>   <i>ip-protocol</i>	TCP, UDP, or IP protocol in the range from 0 to 255.
<i>session-d-port</i> <i>sender-s-port</i>	The <i>session-d-port</i> argument is the destination port. The <i>sender-s-port</i> argument is the source port. Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If the destination is zero, the source must be zero, and the implication is that ports are not checked. If the destination is nonzero, the source must be nonzero (except for <b>wf</b> reservations, for which the source port is always ignored and can therefore be zero).
<b>ff</b>   <b>se</b>   <b>wf</b>	Reservation style: <ul style="list-style-type: none"> <li>Fixed Filter (<b>ff</b>) is single reservation.</li> <li>Shared Explicit (<b>se</b>) is shared reservation, limited scope.</li> <li>Wildcard Filter (<b>wf</b>) is shared reservation, unlimited scope.</li> </ul>
<b>rate</b>   <b>load</b>	QoS guaranteed bit rate service or controlled load service.
<i>bandwidth</i>	Average bit rate, in kbps, to reserve up to 75 percent of the total on the interface. The range is from 1 to 10000000.
<i>burst-size</i>	Maximum burst size (kbps of data in queue). The range is from 1 to 65535.
<b>identity alias</b>	(Optional) Specifies an application ID alias. An alias is a string that can have as many as 64 printable characters (in the range 0x20 to 0x7E). <p><b>Note</b> If you use the “ ” or ? characters as part of the alias or locator string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.</p>

## Command Default

The router does not simulate a host generating RSVP RESV messages.

## Command Modes

Global configuration

**Command History**

Release	Modification
12.0	This command was introduced.
12.4(6)T	The optional <b>identity alias</b> keyword and argument combination was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Use the **ip rsvp reservation-host** command to make a router simulate a host generating its own RSVP RESV messages. This command is similar to the **ip rsvp reservation** command, which can cause a router to generate RESV messages on behalf of another host. The main differences between the **ip rsvp reservation-host** and **ip rsvp reservation** commands follow:

- When you enter the **ip rsvp reservation-host** command, the *session-ip-address* argument must be a local address configured on an interface on the router. Therefore, you cannot proxy a reservation on behalf of a flow that is destined for another host. Also, you cannot use this command to generate reservation messages for multicast sessions.
- Because the message is assumed to originate from the router that you are configuring, you do not specify a next-hop or incoming interface for the RSVP RESV message when entering the **ip rsvp reservation-host** command.
- Use the **ip rsvp reservation-host** command for debugging and testing purposes because you cannot use it to proxy RSVP for non-RSVP-capable hosts or for multicast sessions.

An alias must reference an RSVP identity that you created by using the **ip rsvp identity** command. The policy-locator string associated with this identity is signaled in the RESV message. This identity overrides any application ID that is contained in the matching PATH message.

If the matching PATH message has an application ID, but you have not specified an application ID using the **ip rsvp reservation-host** command, the RESV message does not contain an application ID. However, the RESV message proxied by the **ip rsvp listener** command does put the matching PATH message application ID into the proxied RESV message.

**Examples**

The following example specifies the use of a Shared Explicit style of reservation and the controlled load service, with token buckets of 100 or 150 kbps, 60 or 65 kbps maximum queue depth, and an application ID:

```
Router(config)# ip rsvp reservation-host 10.1.1.1 10.30.1.4 udp 20 30 se load 100 60
identity xyz
```

```
Router(config)# ip rsvp reservation-host 10.40.2.2 10.22.1.1 tcp 20 30 se load 150 65
identity xyz
```

**Related Commands**

Command	Description
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp identity</b>	Defines RSVP application IDs.
<b>ip rsvp neighbor</b>	Enables a router to control who its authorized RSVP neighbors are.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving RSVP RESV messages.
<b>ip rsvp sender</b>	Enables a router to simulate receiving RSVP PATH messages.

<b>Command</b>	<b>Description</b>
<b>ip rsvp sender-host</b>	Enables a router to simulate a host generating RSVP PATH messages.
<b>show ip rsvp installed</b>	Displays RSVP-related bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp policy identity</b>	Displays selected RSVP identities in a router configuration.
<b>show ip rsvp reservation</b>	Displays RSVP RESV-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp resource-provider

To configure a resource provider for an aggregate flow, use the **ip rsvp resource-provider** command in interface configuration mode. To disable a resource provider for an aggregate flow, use the **no** form of this command.

**ip rsvp resource-provider { none | wfq interface | wfq pvc }**

**no ip rsvp resource-provider**

## Syntax Description

<b>none</b>	No resource provider specified regardless of whether one is configured on the interface.
<b>wfq interface</b>	Weighted fair queuing (WFQ) specified as the resource provider on the interface.
<b>wfq pvc</b>	WFQ specified as the resource provider on the permanent virtual circuit (PVC) or connection.

## Command Default

The **wfq interface** is the default resource provider that Resource Reservation Protocol (RSVP) configures on the interface.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(2)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(18)SXF2	This command was integrated into Cisco IOS Release 12.2(18)SXF2.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Use the **ip rsvp resource-provider** command to configure the resource provider with which you want RSVP to interact when it installs a reservation.

To ensure that a flow receives quality of service (QoS) guarantees when using WFQ on a per-flow basis, configure **wfq interface** or **wfq pvc** as the resource provider. To ensure that a flow receives QoS guarantees when using class-based weighted fair queuing (CBWFQ) for data packet processing, configure **none** as the resource provider.



### Note

Resource provider was formerly called QoS provider.

---

**Examples**

In the following example, the **ip rsvp resource-provider** command is configured with **wfq interface** or **wfq pvc** as the resource provider, ensuring that a flow receives QoS guarantees when using WFQ on a per-flow basis:

```
Router# configure terminal
Router(config)# interface atm6/0
Router(config-if)# ip rsvp resource-provider wfq pvc
```

In the following example, the **ip rsvp resource-provider** command is configured with **none** as the resource provider, ensuring that a flow receives QoS guarantees when using CBWFQ for data packet processing:

```
Router# configure terminal
Router(config)# interface atm6/0
Router(config-if)# ip rsvp resource-provider none
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

---

## ip rsvp sender

To enable a router to simulate receiving Resource Reservation Protocol (RSVP) PATH messages, use the **ip rsvp sender** command in global configuration mode. To disable this function, use the **no** form of this command.

```
ip rsvp sender session-ip-address sender-ip-address {tcp | udp | ip-protocol} session-d-port
sender-s-port previous-hop-ip-address previous-hop-interface bandwidth burst-size
[identity alias]
```

```
no ip rsvp sender session-ip-address sender-ip-address {tcp | udp | ip-protocol} session-d-port
sender-s-port previous-hop-ip-address previous-hop-interface bandwidth burst-size
[identity alias]
```

### Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver; for multicast sessions, it is the IP multicast address of the session.
<i>sender-ip-address</i>	IP address of the sender.
<b>tcp   udp   ip-protocol</b>	TCP, UDP, or IP protocol in the range from 0 to 255.
<i>session-d-port</i> <i>sender-s-port</i>	<i>The session-d-port</i> argument is the destination port. The <i>sender-s-port</i> argument is the source port. Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If the destination is zero, the source must be zero, and the implication is that ports are not checked. If the destination is nonzero, the source must be nonzero.
<i>previous-hop-ip-address</i>	Address of the sender or the router closest to the sender.
<i>previous-hop-interface</i>	Previous-hop interface or subinterface. Interface type can be <b>ethernet</b> , <b>loopback</b> , <b>null</b> , or <b>serial</b> .
<i>bandwidth</i>	Average bit rate, in kbps, to reserve up to 75 percent of the total on the interface. The range is from 1 to 10000000.
<i>burst-size</i>	Maximum burst size (kbps of data in queue). The range is from 1 to 65535.
<b>identity alias</b>	(Optional) Specifies an application ID alias. An alias is a string that can have as many as 64 printable characters (in the range 0x20 to 0x7E).  <b>Note</b> If you use the “ ” or ? characters as part of the alias or locator string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.

### Command Default

The router does not simulate receiving RSVP PATH messages.

### Command Modes

Global configuration

Command History	Release	Modification
	11.2	This command was introduced.
	12.4(6)T	The optional <b>identity alias</b> keyword and argument combination was added.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Use the **ip rsvp sender** command to make the router simulate that it is receiving RSVP PATH messages from an upstream host and to proxy RSVP PATH messages from that host. By including a local (loopback) previous-hop address and previous-hop interface, you can also use this command to proxy RSVP for the router that you are configuring.

An alias must reference an RSVP identity that you created by using the **ip rsvp identity** command. The policy-locator string associated with this identity is supplied in the PATH message.

### Examples

The following example sets up the router to act as though it is receiving RSVP PATH messages using UDP over loopback interface 1:

```
Router(config)# ip rsvp sender 239.250.0.1 172.16.2.1 udp 20 30 172.16.2.1 loopback 1 50 5
identity xyz
```

```
Router(config)# ip rsvp sender 239.250.0.2 172.16.2.1 udp 20 30 172.16.2.1 loopback 1 50 5
identity xyz
```

### Related Commands

Command	Description
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp identity</b>	Defines RSVP application IDs.
<b>ip rsvp neighbor</b>	Enables a router to control who its authorized RSVP neighbors are.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving RSVP RESV messages.
<b>ip rsvp reservation-host</b>	Enables a router to simulate a host generating RSVP RESV messages.
<b>ip rsvp sender-host</b>	Enables a router to simulate a host generating RSVP PATH messages.
<b>show ip rsvp installed</b>	Displays RSVP-related bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp policy identity</b>	Displays selected RSVP identities in a router configuration.
<b>show ip rsvp reservation</b>	Displays RSVP RESV-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

## ip rsvp sender-host

To enable a router to simulate a host generating a Resource Reservation Protocol (RSVP) PATH message, use the **ip rsvp sender-host** command in global configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp sender-host** *session-ip-address sender-ip-address* {**tcp** | **udp** | *ip-protocol*} *session-d-port sender-s-port bandwidth burst-size* [**identity alias**]

**no ip rsvp sender-host** *session-ip-address sender-ip-address* {**tcp** | **udp** | *ip-protocol*} *session-d-port sender-s-port bandwidth burst-size* [**identity alias**]

### Syntax Description

<i>session-ip-address</i>	For unicast sessions, this is the address of the intended receiver; for multicast sessions, it is the IP multicast address of the session.
<i>sender-ip-address</i>	IP address of the sender. It must be a logical address configured on an interface on the router that you are configuring.
<b>tcp</b>   <b>udp</b>   <i>ip-protocol</i>	TCP, UDP, or IP protocol in the range from 0 to 255.
<i>session-d-port</i> <i>sender-s-port</i>	<i>The session-d-port argument</i> is the destination port. <i>The sender-s-port argument</i> is the source port. Port numbers are specified in all cases, because the use of 16-bit ports following the IP header is not limited to UDP or TCP. If the destination is zero, the source must be zero, and the implication is that ports are not checked. If the destination is nonzero, the source must be nonzero.
<i>bandwidth</i>	Average bit rate, in kbps, to reserve up to 75 percent of the total on the interface. The range is from 1 to 10000000.
<i>burst-size</i>	Maximum burst size (kbps of data in queue). The range is from 1 to 65535.
<b>identity alias</b>	(Optional) Specifies an application ID alias. An alias is a string that can have as many as 64 printable characters (in the range 0x20 to 0x7E).
	<b>Note</b> If you use the “ ” or ? characters as part of the string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.

### Command Default

The router does not simulate RSVP PATH message generation.

### Command Modes

Global configuration

### Command History

Release	Modification
12.0	This command was introduced.
12.4(6)T	The optional <b>identity alias</b> keyword and argument combination was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Use the **ip rsvp sender-host** command to make a router simulate a host generating its own RSVP PATH messages. This command is similar to the **ip rsvp sender** command, which can cause a router to generate RSVP PATH messages on behalf of another host. The main differences between the **ip rsvp sender-host** and **ip rsvp sender** commands follow:

- When you enter the **ip rsvp sender-host** command, the *sender-ip-address* argument must be a local address configured on an interface of the router.
- Because the message is assumed to originate from the router that you are configuring, you do not specify a previous-hop or incoming interface for the RSVP PATH message when entering the **ip rsvp sender-host** command.
- Use the **ip rsvp sender-host** command for debugging and testing purposes because you cannot use it to proxy RSVP for non-RSVP-capable hosts.

An alias must reference an RSVP identity that you created by using the **ip rsvp identity** command. The policy-locator string associated with this identity is signaled in the RESV message. This identity overrides any application ID that is contained in the matching PATH message.

**Examples**

The following example sets up the router to act like a host that sends traffic to the given address:

```
Router(config)# ip rsvp sender-host 10.0.0.7 10.0.0.1 udp 1 1 10 10 identity xyz
```

**Related Commands**

Command	Description
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp identity</b>	Defines RSVP application IDs.
<b>ip rsvp neighbor</b>	Enables a router to control who its authorized neighbors are.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving RSVP RESV messages.
<b>ip rsvp reservation-host</b>	Enables a router to simulate a host generating RSVP RESV messages.
<b>ip rsvp sender</b>	Enables a router to simulate receiving RSVP PATH messages.
<b>show ip rsvp installed</b>	Displays RSVP-related bandwidth information.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.
<b>show ip rsvp policy identity</b>	Displays selected RSVP identities in a router configuration.
<b>show ip rsvp reservation</b>	Displays RSVP RESV-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP PATH-related sender information currently in the database.

# ip rsvp signalling dscp

To specify the differentiated services code point (DSCP) value to be used on all Resource Reservation Protocol (RSVP) messages transmitted on an interface, use the **ip rsvp signalling dscp** command in interface configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp signalling dscp** *value*

**no ip rsvp signalling dscp**

## Syntax Description

*value* A number for the DSCP. Range is from 0 to 63. Default is 0.

## Command Default

The default value is 0.

## Command Modes

Interface configuration.

## Command History

Release	Modification
12.1	This command was introduced
12.2(18)SXF2	This command was integrated into Cisco IOS Release 12.2(18)SXF2.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

You configure the DSCP per interface, not per flow. The DSCP determines the priority that a packet receives from various hops as it travels to its destination.

The DSCP applies to all RSVP flows installed on a specific interface. You can configure each interface independently for DSCP.

## Examples

Here is an example of the **ip rsvp signalling dscp** command with a DSCP value of 6

```
Router(config-if)# ip rsvp signalling dscp 6
Router(config-if)# end
```

To verify the DSCP value, enter the **show ip rsvp interface detail** command:

```
Router# show ip rsvp interface serial12/0 detail

Se2/0:
  Bandwidth:
    Curr allocated:10K bits/sec
    Max. allowed (total):1536K bits/sec
    Max. allowed (per flow):1536K bits/sec
  Neighbors:
    Using IP enacp:1. Using UDP encaps:0
  DSCP value used in Path/Resv msgs:0x6
  Burst Police Factor:300%
  RSVP:Data Packet Classification provided by: none
```

# ip rsvp signalling fast-local-repair notifications

To configure the number of per flow notifications that Resource Reservation Protocol (RSVP) processes during a fast local repair (FLR) procedure before suspending, use the **ip rsvp signalling fast-local-repair notifications** command in global configuration mode. To set the number of notifications to its default, use the **no** form of this command.

**ip rsvp signalling fast-local-repair notifications** *number*

**no ip rsvp signalling fast-local-repair notifications**

## Syntax Description

<i>number</i>	Total number of notifications to be sent. The range is 10 to 10000. The default is 1000.
---------------	--

## Command Default

There are always notifications sent by the routing information base (RIB) and processed by RSVP. If this command is not configured, RSVP processes 1000 notifications, suspends, then resumes processing of another 1000 notifications, and so on.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(33)SRB	This command was introduced.

## Usage Guidelines

Upon a route change, RIB builds a list of notifications, one per affected flow, and notifies RSVP by sending an event including these notifications. Therefore, these events can contain thousands of elements depending on the number of path state blocks (PSBs) affected.

RSVP processes, by default, 1000 notifications at a time and then suspends if required, to prevent the CPU from being overwhelmed. However, you can configure this number using the **ip rsvp signalling fast-local-repair notifications** command.

## Examples

The following example configures the number of flows that are repaired before RSVP suspends to 100:

```
Router(config)# ip rsvp signalling fast-local-repair notifications 100
```

## Related Commands

Command	Description
<b>ip rsvp signalling fast-local-repair rate</b>	Configures the repair rate that RSVP uses for an FLR procedure.

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling fast-local-repair wait-time</b>	Configures the delay that RSVP uses to start an FLR procedure.
<b>show ip rsvp signalling fast-local-repair</b>	Displays FLR-specific information maintained by RSVP.

# ip rsvp signalling fast-local-repair rate

To configure the repair rate that Resource Reservation Protocol (RSVP) uses for a fast local repair (FLR) procedure, use the **ip rsvp signalling fast-local-repair rate** command in global configuration mode. To set the repair rate to its default, use the **no** form of this command.

**ip rsvp signalling fast-local-repair rate** *rate*

**no ip rsvp signalling fast-local-repair rate**

## Syntax Description

<i>rate</i>	FLR rate for PATH state refresh and repair, in messages per second (msg/sec). The range is 0 to 5000. The default is 400.
-------------	---

## Command Default

If this command is not configured, the RSVP message pacing rate is used.



### Note

The RSVP message pacing rate is enabled by default in Cisco IOS Release 12.2 and later.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(33)SRB	This command was introduced.

## Usage Guidelines

The default repair rate is based on the RSVP message pacing rate.

If you configure the FLR rate by using the **ip rsvp signalling fast-local-repair rate** command, and RSVP message pacing is enabled, the minimum between the FLR rate and the RSVP message pacing rate takes effect. If you disable the RSVP rate limit by using the **no ip rsvp signalling rate-limit** command, then the FLR rate is used. However, if you disable the RSVP rate limit and do not configure an FLR rate, then RSVP performs no message pacing and messages are sent back-to-back. This action is not recommended because the point of local repair (PLR) may flood the downstream node with PATH messages causing some of them to be dropped.

The repair rate is determined at notification time, and this same rate is used during the time of the repair even if you change either the RSVP message pacing rate or the FLR rate during this time.

## Examples

The following example configures a repair rate of 100 messages per second:

```
Router(config)# ip rsvp signalling fast-local-repair rate 100
```

Related Commands	Command	Description
	<b>ip rsvp signalling fast-local-repair notifications</b>	Configures the number of notifications that are processed before RSVP suspends.
	<b>ip rsvp signalling fast-local-repair wait-time</b>	Configures the delay used to start an FLR procedure.
	<b>ip rsvp signalling rate-limit</b>	Controls the transmission rate for RSVP messages sent to a neighboring router during a specified amount of time.

# ip rsvp signalling fast-local-repair wait-time

To configure the delay that Resource Reservation Protocol (RSVP) uses before starting a fast local repair (FLR) procedure, use the **ip rsvp signalling fast-local-repair wait-time** command in interface configuration mode. To set the delay to its default, use the **no** form of this command.

**ip rsvp signalling fast-local-repair wait-time** *interval*

**no ip rsvp signalling fast-local-repair wait-time**

<b>Syntax Description</b>	<i>interval</i>	Amount of time before an FLR procedure begins, in milliseconds (ms). The range is 0 to 5000 ms. The default is 0.
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<b>Command Default</b>	This command is disabled by default; therefore, no delay is configured.
------------------------	---

<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(33)SRB	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>ip rsvp signalling fast-local-repair wait-time</b> command to configure the delay desired in starting an FLR procedure. If you do not configure a delay, then path refreshes are triggered immediately after RSVP receives a route change notification from the routing information base (RIB).
-------------------------	--

<b>Examples</b>	The following example configures a delay of 100 ms: <pre>Router(config-if)# ip rsvp signalling fast-local-repair wait-time 100</pre>
-----------------	---

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip rsvp signalling fast-local-repair notifications</b>	Configures the number of notifications that are processed before RSVP suspends.
	<b>ip rsvp signalling fast-local-repair rate</b>	Configures the repair rate that RSVP uses for an FLR procedure.

# ip rsvp signalling hello (configuration)

To enable Hello globally on the router, use the **ip rsvp signalling hello** command in global configuration mode. To disable Hello globally on the router, use the **no** form of this command.

**ip rsvp signalling hello**

**no ip rsvp signalling hello**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Global configuration

## Command History

Release	Modification
12.0(22)S	This command was introduced.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

## Usage Guidelines

To enable Hello globally on the router, you must enter this command. You also must enable Hello on the interface.

## Examples

In the following example, Hello is enabled globally on the router:

```
Router(config)# ip rsvp signalling hello
```

## Related Commands

Command	Description
<b>ip rsvp signalling hello (interface)</b>	Enables Hello on an interface where you need Fast Reroute protection.
<b>ip rsvp signalling hello statistics</b>	Enables Hello statistics on the router.

# ip rsvp signalling hello (interface)

To enable Hello on an interface where you need Fast Reroute protection, use the **ip rsvp signalling hello** command in interface configuration mode. To disable Hello on an interface where you need Fast Reroute protection, use the **no** form of this command

**ip rsvp signalling hello**

**no ip rsvp signalling hello**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Interface configuration

## Command History

Release	Modification
12.0(22)S	This command was introduced.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

## Usage Guidelines

You must configure Hello globally on the router and on the specific interface.

## Examples

In the following example, Hello is enabled on an interface:

```
Router(config-if)# ip rsvp signalling hello
```

## Related Commands

Command	Description
<b>ip rsvp signalling hello (configuration)</b>	Enables Hello globally on the router.
<b>ip rsvp signalling hello dscp</b>	Sets the DSCP value that is in the IP header of the Hello messages sent out from the interface.
<b>ip rsvp signalling hello refresh misses</b>	Specifies how many Hello acknowledgments a node can miss in a row before the node considers that communication with its neighbor is down.
<b>ip rsvp signalling hello refresh interval</b>	Configures the Hello request interval.

# ip rsvp signalling hello dscp

To set the differentiated services code point (DSCP) value that is in the IP header of a Resource Reservation Protocol (RSVP) traffic engineering (TE) hello message sent from an interface, use the **ip rsvp signalling hello dscp** command in interface configuration mode. To set the DSCP value to its default, use the **no** form of this command.

**ip rsvp signalling hello [fast-reroute] dscp *num***

**no ip rsvp signalling hello [fast-reroute] dscp**

Syntax Description	fast-reroute	(Optional) Initiates Fast Reroute capability.
	<i>num</i>	DSCP value. Valid values are from 0 to 63.

**Command Default** The default DSCP value is 48.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.0(29)S	The optional <b>fast-reroute</b> keyword was added.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

**Usage Guidelines** If a link is congested, it is recommended that you set the DSCP to a value higher than 0 to reduce the likelihood that hello messages will be dropped.

You configure the DSCP per interface, not per flow.

The DSCP applies to the RSVP hellos created on a specific interface. You can configure each interface independently for DSCP.

If you issue the **ip rsvp signalling hello dscp** command without the optional **fast-reroute** keyword, the command applies to Fast Reroute hellos. This command is provided for backward compatibility; however, we recommend that you use the **ip rsvp signalling hello fast-reroute dscp** command.

**Examples** In the following example, hello messages sent from this interface have a DSCP value of 30 and Fast Reroute capability is enabled by specifying the **fast-reroute** keyword:

```
Router(config-if)# ip rsvp signalling hello fast-reroute dscp 30
```

In the following example, hello messages sent from this interface have a DSCP value of 30 and Fast Reroute capability is enabled by default:

```
Router(config-if)# ip rsvp signalling hello dscp 30
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello (interface)</b>	Enables hellos on an interface where you need Fast Reroute protection.
<b>ip rsvp signalling hello refresh interval</b>	Sets the hello refresh interval in hello messages.
<b>ip rsvp signalling hello reroute refresh misses</b>	Sets the missed refresh limit in hello messages.

# ip rsvp signalling hello graceful-restart dscp

To set the differentiated services code point (DSCP) value that is in the IP header of a Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hello message, use the **ip rsvp signalling hello graceful-restart dscp** command in global configuration mode. To set the DSCP value to its default, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart dscp** *num*

**no ip rsvp signalling hello graceful-restart dscp**

<b>Syntax Description</b>	<i>num</i>	DSCP value. Valid values are from 0 to 63.
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<b>Command Default</b>	The default DSCP value is 48.
------------------------	-------------------------------

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

<b>Usage Guidelines</b>	<p>If a link is congested, set the DSCP to a value higher than 0 to reduce the likelihood that hello messages get dropped.</p> <p>The DSCP applies to the RSVP hellos created on a specific router. You can configure each router independently for the DSCP.</p>
-------------------------	---

<b>Examples</b>	<p>In the following example, hello messages have a DSCP value of 30:</p> <pre>Router(config)# ip rsvp signalling hello graceful-restart dscp 30</pre>
-----------------	---

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip rsvp signalling hello graceful-restart refresh interval</b>	Sets the hello request interval in graceful restart hello messages.
	<b>ip rsvp signalling hello graceful-restart refresh misses</b>	Sets the missed refresh limit in graceful restart hello messages.

# ip rsvp signalling hello graceful-restart mode

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart capability on a Route Processor (RP), use the **ip rsvp signalling hello graceful-restart mode** command in global configuration mode. To disable graceful restart capability, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart mode {help-neighbor | full}**

**no ip rsvp signalling hello graceful-restart mode**

Syntax Description	help-neighbor	full
	Enables support for a neighboring router to restart after a failure.	Enables support for a router to perform self recovery or to help a neighbor restart after a failure.

**Command Default** Graceful restart is disabled until you issue this command.

**Command Modes** Global configuration

Command History	Release	Modification
	12.0(29)S	This command was introduced as <b>ip rsvp signalling hello graceful-restart mode help-neighbor</b> .
	12.2(33)SRA	The <b>full</b> keyword was added. This command replaces the as <b>ip rsvp signalling hello graceful-restart mode help-neighbor</b> command.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** Use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command to enable support capability for a neighboring router to restart after a failure.

Use the **ip rsvp signalling hello graceful-restart mode full** command to enable support capability for a router to begin self recovery or help its neighbor to restart on platforms that support stateful switchover (SSO), such as Cisco 7600 series routers, provided that you have installed and configured a standby RP.

**Examples** In the following example, an RP is configured with support capability to perform self recovery after a failure:

```
Router(config)# ip rsvp signalling hello graceful-restart mode full
```

Related Commands	Command	Description
	<b>ip rsvp signalling hello graceful-restart dscp</b>	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.
	<b>ip rsvp signalling hello graceful-restart neighbor</b>	Enables RSVP-TE graceful restart support capability on a neighboring router.
	<b>ip rsvp signalling hello graceful-restart refresh interval</b>	Sets the value to control the request interval in graceful restart hello messages.
	<b>ip rsvp signalling hello graceful-restart refresh misses</b>	Sets the value to control the missed refresh limit in graceful restart hello messages.
	<b>show ip rsvp hello graceful-restart</b>	Displays information about RSVP-TE graceful restart hello messages.

# ip rsvp signalling hello graceful-restart mode help-neighbor



## Note

Effective with Cisco IOS Release 12.2(33)SRA, the **ip rsvp signalling hello graceful-restart mode help-neighbor** command is replaced by the **ip rsvp signalling hello graceful-restart mode** command. See the **ip rsvp signalling hello graceful-restart mode** command for more information.

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart capability on a neighboring router, use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command in global configuration mode. To disable graceful restart capability, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart mode help-neighbor**

**no ip rsvp signalling hello graceful-restart mode help-neighbor**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Graceful restart is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was replaced by the <b>ip rsvp signalling hello graceful-restart mode</b> command.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp signalling hello graceful-restart mode help-neighbor** command to restart a neighboring router.

## Examples

In the following example, graceful restart is enabled:

```
Router(config)# ip rsvp signalling hello graceful-restart mode help-neighbor
```

## Related Commands

Command	Description
<b>ip rsvp signalling hello graceful-restart dscp</b>	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.

---

<b>ip rsvp signalling hello graceful-restart refresh interval</b>	Sets the value to control the request interval in graceful restart hello messages.
<b>ip rsvp signalling hello graceful-restart refresh misses</b>	Sets the value to control the missed refresh limit in graceful restart hello messages.

---

# ip rsvp signalling hello graceful-restart neighbor

To enable Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart capability on a neighboring router, use the **ip rsvp signalling hello graceful-restart neighbor** command in interface configuration mode. To disable graceful restart capability, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart neighbor** *ip-address*

**no ip rsvp signalling hello graceful-restart neighbor** *ip-address*

## Syntax Description

<i>ip-address</i>	IP address of a neighbor on a given interface.
-------------------	--

## Command Default

No neighboring routers have graceful restart capability enabled until you issue this command.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **ip rsvp signalling hello graceful-restart neighbor** command to enable support for graceful restart on routers helping their neighbors recover TE tunnels following stateful switchover (SSO).



### Note

You must issue this command on every interface of the neighboring router that you want to help restart.

## Examples

The following example configures graceful restart on POS interface 1/0/0 of a neighboring router with the IP address 10.0.0.1:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface POS1/0/0
Router(config-if)# ip rsvp signalling hello graceful-restart neighbor 10.0.0.1
```

## Related Commands

Command	Description
<b>ip rsvp signalling hello graceful-restart mode</b>	Enables RSVP-TE graceful restart support capability on an RP.
<b>show ip rsvp hello graceful-restart</b>	Displays information about RSVP-TE graceful restart hello messages.

# ip rsvp signalling hello graceful-restart refresh interval

To configure the Resource Reservation Protocol (RSVP) traffic engineering (TE) refresh interval in graceful restart hello messages, use the **ip rsvp signalling hello graceful-restart refresh interval** command in global configuration mode. To set the interval to its default value, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart refresh interval** *interval-value*

**no ip rsvp signalling hello graceful-restart refresh interval**

## Syntax Description

<i>interval-value</i>	Frequency, in milliseconds (ms), at which a node sends hello messages to a neighbor. Valid values are from 1000 to 30000.
-----------------------	---

## Command Default

1000 milliseconds (10 seconds)

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

A node periodically generates a hello message that contains a Hello Request object for all its neighbors. The frequency of those hello messages is determined by the hello interval.



### Note

If you change the default value for this command and you are also using the **ip rsvp signalling refresh interval** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh interval** command is less than the value for the **ip rsvp signalling refresh interval** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling refresh interval** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh interval** command.

## Examples

In the following example, hello requests are sent to a neighbor every 5000 ms:

```
Router(config)# ip rsvp signalling hello graceful-restart refresh interval 5000
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello graceful-restart dscp</b>	Sets the DSCP value in the IP header of a RSVP TE graceful restart hello message.
<b>ip rsvp signalling hello graceful-restart refresh misses</b>	Sets the missed refresh limit in graceful restart hello messages.
<b>ip rsvp signalling refresh interval</b>	Specifies the interval between sending refresh messages for each RSVP state.

# ip rsvp signalling hello graceful-restart refresh misses

To specify how many sequential Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hello acknowledgments (ACKs) a node can miss before the node considers communication with its neighbor lost, use the **ip rsvp signalling hello graceful-restart refresh misses** command in global configuration mode. To return the missed refresh limit to its default value, use the **no** form of this command.

**ip rsvp signalling hello graceful-restart refresh misses** *msg-count*

**no ip rsvp signalling hello graceful-restart refresh misses**

<b>Syntax Description</b>	<i>msg-count</i>	The number of sequential hello acknowledgments (ACKs) that a node can miss before RSVP considers the state expired and tears it down. Valid values are from 4 to 10.
---------------------------	------------------	--

**Command Default** The default number of sequential hello acknowledgments is 4.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH

**Usage Guidelines** A hello message comprises a hello message, a Hello Request object, and a Hello ACK object. Each request is answered by an acknowledgment. If a link is congested or a router has a heavy load, set this number to a value higher than the default value to ensure that hello does not falsely declare that a neighbor is down.



**Note**

If you change the default value for this command and you are also using the **ip rsvp signalling hello refresh misses** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh misses** command is less than the value for the **ip rsvp signalling hello refresh misses** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling hello refresh misses** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh misses** command.

**Examples** In the following example, if the node does not receive five sequential hello acknowledgments, the node declares that its neighbor is down:

```
Router(config)# ip rsvp signalling hello graceful-restart refresh misses 5
```

Related Commands	Command	Description
	<b>ip rsvp signalling hello graceful-restart dscp</b>	Sets the DSCP value in graceful restart hello messages.
	<b>ip rsvp signalling hello graceful-restart refresh interval</b>	Sets the refresh interval in graceful restart hello messages.
	<b>ip rsvp signalling refresh misses</b>	Specifies the number of successive refresh messages that can be missed before RSVP removes a state from the database.
	<b>ip rsvp signalling hello refresh misses</b>	Specifies how many Hello acknowledgments a node can miss in a row before the node considers that communication with its neighbor is down.

# ip rsvp signalling hello refresh interval

To configure the Resource Reservation Protocol (RSVP) traffic engineering (TE) hello refresh interval, use the **ip rsvp signalling hello refresh interval** command in interface configuration mode. To set the refresh interval to its default value, use the **no** form of this command.

**ip rsvp signalling hello** [**fast-reroute**] **refresh interval** *interval-value*

**no ip rsvp signalling hello** [**fast-reroute**] **refresh interval**

## Syntax Description

<b>fast-reroute</b>	(Optional) Initiates Fast Reroute capability.
<i>interval-value</i>	Frequency, in milliseconds (msec), at which a node sends hello messages to a neighbor. Valid values are from 1000 to 30000 (1 to 30 seconds).
<b>Note</b>	We recommend that you configure a value greater than 200 msec to avoid a hello message falsely detecting a neighbor down event and triggering Fast Reroute unnecessarily.

## Command Default

The default *frequency* at which a node sends hello messages to a neighbor is 1000 milliseconds (10 seconds).

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(22)S	This command was introduced.
12.0(29)S	The optional <b>fast-reroute</b> keyword was added.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

## Usage Guidelines

You can configure the hello request interval on a per-interface basis. A node periodically generates a hello message containing a Hello Request object for each neighbor whose status is being tracked. The frequency of those hello messages is determined by the hello interval.

If you issue the **ip rsvp signalling hello refresh interval** command without the optional **fast-reroute** keyword, the command applies to Fast Reroute hellos. This command is provided for backward compatibility; however, we recommend that you use the **ip rsvp signalling hello fast-reroute refresh interval** command.

## Examples

In the following example, hello requests are sent to a neighbor every 5000 milliseconds and Fast Reroute capability is enabled by specifying the **fast-reroute** keyword:

```
Router(config-if)# ip rsvp signalling hello fast-reroute refresh interval 5000
```

In the following example, hello requests are sent to a neighbor every 5000 milliseconds and Fast Reroute capability is enabled by default:

```
Router(config-if)# ip rsvp signalling hello refresh interval 5000
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello dscp</b>	Sets the DSCP value in hello messages.
<b>ip rsvp signalling hello graceful-restart fresh interval</b>	Sets the refresh interval in graceful restart hello messages.
<b>ip rsvp signalling hello reroute refresh misses</b>	Sets the missed refresh limit in hello messages.

# ip rsvp signalling hello refresh misses

To specify how many Resource Reservation Protocol (RSVP) traffic engineering (TE) hello acknowledgments a node can miss in a row before the node considers that communication with its neighbor is down, use the **ip rsvp signalling hello refresh misses** command in interface configuration mode. To return the missed refresh limit to its default value, use the **no** form of this command.

**ip rsvp signalling hello** [**fast-reroute**] **refresh misses** *msg-count*

**no ip rsvp signalling hello** [**fast-reroute**] **refresh misses**

Syntax Description	fast-reroute	(Optional) Initiates Fast Reroute capability.
	<i>msg-count</i>	Number of sequential hello acknowledgments that a node can miss before RSVP considers the state expired and tears it down. Valid values are from 4 to 10.

**Command Default** The default *number of sequential hello acknowledgments* is 4.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.0(29)S	The optional <b>fast-reroute</b> keyword was added.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

**Usage Guidelines** A hello comprises a hello message, a Hello Request object, and a Hello ACK object. Each request is answered by an acknowledgment. If a link is very congested or a router has a very heavy load, set this number to a value higher than the default value to ensure that hello does not falsely declare that a neighbor is down.

If you issue the **ip rsvp signalling hello refresh misses** command without the optional **fast-reroute** keyword, the command applies to Fast Reroute hellos and Fast Reroute capability is enabled by default. This command is provided for backward compatibility; however, we recommend that you use the **ip rsvp signalling hello fast-reroute refresh misses** command.

**Examples** In the following example, if the node does not receive five hello acknowledgments in a row, the node declares that its neighbor is down and Fast Reroute is enabled by specifying the **fast-reroute** keyword:

```
Router(config-if)# ip rsvp signalling hello fast-reroute refresh misses 5
```

In the following example, if the node does not receive five hello acknowledgments in a row, the node declares that its neighbor is down and Fast Reroute is enabled by default:

```
Router(config-if)# ip rsvp signalling hello refresh misses 5
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello dscp</b>	Sets the DSCP value in hello messages.
<b>ip rsvp signalling hello refresh interval</b>	Sets the refresh interval in hello messages.

# ip rsvp signalling hello reroute dscp

To set the differentiated services code point (DSCP) value that is in the IP header of a Resource Reservation Protocol (RSVP) traffic engineering (TE) reroute hello (for state timeout) message sent from an interface, use the **ip rsvp signalling hello reroute dscp** command in interface configuration mode. To set the DSCP value to its default, use the **no** form of this command.

**ip rsvp signalling hello reroute dscp** *num*

**no ip rsvp signalling hello reroute dscp**

<b>Syntax Description</b>	<i>num</i>	DSCP value. Valid values are from 0 to 63.
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<b>Command Default</b>	The default DSCP value is 48.
------------------------	-------------------------------

<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

<b>Usage Guidelines</b>	<p>If a link is congested, you should set the DSCP to a value higher than 0 to reduce the likelihood that hello messages get dropped.</p> <p>You configure the DSCP per interface, not per flow.</p> <p>The DSCP applies to the RSVP hellos created on a specific interface. You can configure each interface independently for DSCP.</p>
-------------------------	---

<b>Examples</b>	In the following example, hello messages sent from this interface have a DSCP value of 30:
-----------------	--

```
Router(config-if)# ip rsvp signalling hello reroute dscp 30
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip rsvp signalling hello reroute refresh interval</b>	Sets the hello request interval in reroute hello messages.
<b>ip rsvp signalling hello reroute refresh misses</b>	Sets the missed refresh limit in reroute hello messages.	

# ip rsvp signalling hello reroute refresh interval

To configure the Resource Reservation Protocol (RSVP) Traffic Engineering (TE) reroute hello (for state timeout) refresh interval, use the **ip rsvp signalling hello reroute refresh interval** command in interface configuration mode. To set the refresh interval to its default value, use the **no** form of this command.

**ip rsvp signalling hello reroute** [**fast-reroute**] **refresh interval** *interval-value*

**no ip rsvp signalling hello reroute** [**fast-reroute**] **refresh interval**

## Syntax Description

<b>fast-reroute</b>	(Optional) Initiates Fast Reroute capability.
<i>interval-value</i>	Frequency, in milliseconds, at which a node sends hello messages to a neighbor. Valid values are from 1000 to 30000 (1 to 30 seconds).

## Command Default

The default *frequency* at which a node sends hello messages to a neighbor is 1000 milliseconds (10 seconds).

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

You can configure the hello request interval on a per-interface basis. A node periodically generates a hello message containing a Hello Request object for each neighbor whose status is being tracked. The frequency of those hello messages is determined by the hello interval. For some routers, if you set the interval to a value less than the default value, CPU usage may be high.

## Examples

In the following example, hello requests are sent to a neighbor every 5000 milliseconds and Fast Reroute capability is enabled by specifying the **fast-reroute** keyword:

```
Router(config-if)# ip rsvp signalling hello fast-reroute refresh interval 5000
```

In the following example, hello requests are sent to a neighbor every 5000 milliseconds and Fast Reroute capability is enabled by default:

```
Router(config-if)# ip rsvp signalling hello reroute refresh interval 5000
```

■ ip rsvp signalling hello reroute refresh interval

---

**Related Commands**

---

**Command**

---

**Description**

---

**ip rsvp signalling hello  
reroute refresh misses** Sets the missed refresh limit in reroute hello messages.

---

# ip rsvp signalling hello reroute refresh misses

To specify how many Resource Reservation Protocol (RSVP) traffic engineering (TE) reroute hello (for state timeout) acknowledgments (ACKs) a node can miss in a row before the node considers communication with its neighbor is down, use the **ip rsvp signalling hello reroute refresh misses** command in interface configuration mode. To return the missed refresh limit to its default value, use the **no** form of this command.

**ip rsvp signalling hello reroute refresh misses** *msg-count*

**no ip rsvp signalling hello reroute refresh misses**

<b>Syntax Description</b>	<i>msg-count</i>	The number of sequential hello acknowledgments (ACKs) that a node can miss before RSVP considers the state expired and tears it down. Valid values are from 4 to 10.
---------------------------	------------------	--

**Command Default** The default is 4.

**Command Modes** Interface configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** A hello comprises a hello message, a Hello Request object, and a Hello ACK object. Each request is answered by an acknowledgment. If a link is very congested or a router has a very heavy load, set this number to a value higher than the default value to ensure that hello does not falsely declare that a neighbor is down.

**Examples** In the following example, if the node does not receive five hello acknowledgments in a row, the node declares that its neighbor is down:

```
Router(config-if)# ip rsvp signalling hello reroute refresh misses 5
```

Related Commands	Command	Description
	<b>ip rsvp signalling hello reroute dscp</b>	Sets the DSCP value in reroute hello messages.
	<b>ip rsvp signalling hello reroute refresh interval</b>	Sets the refresh interval in reroute hello messages.

# ip rsvp signalling hello statistics

To enable Hello statistics on the router, use the **ip rsvp signalling hello statistics** command in global configuration mode. To disable Hello statistics on the router, use the **no** form of this command.

**ip rsvp signalling hello statistics**

**no ip rsvp signalling hello statistics**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Global configuration

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

**Examples** In the following example, Hello statistics are enabled on the router.

```
Router(config)# ip rsvp signalling hello statistics
```

Related Commands	Command	Description
	<b>clear ip rsvp hello instance statistics</b>	Clears Hello statistics for an instance.
	<b>ip rsvp signalling hello (configuration)</b>	Enables Hello globally on the router.
	<b>show ip rsvp hello statistics</b>	Displays how long Hello packets have been in the Hello input queue.

## ip rsvp signalling initial-retransmit-delay

To configure the minimum amount of time that a Resource Reservation Protocol (RSVP)-configured router waits for an acknowledgment (ACK) message before retransmitting the same message, use the **ip rsvp signalling initial-retransmit-delay** command in global configuration mode. To reset the delay value to its default, use the **no** form of this command.

**ip rsvp signalling initial-retransmit-delay** *delay-value*

**no ip rsvp signalling initial-retransmit-delay**

<b>Syntax Description</b>	<i>delay-value</i>	Minimum amount of time that a router waits for an ACK message before the first retransmission of the same message. The delay value ranges from 500 to 30,000 milliseconds (ms).
---------------------------	--------------------	---

**Defaults** The default value is 1000 ms (1.0 sec).

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **ip rsvp signalling initial-retransmit-delay** command to configure the minimum amount of time that a router waits for an ACK message before retransmitting the same message.

If an ACK is not received for a state, the first retransmit occurs after the initial retransmit interval. If no ACK is received after the first retransmit, a second retransmit occurs. The message continues to be retransmitted, with the gap between successive retransmits being twice the previous interval, until an ACK is received. Then the message drops into normal refresh schedule if it needs to be refreshed (Path and Resv messages), or is processed (Error or Tear messages). If no ACK is received after five retransmits, the message is discarded as required.

**Examples** The following command shows how to set the initial-retransmit-delay to 2 seconds:

```
Router(config)# ip rsvp signalling initial-retransmit-delay 2000
```

The following command shows how to reset the initial-retransmit-delay to the default (1.0 sec):

```
Router(config)# no ip rsvp signalling initial-retransmit-delay
```

# ip rsvp signalling patherr state-removal

To reduce the amount of Resource Reservation Protocol (RSVP) traffic messages in a network, use the **ip rsvp signalling patherr state-removal** command in global configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp signalling patherr state-removal** [**neighbor** *acl*]

**no ip rsvp signalling patherr state-removal**

Syntax Description	neighbor	(Optional) Adjacent routers that are part of a particular traffic engineering tunnel.
	<i>acl</i>	(Optional) A simple access list with values from 1 to 99.

**Defaults** Disabled

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **ip rsvp signalling patherr state-removal** command to allow routers to delete Path state automatically when forwarding a PathError message, thereby eliminating the need for a subsequent PathTear message.

This command is most effective when all network nodes support this feature. All nodes need to have the latest version of Cisco IOS software configured.

This command applies only to label-switched path (LSP) flows.

**Examples** The following command shows how to enable **ip rsvp signalling patherr state-removal**:

```
Router(config)# ip rsvp signalling patherr state-removal
```

The following command shows how to disable **ip rsvp signalling patherr state-removal**:

```
Router(config)# no ip rsvp signalling patherr state-removal
```

The following command shows how to enable **ip rsvp signalling patherr state-removal** based on an access control list (ACL):

```
Router(config)# ip rsvp signalling patherr state-removal neighbor 98
```

The following command shows how to disable **ip rsvp signalling patherr state-removal** based on an ACL:

```
Router(config)# no ip rsvp signalling patherr state-removal neighbor 98
```

# ip rsvp signalling rate-limit

To control the transmission rate for Resource Reservation Protocol (RSVP) messages sent to a neighboring router during a specified amount of time, use the **ip rsvp signalling rate-limit** command in global configuration mode. To disable this function, use the **no** form of this command.

## Syntax for T Releases

```
ip rsvp signalling rate-limit [burst] [max-size] [period]
```

```
no ip rsvp signalling rate-limit
```

## Syntax for 12.0S and 12.2S Releases

```
ip rsvp signalling rate-limit [burst] [limit] [max-size] [period]
```

```
no ip rsvp signalling rate-limit
```

Syntax Description	Parameter	Description
	<i>burst</i>	(Optional) Maximum number of RSVP messages allowed to be sent to a neighboring router during this interval. The range is from 1 to 5000. The default is 8.
	<i>limit</i>	(Optional) Maximum number of messages to send per queue interval. The range is from 1 to 5000. The default is 37.
	<i>max-size</i>	(Optional) Maximum size of the message queue, in bytes. The range is from 1 to 5000. The default is 2000.
	<i>period</i>	(Optional) Length of the interval (time frame) in milliseconds (ms). The range is from 10 to 5000. The default is 20.

**Command Default** This command is disabled by default; therefore, no messages are sent.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(13)T	This command was changed from <b>ip rsvp msg-pacing</b> to <b>ip rsvp signalling rate-limit</b> .
	12.0(24)S	The <i>limit</i> argument was added and this command was integrated into Cisco IOS Release 12.0(24)S.
	12.0(29)S	The <i>burst</i> and <i>max-size</i> defaults were increased to 8 messages and 2000 bytes, respectively.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(18)SXF5	This command was integrated into Cisco IOS Release 12.2(18)SXF5.
	12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

---

**Usage Guidelines**

Use the **ip rsvp signalling rate-limit** command to prevent a burst of RSVP traffic engineering signaling messages from overflowing the input queue of a receiving router, which would cause the router to drop some messages. Dropped messages substantially delay the completion of signaling.

This command replaces the **ip rsvp msg-pacing** command.

---

**Examples**

The following command shows how every 10 ms 6 messages with a message queue of 500 bytes are sent to any neighboring router:

```
Router(config)# ip rsvp signalling rate-limit 10 6 500
```

---

**Related Commands**

Command	Description
<b>debug ip rsvp rate-limit</b>	Displays debug messages for RSVP rate-limiting events.

---

# ip rsvp signalling refresh interval

To specify the interval between sending refresh messages for each Resource Reservation Protocol (RSVP) state, use the **ip rsvp signalling refresh interval** command in global configuration mode. To set the interval to its default value, use the **no** form of the command.

**ip rsvp signalling refresh interval** *interval-value*

**no ip rsvp signalling refresh interval**

<b>Syntax Description</b>	<i>interval-value</i>	Time between sending refreshes for each RSVP state. Specified in milliseconds and ranges from 5000 to 4294967295 milliseconds; default value is 30000 milliseconds (30 seconds).
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<b>Command Default</b>	30 seconds
------------------------	------------

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(26)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.	
12.2(18)SXF5	This command was integrated into Cisco IOS Release 12.2(18)SXF5.	
12.2(33)SRB	This feature was integrated into Cisco IOS Release 12.2(33)SRB.	

<b>Usage Guidelines</b>	<p>Use the <b>ip rsvp signalling refresh interval</b> command to specify the interval between sending refresh messages for each RSVP state.</p> <p>The RSVP protocol relies on a soft-state mechanism to maintain state consistency in the face of network losses. This mechanism is based on continuous refresh messages to keep a state current. Each RSVP router is responsible for sending periodic refresh messages to its neighbors.</p>
-------------------------	--



#### Note

If you change the default value for this command and you are also using the **ip rsvp signalling hello graceful-restart refresh interval** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh interval** command is less than the value for the **ip rsvp signalling refresh interval** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling refresh interval** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh interval** command.

<b>Examples</b>	The following example specifies a refresh interval of 60000 milliseconds (60 seconds):
-----------------	--

```
Router(config)# ip rsvp signalling refresh interval 60000
```

The following example returns the refresh interval to the default value of 30 seconds:

```
Router(config)# no ip rsvp signalling refresh interval
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling refresh misses</b>	Specifies the number of successive refresh messages that can be missed before RSVP removes a state from the database.

---

# ip rsvp signalling refresh misses

To specify the number of successive refresh messages that can be missed before Resource Reservation Protocol (RSVP) removes a state from the database, use the **ip rsvp signalling refresh misses** command in global configuration mode. To return the missed refresh limit to its default value, use the **no** form of this command.

**ip rsvp signalling refresh misses** *msg-count*

**no ip rsvp signalling refresh misses**

## Syntax Description

*msg-count* Number of successive refresh messages that can be missed before RSVP considers the state expired and tears it down. Range is 2 to 10.

## Command Default

4 messages

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(26)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(18)SXF5	This command was integrated into Cisco IOS Release 12.2(18)SXF5.
12.2(33)SRB	This feature was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Use the **ip rsvp signalling refresh misses** command to specify the number of successive refresh messages that can be missed before RSVP regards the router state as expired and removes that state from the database.



### Note

If you change the default value for this command and you are also using the **ip rsvp signalling hello graceful-restart refresh misses** command, ensure that the value for the **ip rsvp signalling hello graceful-restart refresh misses** command is less than the value for the **ip rsvp signalling refresh misses** command. Otherwise, some or all of the label-switched paths (LSPs) may not be recovered after a stateful switchover (SSO) has occurred. We recommend that the value for the **ip rsvp signalling refresh misses** command be twice the value for the **ip rsvp signalling hello graceful-restart refresh misses** command.

## Examples

The following example specifies a missed refresh limit of 6 messages:

```
Router(config)# ip rsvp signalling refresh misses 6
```

The following example returns the refresh misses limit to the default value of 4:

```
Router(config)# no ip rsvp signalling refresh misses
```

---

**Related Commands**

Command	Description
<b>ip rsvp signalling refresh interval</b>	Specifies the interval between sending refresh messages for each RSVP state.

# ip rsvp signalling refresh reduction

To enable Resource Reservation Protocol (RSVP) refresh reduction, use the **ip rsvp signalling refresh reduction** command in global configuration mode. To disable refresh reduction, use the **no** form of this command.

**ip rsvp signalling refresh reduction**

**no ip rsvp signalling refresh reduction**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Usage Guidelines

RSVP refresh reduction is a set of extensions to reduce the messaging load imposed by RSVP and to help it scale to support larger numbers of flows.

The following features of the refresh reduction standard (RFC 2961) are supported and will be turned on with this command:

- Setting the refresh-reduction-capable bit in message headers
- Message-Identifier (ID) usage
- Reliable messaging with rapid retransmit, acknowledgement (ACK) messages, and MESSAGE\_ID objects
- Summary refresh extension
- Bundle messages (reception only)

Refresh reduction requires the cooperation of the neighbor to operate; for this purpose, the neighbor must also support the standard. If the router detects that a directly connected neighbor is not supporting the refresh reduction standard (either through observing the refresh-reduction-capable bit in messages received from the next hop, or by sending a MESSAGE\_ID object to the next hop and receiving an error), refresh reduction will not be used on this link irrespective of this command.

## Examples

The following command shows how to enable RSVP refresh reduction:

```
Router(config)# ip rsvp signalling refresh reduction
```

The following command shows how to disable RSVP refresh reduction:

```
Router(config)# no ip rsvp signalling refresh reduction
```

Related Commands	Command	Description
	<b>show ip rsvp interface</b>	Displays RSVP-related interface information.
	<b>show ip rsvp signalling refresh reduction</b>	Displays refresh-reduction parameters for RSVP messages.

# ip rsvp signalling refresh reduction ack-delay

To configure the maximum amount of time that a Resource Reservation Protocol (RSVP)-configured router holds on to an acknowledgment (ACK) message before sending it, use the **ip rsvp signalling refresh reduction ack-delay** command in global configuration mode. To reset the ack-delay value to its default, use the **no** form of this command.

**ip rsvp signalling refresh reduction ack-delay** *delay-value*

**no ip rsvp signalling refresh reduction ack-delay**

<b>Syntax Description</b>	<i>delay-value</i>	Maximum amount of time that a router holds on to an ACK message before sending it. Values range from 100 to 10000 milliseconds (ms).
---------------------------	--------------------	--

**Defaults** The default value is 250 ms (0.25 sec).

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **ip rsvp signalling refresh reduction ack-delay** command to configure the maximum amount of time that an RSVP-configured router keeps an ACK message before sending it.

**Examples** The following command shows how to set the ack-delay value to 1 second:

```
Router(config)# ip rsvp signalling refresh reduction ack-delay 1000
```

The following command shows how to set the ack-delay value to the default value:

```
Router(config)# no ip rsvp signalling refresh reduction ack-delay
```

# ip rsvp svc-required

To enable creation of a switched virtual circuit (SVC) to service any new Resource Reservation Protocol (RSVP) reservation made on the interface or subinterface of an Enhanced ATM port adapter (PA-A3), use the **ip rsvp svc-required** command in interface configuration mode. To disable SVC creation for RSVP reservations, use the **no** form of this command.

**ip rsvp svc-required**

**no ip rsvp svc-required**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command applies exclusively to the RSVP-ATM QoS Interworking feature.

Usually reservations are serviced when RSVP classifies packets and a queueing mechanism schedules them for transmission to manage congestion. Traditionally, RSVP is used with weighted fair queueing (WFQ). When RSVP is coupled with WFQ, all of the packets visible to WFQ are also visible to RSVP, which allows RSVP to identify and take action on packets important to it. In this case, WFQ provides bandwidth guarantees.

However, when the **ip rsvp svc-required** command is used to configure an interface or subinterface, a new SVC is established and used to service each new reservation on the interface. ATM SVCs are used to provide bandwidth guarantees and NetFlow is used on input interfaces to make data packets visible to RSVP.



**Note**

When RSVP is enabled, all packets are processed by the Route Switch Processor (RSP).

This command must be executed on both ends of an SVC driven by RSVP. This command is supported only for the Enhanced ATM port adapter (PA-A3) and its subinterfaces.

**Note**

For this command to take effect, NetFlow must be enabled. Therefore, the **ip route-cache flow** command must precede this command in the configuration.

Use the **show ip rsvp interface** command to determine whether this command is in effect for any interface or subinterface.

**Examples**

The following example signals RSVP that reservations made on ATM interface 2/0/0 will be serviced by creation of an SVC:

```
interface atm2/0/0
 ip rsvp svc-required
```

**Related Commands**

Command	Description
<b>ip route-cache flow</b>	Enables NetFlow switching for IP routing.
<b>ip rsvp atm-peak-rate-limit</b>	Sets a limit on the peak cell rate of reservations for all newly created RSVP SVCs established on the current interface or any of its subinterfaces.
<b>ip rsvp precedence</b>	Allows you to set the IP Precedence values to be applied to packets that either conform to or exceed the RSVP flowspec.
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

# ip rsvp tos

To enable the router to mark the five low-order type of service (ToS) bits of the IP header ToS byte for packets in a Resource Reservation Protocol (RSVP) reserved path using the specified values for traffic that either conforms to or exceeds the RSVP flowspec, use the **ip rsvp tos** command in interface configuration mode. To remove existing settings for the ToS bits, use the **no** form of this command; if neither the **conform** nor **exceed** keyword is specified, all settings for the ToS bits are removed.

```
ip rsvp tos {conform tos-value} {exceed tos-value}
```

```
no ip rsvp tos [conform] [exceed]
```

## Syntax Description

<b>conform</b> <i>tos-value</i>	Specifies a ToS value in the range from 0 to 31 for traffic that conforms to the RSVP flowspec. The ToS value is written to the five low-order bits (bits 0 to 4) of the ToS byte in the IP header of a packet. Either the <b>conform</b> or <b>exceed</b> keyword is required; both keywords may be specified.  When used with the <b>no</b> form of the command, the <b>conform</b> keyword is optional.
<b>exceed</b> <i>tos-value</i>	(Optional) Specifies a ToS value in the range from 0 to 31 for traffic that exceeds the RSVP flowspec. The ToS byte value is written to the five low-order bits (bits 0 to 4) of the ToS byte in the IP header of a packet. Either the <b>conform</b> or <b>exceed</b> keyword is required; both keywords may be specified.  When used with the <b>no</b> form of the command, the <b>exceed</b> keyword is optional.

## Command Default

The ToS bits of the ToS byte are left unmodified when this command is not used. (The default behavior is equivalent to use of the **no ip rsvp tos** command.)

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Packets in an RSVP reserved path are divided into two classes: those that conform to the reservation flowspec and those that correspond to a reservation but that exceed, or are outside, the reservation flowspec.

The **ip rsvp tos** command allows you to set the ToS values to be applied to packets belonging to these two classes. You must specify the ToS value for at least one class of traffic when you use this command. You can use a single instance of the command to specify values for both classes, in which case you can specify the **conform** and **exceed** keywords in either order.

As part of its input processing, RSVP uses the **ip rsvp tos** command configuration to set the ToS bits of the ToS byte on conforming and nonconforming packets. If per-virtual circuit (VC) VIP-distributed Weighted Random Early Detection (DWRED) is configured, the system uses the ToS bit and IP Precedence bit settings on the output interface in its packet drop process. The ToS bit and IP Precedence bit settings of a packet can also be used by interfaces on downstream routers.

Execution of the **ip rsvp tos** command causes ToS bit values for all preexisting reservations on the interface to be modified.

**Note**

RSVP must be enabled on an interface before you can use this command; that is, use of the **ip rsvp bandwidth** command must precede use of the **ip rsvp tos** command. RSVP cannot be configured with VIP-distributed Cisco Express Forwarding (dCEF).

**Note**

The **ip rsvp tos** command sets bits 0 to 4 so that in combination with the IP Precedence bit settings every bit in the ToS byte is set. Use of these bits is made with full knowledge of the fact that certain canonical texts that address the ToS byte specify that only bits 1 to 4 are used as the ToS bits.

RSVP receives packets from the underlying forwarding mechanism. Therefore, to use the **ip rsvp tos** command to set the ToS bits, one of the following features is required:

- Weighted fair queueing (WFQ) must be enabled on the interface.
- RSVP switched virtual circuits (SVCs) must be used.
- NetFlow must be configured to assist RSVP.

**Note**

Use of the **no** form of this command is not equivalent to giving the **ip rsvp tos 0** command, which sets all precedence on the packets to 0, regardless of previous precedence setting.

**Examples**

The following example sets the ToS bits value to 4 for all traffic on ATM interface 1 that conforms to the RSVP flowspec. ToS bits on packets exceeding the flowspec are not altered.

```
interface atm1
 ip rsvp tos conform 4
```

**Related Commands**

Command	Description
<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
<b>ip rsvp flow-assist</b>	Enables RSVP to attach itself to NetFlow so that it can leverage NetFlow services.
<b>ip rsvp policy cops minimal</b>	Lowers the COPS server's load and improves latency times for messages on the governed router.
<b>show ip rsvp</b>	Displays the IP Precedence and ToS bit values to be applied to packets that either conform to or exceed the RSVP flowspec for a given interface.

# ip rsvp udp-multicasts

To instruct the router to generate User Datagram Protocol (UDP)-encapsulated Resource Reservation Protocol (RSVP) multicasts whenever it generates an IP-encapsulated multicast packet, use the **ip rsvp udp-multicasts** command in interface configuration mode. To disable this function, use the **no** form of this command.

**ip rsvp udp-multicasts** [*multicast-address*]

**no ip rsvp udp-multicasts** [*multicast-address*]

## Syntax Description

*multicast-address* (Optional) Host name or UDP multicast address of router.

## Command Default

The generation of UDP multicasts is disabled. If a system sends a UDP-encapsulated RSVP message to the router, the router begins using UDP for contact with the neighboring system. The router uses multicast address 224.0.0.14 and starts sending to UDP port 1699. If the command is entered with no specifying multicast address, the router uses the same multicast address.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use this command to instruct a router to generate UDP-encapsulated RSVP multicasts whenever it generates an IP-encapsulated multicast packet. Some hosts require this trigger from the router.

RSVP cannot be configured with VIP-distributed Cisco Express Forwarding (dCEF).

## Examples

The following example reserves up to 7500 kbps on Ethernet interface 2, with up to 1 Mbps per flow. The router is configured to use UDP encapsulation with the multicast address 224.0.0.14.

```
interface ethernet 2
 ip rsvp bandwidth 7500 1000
 ip rsvp udp-multicasts 224.0.0.14
```

Related Commands	Command	Description
	<b>ip rsvp bandwidth</b>	Enables RSVP for IP on an interface.
	<b>ip rsvp neighbor</b>	Enables neighbors to request a reservation.
	<b>ip rsvp reservation</b>	Enables a router to simulate receiving and forwarding RSVP RESV messages.
	<b>ip rsvp sender</b>	Enables a router to simulate receiving and forwarding RSVP PATH messages.

# ip rtp compression-connections

To specify the total number of Real-Time Transport Protocol (RTP) header compression connections that can exist on an interface, use the **ip rtp compression-connections** command in interface configuration mode. To restore the default value, use the **no** form of this command.

**ip rtp compression-connections** *number*

**no ip rtp compression-connections**

## Syntax Description

<i>number</i>	Number of RTP header compression connections the cache supports, in the range from 3 to 1000.
---------------	---

## Command Default

For PPP and High-Level Data Link Control (HDLC) interfaces, the default is 16 compression connections.

For Frame Relay interfaces, the default is 256 compression connections.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.
12.0(7)T	For PPP and HDLC interfaces, the maximum number of compression connections increased from 256 to 1000.  For Frame Relay interfaces, the maximum number of compression connections increased from 32 to 256. The default number of compression connections was increased from 32 (fixed) to 256 (configurable).
12.1(4)E	This command was implemented on the Cisco 7100 series.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You should configure one connection for each RTP call through the specified interface.

Each connection sets up a compression cache entry, so you are in effect specifying the maximum number of cache entries and the size of the cache. Too few cache entries for the specified interface can lead to degraded performance, and too many cache entries can lead to wasted memory.



### Note

Both ends of the serial connection must use the same number of cache entries.

**Examples**

The following example changes the number of RTP header compression connections supported to 150:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression
Router(config-if)# ip rtp compression-connections 150
Router(config-if)# end
```

**Related Commands**

Command	Description
<b>ip rtp header-compression</b>	Enables RTP header compression.
<b>show ip rtp header-compression</b>	Displays RTP header compression statistics.

# ip rtp header-compression

To enable Real-Time Transport Protocol (RTP) header compression, use the **ip rtp header-compression** command in interface configuration mode. To disable RTP header compression, use the **no** form of this command.

**ip rtp header-compression** [**passive** | **iphc-format** | **ietf-format**] [**periodic-refresh**]

**no ip rtp header-compression** [**passive** | **iphc-format** | **ietf-format**] [**periodic-refresh**]

## Syntax Description

<b>passive</b>	(Optional) Compresses outgoing RTP packets only if incoming RTP packets on the same interface are compressed. If you do not specify the <b>passive</b> keyword, all RTP packets are compressed.
<b>iphc-format</b>	(Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used.
<b>ietf-format</b>	(Optional) Indicates that the Internet Engineering Task Force (IETF) format of header compression will be used.
<b>periodic-refresh</b>	(Optional) Indicates that the compressed IP header will be refreshed periodically.

## Command Default

Disabled

For PPP interfaces, the default format for header compression is the IPHC format.

For High-Level Data Link Control (HDLC) and Frame Relay interfaces, the default format for header compression is the original proprietary Cisco format. The maximum number of compression connections for the proprietary Cisco format is 256.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.3	This command was introduced.
12.0	This command was integrated into Cisco IOS Release 12.0. This command was modified to include the <b>iphc-format</b> keyword.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T. This command was modified to include the <b>periodic-refresh</b> keyword.
12.3(4)T	This command was modified to include the <b>ietf-format</b> keyword.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You can compress IP/User Datagram Protocol (UDP)/RTP headers to reduce the size of your packets. Compressing headers is especially useful for RTP because RTP payload size can be as small as 20 bytes, and the uncompressed header is 40 bytes.

### The **passive** Keyword

By default, the **ip rtp header-compression** command compresses outgoing RTP traffic. If you specify the **passive** keyword, outgoing RTP traffic is compressed only if *incoming* RTP traffic on the *same* interface is compressed. If you do not specify the **passive** keyword, *all* outgoing RTP traffic is compressed.

The **passive** keyword is ignored on PPP interfaces. PPP interfaces negotiate the use of header-compression, regardless of whether the **passive** keyword is specified. Therefore, on PPP interfaces, the **passive** keyword is replaced by the IPHC format, the default format for PPP interfaces.

### The **iphc-format** Keyword

The **iphc-format** keyword indicates that the IPHC format of header compression that will be used. For PPP and HDLC interfaces, when the **iphc-format** keyword is specified, TCP header compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP header compression and TCP header compression are enabled, both UDP packets and TCP packets are compressed.

The **iphc-format** keyword includes checking whether the destination port number is even and is in the ranges of 16,385 to 32,767 (for Cisco audio) or 49,152 to 65,535 (for Cisco video). Valid RTP packets that meet the criteria (that is, the port number is even and is within the specified range) are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

The **iphc-format** keyword is not available for interfaces that use Frame Relay encapsulation.



#### Note

The header compression format (in this case, IPHC) must be the same at *both* ends of the network. That is, if you specify the **iphc-format** keyword on the local router, you must also specify the **iphc-format** keyword on the remote router.

### The **ietf-format** Keyword

The **ietf-format** keyword indicates that the IETF format of header compression will be used. For HDLC interfaces, the **ietf-format** keyword compresses only UDP packets. For PPP interfaces, when the **ietf-format** keyword is specified, TCP header compression is also enabled. For this reason, the **ip tcp header-compression** command appears in the output of the **show running-config** command. Since both RTP header compression and TCP header compression are enabled, both UDP packets and TCP packets are compressed.

With the **ietf-format** keyword, any even destination port number higher than 1024 can be used. Valid RTP packets that meet the criteria (that is, the port number is even and is higher than 1024) are compressed using the compressed RTP packet format. Otherwise, packets are compressed using the less-efficient compressed non-TCP packet format.

The **ietf-format** keyword is not available for interfaces that use Frame Relay encapsulation.



#### Note

The header compression format (in this case, IETF) must be the same at *both* ends of the network. That is, if you specify the **ietf-format** keyword on the local router, you must also specify the **ietf-format** keyword on the remote router.

### Support for Serial Lines

RTP header compression is supported on serial lines using Frame Relay, HDLC, or PPP encapsulation. You must enable compression on both ends of a serial connection.

### Unicast or Multicast RTP Packets

This command can compress unicast or multicast RTP packets, and, hence, multicast backbone (MBONE) traffic can also be compressed over slow links. The compression scheme is beneficial only when you have small payload sizes, as in audio traffic.

### Examples

The following example enables RTP header compression on the Serial1/0 interface and limits the number of RTP header compression connections to 10. In this example, the optional **iphc-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# end
```

The following example enables RTP header compression on the Serial2/0 interface and limits the number of RTP header compression connections to 20. In this example, the optional **ietf-format** keyword of the **ip rtp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression ietf-format
Router(config-if)# ip rtp compression-connections 20
Router(config-if)# end
```

In the following example, RTP header compression is enabled on the Serial1/0 interface and the optional **periodic-refresh** keyword of the **ip rtp header-compression** command is specified:

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0
Router(config-if)# encapsulation ppp
Router(config-if)# ip rtp header-compression iphc-format periodic-refresh
Router(config-if)# ip rtp compression-connections 10
Router(config-if)# end
```

### Related Commands

Command	Description
<b>clear ip rtp header-compression</b>	Clears RTP header compression structures and statistics.
<b>ip rtp compression-connections</b>	Specifies the total number of RTP header compression connections that can exist on an interface.
<b>show ip rtp header-compression</b>	Displays RTP header compression statistics.
<b>show running-config</b>	Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.

# ip rtp priority

To reserve a strict priority queue for a set of Real-Time Transport Protocol (RTP) packet flows belonging to a range of User Datagram Protocol (UDP) destination ports, use the **ip rtp priority** command in interface configuration mode. To disable the strict priority queue, use the **no** form of this command.

**ip rtp priority** *starting-rtp-port-number port-number-range bandwidth*

**no ip rtp priority**

## Syntax Description

<i>starting-rtp-port-number</i>	The starting RTP port number. The lowest port number to which the packets are sent. The port number can be a number from 2000 to 65,535.
<i>port-number-range</i>	The range of UDP destination ports. Number, when added to the <i>starting-rtp-port-number</i> argument, that yields the highest UDP port number. The range of UDP destination ports is from 0 to 16,383.
<i>bandwidth</i>	Maximum allowed bandwidth, in kbps. The maximum allowed bandwidth is from 0 to 2000.

## Command Default

Disabled

## Command Modes

Interface configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command is most useful for voice applications, or other applications that are delay-sensitive.

This command extends and improves on the functionality offered by the **ip rtp reserve** command by allowing you to specify a range of UDP/RTP ports whose voice traffic is guaranteed strict priority service over any other queues or classes using the same output interface. Strict priority means that if packets exist in the priority queue, they are dequeued and sent first—that is, before packets in other queues are dequeued. We recommend that you use the **ip rtp priority** command instead of the **ip rtp reserve** command for voice configurations.

This command can be used in conjunction with either weighted fair queueing (WFQ) or class-based WFQ (CBWFQ) on the same outgoing interface. In either case, traffic matching the range of ports specified for the priority queue is guaranteed strict priority over other CBWFQ classes or WFQ flows; voice packets in the priority queue are always serviced first.

Remember the following guidelines when using the **ip rtp priority** command:

- When used in conjunction with WFQ, the **ip rtp priority** command provides strict priority to voice, and WFQ scheduling is applied to the remaining queues.
- When used in conjunction with CBWFQ, the **ip rtp priority** command provides strict priority to voice. CBWFQ can be used to set up classes for other types of traffic (such as Systems Network Architecture [SNA]) that need dedicated bandwidth and need to be treated better than best effort and not as strict priority; the nonvoice traffic is serviced fairly based on the weights assigned to the enqueued packets. CBWFQ can also support flow-based WFQ within the default CBWFQ class if so configured.

Remember the following guidelines when configuring the *bandwidth* argument:

- It is always safest to allocate to the priority queue slightly more than the known required amount of bandwidth, to allow room for network bursts.
- The IP RTP Priority admission control policy takes RTP header compression into account. Therefore, while configuring the *bandwidth* argument of the **ip rtp priority** command you need to configure only for the bandwidth of the compressed call. Because the *bandwidth* argument is the maximum total bandwidth, you need to allocate enough bandwidth for all calls if there will be more than one call.
- Configure a bandwidth that allows room for Layer 2 headers. The bandwidth allocation takes into account the payload plus the IP, UDP, and RTP headers but does not account for Layer 2 headers. Allowing 25 percent bandwidth for other overhead is conservative and safe.
- The sum of all bandwidth allocation for voice and data flows on an interface cannot exceed 75 percent of the total available bandwidth, unless you change the default maximum reservable bandwidth. To change the maximum reservable bandwidth, use the **max-reserved-bandwidth** command on the interface.

For more information on IP RTP Priority bandwidth allocation, refer to the section “IP RTP Priority” in the chapter “Congestion Management Overview” in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

## Examples

The following example first defines a CBWFQ configuration and then reserves a strict priority queue with the following values: a starting RTP port number of 16384, a range of 16383 UDP ports, and a maximum bandwidth of 40 kbps:

```
! The following commands define a class map:
class-map class1
match access-group 101
exit

! The following commands create and attach a policy map:
policy-map policy1
class class1
bandwidth 3000
queue-limit 30
random-detect
random-detect precedence 0 32 256 100
exit
interface Serial1
service-policy output policy1

! The following command reserves a strict priority queue:
ip rtp priority 16384 16383 40
```

Related Commands	Command	Description
	<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
	<b>fair queue (WFQ)</b>	Enables WFQ for an interface.
	<b>frame-relay ip rtp priority</b>	Reserves a strict priority queue on a Frame Relay PVC for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>ip rtp reserve</b>	Reserves a special queue for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>max-reserved-bandwidth</b>	Changes the percent of interface bandwidth allocated for CBWFQ, LLQ, and IP RTP Priority.
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	<b>ppp multilink</b>	Enables MLP on an interface and, optionally, enables dynamic bandwidth allocation.
	<b>ppp multilink fragment-delay</b>	Configures a maximum delay allowed for transmission of a packet fragment on an MLP bundle.
	<b>ppp multilink interleave</b>	Enables interleaving of RTP packets among the fragments of larger packets on an MLP bundle.
	<b>priority</b>	Gives priority to a class of traffic belonging to a policy map.
	<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.

# ip tcp compression-connections

To specify the total number of Transmission Control Protocol (TCP) header compression connections that can exist on an interface, use the **ip tcp compression-connections** command in interface configuration mode. To restore the default, use the **no** form of this command.

**ip tcp compression-connections** *number*

**no ip tcp compression-connections**

## Syntax Description

<i>number</i>	Number of TCP header compression connections the cache supports, in the range from 3 to 256.
---------------	--

## Command Default

For PPP and High-Level Data Link Control (HDLC) interfaces, the default is 16 compression connections.

For Frame Relay interfaces, the default is 256 compression connections.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
10.0	This command was introduced.
12.0(7)T	For Frame Relay interfaces, the maximum number of compression connections increased from 32 to 256. The default number of compression connections was increased from 32 (fixed) to 256 (configurable).
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You should configure one connection for each TCP connection through the specified interface.

Each connection sets up a compression cache entry, so you are in effect specifying the maximum number of cache entries and the size of the cache. Too few cache entries for the specified interface can lead to degraded performance, and too many cache entries can lead to wasted memory.



### Note

Both ends of the serial connection must use the same number of cache entries.

**Examples**

The following example sets the first serial interface for header compression with a maximum of ten cache entries:

```
Router> enable
Router# configure terminal
Router(config)# interface serial 0
Router(config-if)# ip tcp header-compression
Router(config-if)# ip tcp compression-connections 10
Router(config-if)# end
```

**Related Commands**

Command	Description
<b>ip tcp header-compression</b>	Enables TCP header compression.
<b>show ip tcp header-compressions</b>	Displays TCP header compression statistics.

# ip tcp header-compression

To enable Transmission Control Protocol (TCP) header compression, use the **ip tcp header-compression** command in interface configuration mode. To disable compression, use the **no** form of this command.

**ip tcp header-compression** [**passive** | **iphc-format** | **ietf-format**]

**no ip tcp header-compression** [**passive** | **iphc-format** | **ietf-format**]

## Syntax Description

<b>passive</b>	(Optional) Compresses outgoing TCP packets only if incoming TCP packets on the same interface are compressed. If you do not specify the <b>passive</b> keyword, all TCP packets are compressed.
<b>iphc-format</b>	(Optional) Indicates that the IP Header Compression (IPHC) format of header compression will be used.
<b>ietf-format</b>	(Optional) Indicates that the Internet Engineering Task Force (IETF) format of header compression will be used.

## Command Default

Disabled

For PPP interfaces, the default format for header compression is the IPHC format.

For High-Level Data Link Control (HDLC) and Frame Relay interfaces, the default format is as described in RFC 1144, *Compressing TCP/IP Headers for Low-Speed Serial Links*.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
10.0	This command was introduced.
12.0	This command was integrated into Cisco IOS Release 12.0. This command was modified to include the <b>iphc-format</b> keyword.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T. This command was modified to include the <b>ietf-format</b> keyword.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You can compress the headers of your TCP/IP packets in order to reduce the size of your packets. TCP header compression is supported on serial lines using Frame Relay, HDLC, or PPP encapsulation. You must enable compression on both ends of a serial connection. Compressing the TCP header can speed up Telnet connections dramatically.

In general, TCP header compression is advantageous when your traffic consists of many small packets, not for traffic that consists of large packets. Transaction processing (usually using terminals) tends to use small packets and file transfers use large packets. This feature only compresses the TCP header, so it has no effect on User Datagram Protocol (UDP) packets or other protocol headers.

### The **passive** Keyword

By default, the **ip tcp header-compression** command compresses outgoing TCP traffic. If you specify the **passive** keyword, outgoing TCP traffic is compressed only if *incoming* TCP traffic on the *same* interface is compressed. If you do not specify the **passive** keyword, *all* outgoing TCP traffic is compressed.

For PPP interfaces, the **passive** keyword is ignored. PPP interfaces negotiate the use of header-compression, regardless of whether the **passive** keyword is specified. Therefore, on PPP interfaces, the **passive** keyword is replaced by the IPHC format, the default format for PPP interfaces.

### The **iphc-format** Keyword

The **iphc-format** keyword indicates that the IPHC format of header compression will be used. For PPP and HDLC interfaces, when the **iphc-format** keyword is specified, Real-Time Transport Protocol (RTP) header compression is also enabled. For this reason, the **ip rtp header-compression** command appears in the output of the **show running-config** command. Since both TCP header compression and RTP header compression are enabled, both TCP packets and UDP packets are compressed.

The **iphc-format** keyword is not available for interfaces that use Frame Relay encapsulation.



#### Note

The header compression format (in this case, IPHC) must be the same at *both* ends of the network. That is, if you specify the **iphc-format** keyword on the local router, you must also specify the **iphc-format** keyword on the remote router.

### The **ietf-format** Keyword

The **ietf-format** keyword indicates that the IETF format of header compression will be used. For HDLC interfaces, the **ietf-format** keyword compresses only TCP packets. For PPP interfaces, when the **ietf-format** keyword is specified, RTP header compression is also enabled. For this reason, the **ip rtp header-compression** command appears in the output of the **show running-config** command. Since both TCP header compression and RTP header compression are enabled, both TCP packets and UDP packets are compressed.

The **ietf-format** keyword is not available for interfaces that use Frame Relay encapsulation.



#### Note

The header compression format (in this case, IETF) must be the same at *both* ends of the network. That is, if you specify the **ietf-format** keyword on the local router, you must also specify the **ietf-format** keyword on the remote router.

### Examples

The following example sets the first serial interface for header compression with a maximum of ten cache entries:

```
Router> enable
Router# configure terminal
Router(config)# interface serial 0
Router(config-if)# ip tcp header-compression
Router(config-if)# ip tcp compression-connections 10
Router(config-if)# end
```

The following example enables RTP header compression on the Serial1/0.0 subinterface and limits the number of RTP header compression connections to 10. In this example, the optional **iphc-format** keyword of the **ip tcp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial1/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip tcp header-compression iphc-format
Router(config-if)# ip tcp compression-connections 10
Router(config-if)# end
```

The following example enables RTP header compression on the Serial2/0.0 subinterface and limits the number of RTP header compression connections to 20. In this example, the optional **ietf-format** keyword of the **ip tcp header-compression** command is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface Serial2/0.0
Router(config-if)# encapsulation ppp
Router(config-if)# ip tcp header-compression ietf-format
Router(config-if)# ip tcp compression-connections 20
Router(config-if)# end
```

#### Related Commands

Command	Description
<b>ip tcp compression-connections</b>	Specifies the total number of TCP header compression connections that can exist on an interface.
<b>show ip tcp header-compression</b>	Displays TCP/IP header compression statistics.
<b>show running-config</b>	Displays the contents of the currently running configuration file or the configuration for a specific interface, or map class information.

# iphc-profile

To create an IP Header Compression (IPHC) profile and to enter IPHC-profile configuration mode, use the **iphc-profile** command in global configuration mode. To attach an existing IPHC profile to an interface or subinterface, use the **iphc-profile** command in interface configuration mode. To delete the IPHC profile, use the **no** form of this command.

```
iphc-profile profile-name { ietf | van-jacobson }
```

```
no iphc-profile profile-name
```

Syntax Description		
	<i>profile-name</i>	Name of the IPHC profile to be created or attached. The IPHC profile name can be a maximum of 32 characters.
	<b>ietf</b>	Specifies that the IPHC profile is for Internet Engineering Task Force (IETF) header compression.
	<b>van-jacobson</b>	Specifies that the IPHC profile is for Van Jacobson header compression.

**Command Default** No IPHC profile is created or attached.

**Command Modes** Global configuration (to create an IPHC profile)  
Interface configuration (to attach an existing IPHC profile to an interface or subinterface)

Command History	Release	Modification
	12.4(9)T	This command was introduced.

**Usage Guidelines** The **iphc-profile** command creates an IPHC profile used for enabling header compression and enters IPHC-profile configuration mode (config-iphcp). An IPHC profile is a template within which you can configure the type of header compression that you want to use, enable any optional features and settings for header compression, and then apply the profile to an interface, a subinterface, or a Frame Relay permanent virtual circuit (PVC).

### Specifying the IPHC Profile Type

When you create an IPHC profile, you must specify the IPHC profile type by using either the **ietf** keyword or the **van-jacobson** keyword. The IETF profile type conforms to and supports the standards established with RFC 2507, RFC 2508, RFC 3544, and RFC 3545 and is typically associated with non-TCP header compression (for example, RTP header compression). The Van Jacobson profile type conforms to and supports the standards established with RFC 1144 and is typically associated with TCP header compression.



#### Note

If you are using Frame Relay encapsulation, you must specify the **ietf** keyword (not the **van-jacobson** keyword).

### Considerations When Specifying the IPHC Profile Type

When specifying the IPHC profile type, consider whether you are compressing TCP traffic or non-TCP traffic (that is, RTP traffic). Also consider the header compression format capabilities of the remote network link that will receive traffic. The IPHC profile type that you specify directly affects the header compression format used on the remote network links to which the IPHC profile is applied. *Only* TCP traffic is compressed on remote network links using a Van Jacobson IPHC profile, whereas TCP *and/or* non-TCP traffic (for example, RTP traffic) is compressed on remote network links using an IETF IPHC profile.



#### Note

The header compression format in use on the router that you are configuring and the header compression format in use on the remote network link must match.

### Configurable Header Compression Features and Settings

The specific set of header compression features and settings that you can configure (that is, enable or modify) is determined by the IPHC profile type that you specify (either IETF or Van Jacobson) when you create the IPHC profile. Both sets are listed below.

If you specify Van Jacobson as the IPHC profile type, you can enable TCP header compression and set the number of TCP contexts. [Table 12](#) lists each available Van Jacobson IPHC profile type header compression feature and setting and the command used to enable it.

**Table 12** Van Jacobson IPHC Profile Type Header Compression Features and Settings

Command	Feature or Setting
<b>tcp</b>	Enables TCP header compression.
<b>tcp contexts</b>	Sets the number of contexts available for TCP header compression.

If you specify IETF as the IPHC profile type, you can enable non-TCP header compression (that is, RTP header compression), along with a number of additional features and settings. [Table 13](#) lists each available IETF IPHC profile type header compression feature and setting and the command or commands used to enable it.

**Table 13** IETF IPHC Profile Type Header Compression Features and Settings

Command	Feature or Setting
<b>feedback</b>	Enables the context-status feedback messages from the interface or link.
<b>maximum header</b>	Sets the maximum size of the compressed IP header.
<b>non-tcp</b>	Enables non-TCP header compression.
<b>non-tcp contexts</b>	Sets the number of contexts available for non-TCP header compression.
<b>rtp</b>	Enables RTP header compression.
<b>recoverable-loss</b>	Enables Enhanced Compressed Real-Time Transport Protocol (ECRTP) on an interface.
<b>refresh max-period</b> <b>refresh max-time</b> <b>refresh rtp</b>	Sets the context refresh (full-header refresh) options, such as the amount of time to wait before a full header is refreshed.
<b>tcp</b>	Enables TCP header compression.
<b>tcp contexts</b>	Sets the number of contexts available for TCP header compression.

### For More Information About IPHC Profiles

For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

### Examples

In the following example, an IPHC profile called profile1 is created, and the Van Jacobson IPHC profile type is specified.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile1 van-jacobson
Router(config-iphcp)# end
```

In the following example, a second IPHC profile called profile2 is created. For this IPHC profile, the IETF IPHC profile type is specified.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# end
```

In the following example, an existing IPHC profile called profile2 is attached to serial interface 3/0. For this IPHC profile, the IPHC profile type (in this case, IETF) of profile2 is specified.

```
Router> enable
Router# configure terminal
Router(config)# interface serial 3/0
Router(config-if)# iphc-profile profile2 ietf
Router(config-iphcp)# end
```

### Related Commands

Command	Description
<b>feedback</b>	Enables the context-status feedback messages from the interface or link.
<b>maximum header</b>	Specifies the maximum size of the compressed IP header.
<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.
<b>non-tcp contexts</b>	Sets the number of contexts available for non-TCP header compression.
<b>recoverable-loss</b>	Enables ECRTP on an interface.
<b>refresh max-period</b>	Sets the number of packets sent between full-header refresh occurrences.
<b>refresh max-time</b>	Sets the amount of time to wait before a full-header refresh occurrence.
<b>refresh rtp</b>	Enables a context refresh occurrence for RTP header compression.
<b>rtp</b>	Enables RTP header compression within an IPHC profile.
<b>show iphc-profile</b>	Displays configuration information for one or more IPHC profiles.
<b>tcp</b>	Enables TCP header compression within an IPHC profile.
<b>tcp contexts</b>	Set the number of contexts available for TCP header compression.

# lane client qos

To apply a LAN Emulation (LANE) quality of service (QoS) database to an interface, use the **lane client qos** command in subinterface configuration mode. To remove the QoS over LANE feature from the interface, use the **no** form of this command.

**lane client qos** *database-name*

**no lane client qos** *database-name*

## Syntax Description

<i>database-name</i>	Name of the QoS database.
----------------------	---------------------------

## Command Default

This command is not configured by default.

## Command Modes

Subinterface configuration

## Command History

Release	Modification
12.1(2)E	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

This example shows how to apply a LANE QoS database to a subinterface:

```
Router(config-subif)# lane client qos user1
```

## Related Commands

Command	Description
<b>atm-address</b>	Specifies the QoS parameters associated with a particular ATM address.
<b>lane qos database</b>	Begins the process of building a QoS over LANE database
<b>show lane qos database</b>	Displays the contents of a specific QoS over LANE database.
<b>ubr+ cos</b>	Maps a CoS value to a UBR+ VCC.

# lane qos database

To build the LAN Emulation (LANE) quality-of-service database, use the **lane qos database** command in global configuration mode. To remove a LANE QoS database name, use the **no** form of this command.

**lane qos database** *name*

**no lane qos database** *name*

## Syntax Description

<i>name</i>	Name of the LANE QoS database.
-------------	--------------------------------

## Command Default

This command is not configured by default.

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(2)E	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command specifies a named database of QoS parameters. The database can be applied on the subinterfaces on which a LANE client is configured.

## Examples

This example shows how to begin configuring a QoS over LANE database named user1 on a Catalyst 5000 family ATM switch:

```
ATM# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
ATM(config)# lane qos database user1
```

This example shows how to begin configuring a QoS over LANE database named user2 on a router:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# lane qos database user2
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>atm-address</b>	Specifies the QoS parameters associated with a particular ATM address.
<b>lane client qos</b>	Applies a QoS over LANE database to an interface.
<b>show lane qos database</b>	Displays the contents of a specific QoS over LANE database.
<b>ubr+ cos</b>	Maps a CoS value to a UBR+ VCC.

# load protocol

To load a protocol header description file (PHDF) onto a router, use the **load protocol** command in global configuration mode. To unload all protocols from a specified location or a single protocol, use the **no** form of this command.

**load protocol** *location:filename*

**no load protocol** {*location:filename* | *protocol-name*}

## Syntax Description

<i>location:filename</i>	Location of the PHDF that is to be loaded onto the router. When used with the no version of this command, all protocols loaded from the specified filename will be unloaded. <b>Note</b> The location must be local to the router.
<i>protocol-name</i>	Unloads only the specified protocol. <b>Note</b> If you attempt to unload a protocol that is being referenced by a filter, you will receive an error.

## Command Default

If this command is not issued, no PHDFs will be loaded onto the router.

## Command Modes

Global configuration

## Command History

Release	Modification
12.4(4)T	This command was introduced.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

## Usage Guidelines

Flexible packet matching allows users to classify traffic on the basis of any portion of a packet header given the protocol field, length, and pattern. Protocol headers are defined in separate files called PHDFs; the field names that are defined within the PHDFs are used for defining the packet filters. A PHDF is a file that allows the user to leverage the flexibility of extensible markup language (XML) to describe almost any protocol header. The important components of the PHDF are the version, the XML file schema location, and the protocol field definitions. The protocol field definitions name the appropriate field in the protocol header, allow for a comment describing the field, provide the location of the protocol header field in the header (the offset is relative to the start of the protocol header), and provide the length of the field. Users can choose to specify the measurement in bytes or in bits.



### Note

The total length of the header must be specified at the end of each PHDF.

In case of a redundant setup, users should ensure all PHDFs that are used in the flexible packet matching configuration are present on the corresponding standby disk. If the PHDFs are not on standby disk, all flexible packet matching policies using the PHDFs will be broken.

Users can write their own custom PHDFs via XML. However, the following standard PHDFs can also be loaded onto the router: ip.phdf, ether.phdf, tcp.phdf, and udp.phdf.

Standard PHDFs are available on Cisco.com at the following URL:

<http://www.cisco.com/cgi-bin/tablebuild.pl/fpm>

Because PHDFs are defined via XML, they are not shown in a running configuration.

Issue the **load protocol** command to apply filters to a protocol by defining and loading a PHDF for that protocol header.

## Examples

The following example shows how to configure FPM for blaster packets. The class map contains the following match criteria: TCP port 135, 4444 or UDP port 69; and pattern 0x0030 at 3 bytes from start of IP header.

```
load protocol disk2:ip.phdf
load protocol disk2:tcp.phdf
load protocol disk2:udp.phdf

class-map type stack match-all ip-tcp
  match field ip protocol eq 0x6 next tcp

class-map type stack match-all ip-udp
  match field ip protocol eq 0x11 next udp

class-map type access-control match-all blaster1
  match field tcp dest-port eq 135
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster2
  match field tcp dest-port eq 4444
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster3
  match field udp dest-port eq 69
  match start 13-start offset 3 size 2 eq 0x0030

policy-map type access-control fpm-tcp-policy
  class blaster1
  drop
  class blaster2
  drop

policy-map type access-control fpm-udp-policy
  class blaster3
  drop

policy-map type access-control fpm-policy
  class ip-tcp
  service-policy fpm-tcp-policy
  class ip-udp
  service-policy fpm-udp-policy

interface gigabitEthernet 0/1
  service-policy type access-control input fpm-policy
```

The following example is the XML setup for the PHDF “ip.phdf:”

```
<?xml version="1.0" encoding="UTF-8"?>
<phdf xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="D:\harinadh\Doc\Projects\FPME\XML\ex.xsd">
<protocol name="ip" description="Definition-for-the-IP-protocol">
<field name="version" description="IP-version">
<offset type="fixed-offset" units="bits"> 0 </offset>
<length type="fixed" units="bits">4</length>
</field>
<field name="ihl" description="IP-Header-Length">
<offset type="fixed-offset" units="bits">4</offset>
<length type="fixed" units="bits">4</length>
</field>
<field name="tos" description="IP-Type-of-Service">
<offset type="fixed-offset" units="bits">8</offset>
<length units="bits" type="fixed">8</length>
</field>
<field name="length" description="IP-Total-Length">
<offset type="fixed-offset" units="bytes">2</offset>
<length type="fixed" units="bytes">2</length>
</field>
<field name="identification" description="IP-Identification">
<offset type="fixed-offset" units="bytes">4</offset>
<length type="fixed" units="bytes">2</length>
</field>
<field name="flags" description="IP-Fragmentation-Flags">
<offset type="fixed-offset" units="bytes">6</offset>
<length type="fixed" units="bits">3</length>
</field>
<field name="fragment-offset" description="IP-Fragmentation-Offset">
<offset type="fixed-offset" units="bits">51</offset>
<length type="fixed" units="bits">13</length>
</field>
<field name="ttl" description="Definition-for-the-IP-TTL">
<offset type="fixed-offset" units="bytes">8</offset>
<length type="fixed" units="bytes">1</length>
</field>
<field name="protocol" description="IP-Protocol">
<offset type="fixed-offset" units="bytes">9</offset>
<length type="fixed" units="bytes">1</length>
</field>
<field name="checksum" description="IP-Header-Checksum">
<offset type="fixed-offset" units="bytes">10</offset>
<length type="fixed" units="bytes">2</length>
</field>
<field name="source-addr" description="IP-Source-Address">
<offset type="fixed-offset" units="bytes">12</offset>
<length type="fixed" units="bytes">4</length>
</field>
<field name="dest-addr" description="IP-Destination-Address">
<offset type="fixed-offset" units="bytes">16</offset>
<length type="fixed" units="bytes">4</length>
</field>
<headerlength type="fixed" value="20"></headerlength>
</protocol>
</phdf>
```

# match access-group

To configure the match criteria for a class map on the basis of the specified access control list (ACL), use the **match access-group** command in class-map configuration mode. To remove ACL match criteria from a class map, use the **no** form of this command.

**match access-group** { *access-group* | **name** *access-group-name* }

**no match access-group** *access-group*

## Syntax Description

<i>access-group</i>	Numbered ACL whose contents are used as the match criteria against which packets are checked to determine if they belong to this class. An ACL number can be a number from 1 to 2699.
<b>name</b> <i>access-group-name</i>	Named ACL whose contents are used as the match criteria against which packets are checked to determine if they belong to this class. The name can be a maximum of 40 alphanumeric characters.

## Command Default

No match criteria are configured.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.0(17)SL	This command was enhanced to include matching on access lists on the Cisco 10000 series router.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.4(6)T	This command was enhanced to support Zone-Based Policy Firewall.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

For class-based weighted fair queueing (CBWFQ), you define traffic classes based on match criteria including ACLs, protocols, input interfaces, quality of service (QoS) labels, and EXP field values. Packets satisfying the match criteria for a class constitute the traffic for that class.



### Note

For Zone-Based Policy Firewall, this command is not applicable to CBWFQ.

The **match access-group** command specifies a numbered or named ACL whose contents are used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

#### Supported Platforms Other than Cisco 10000 Series Routers

To use the **match access-group** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. After you identify the class, you can use one of the following commands to configure its match criteria:

- **match access-group**
- **match input-interface**
- **match mpls experimental**
- **match protocol**



#### Note

Zone-Based Policy Firewall supports only the **match access-group**, **match protocol**, and **match class-map** commands.

If you specify more than one command in a class map, only the last command entered applies. The last command overrides the previously entered commands.



#### Note

The **match access-group** command specifies the numbered access list against whose contents packets are checked to determine if they match the criteria specified in the class map. Access lists configured with the optional **log** keyword of the **access-list** command are not supported when you configure match criteria. For more information about the **access-list** command, refer to the [Cisco IOS IP Application Services Command Reference](#).

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To use the **match access-group** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.



#### Note

The **match access-group** command specifies the numbered access list against whose contents packets are checked to determine if they match the criteria specified in the class map. Access lists configured with the optional **log** keyword of the **access-list** command are not supported when you configure match criteria.

#### Examples

The following example specifies a class map called `acl144` and configures the ACL numbered 144 to be used as the match criterion for that class:

```
class-map acl144
  match access-group 144
```

The following example pertains to Zone-Based Policy Firewall. The example defines a class map called `c1` and configures the ACL numbered 144 to be used as the match criterion for that class.

```
class-map type inspect match-all c1
  match access-group 144
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>access-list (IP extended)</b>	Defines an extended IP access list.
	<b>access-list (IP standard)</b>	Defines a standard IP access list.
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
	<b>match input-interface</b>	Configures a class map to use the specified input interface as a match criterion.
	<b>match mpls experimental</b>	Configures a class map to use the specified EXP field value as a match criterion.
	<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.

# match any

To configure the match criteria for a class map to be successful match criteria for all packets, use the **match any** command in class-map configuration mode. To remove all criteria as successful match criteria, use the **no** form of this command.

**match any**

**no match any**

## Syntax Description

This command has no arguments or keywords.

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.0(5)T	This command was integrated into Cisco IOS Release 12.0(5)T.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

In the following configuration, all packets leaving Ethernet interface 1/1 will be policed based on the parameters specified in policy-map class configuration mode:

```
Router(config)# class-map matchany
Router(config-cmap)# match any
Router(config-cmap)# exit

Router(config)# policy-map policy1
Router(config-pmap)# class class4
Router(config-pmap-c)# police 8100 1500 2504 conform-action transmit exceed-action
set-qos-transmit 4
Router(config-pmap-c)# exit

Router(config)# interface ethernet1/1
Router(config-if)# service-policy output policy1
```

Related Commands	Command	Description
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
	<b>match input-interface</b>	Configures a class map to use the specified input interface as a match criterion.
	<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.

# match atm-clp

To enable packet matching on the basis of the ATM cell loss priority (CLP), use the **match atm-clp** command in class-map configuration mode. To disable packet matching on the basis of the ATM CLP, use the **no** form of this command.

**match atm-clp**

**no match atm-clp**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Packets are not matched on the basis of the ATM CLP.

## Command Modes

Class-map configuration (config-cmap)

## Command History

Release	Modification
12.0(28)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.2(33)SRC	Support for the Cisco 7600 series router was added.
12.4(15)T2	This command was integrated into Cisco IOS Release 12.4(15)T2.
12.2(33)SB	Support for the Cisco 7300 series router was added.

## Usage Guidelines

This command is supported on policy maps that are attached to ATM main interfaces, ATM subinterfaces, or ATM permanent virtual circuits (PVCs). However, policy maps (containing the **match atm-clp** command) that are attached to these types of ATM interfaces can be *input* policy maps *only*.

This command is supported on the PA-A3 adaptor *only*.

## Examples

In this example, a class called “class-c1” has been created using the **class-map** command, and the **match atm-clp** command has been configured inside that class. Therefore, packets are matched on the basis of the ATM CLP and are placed into this class.

```
Router> enable
Router# configure terminal
Router(config)# class-map class-c1
Router(config-cmap)# match atm-clp
Router(config-cmap)# end
```

Related Commands	Command	Description
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
	<b>show atm pvc</b>	Displays all ATM PVCs and traffic information.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# match cos

To match a packet on the basis of a Layer 2 class of service (CoS)/Inter-Switch Link (ISL) marking, use the **match cos** command in class-map configuration mode. To remove a specific Layer 2 CoS/ISL marking as a match criterion, use the **no** form of this command.

```
match cos cos-value [cos-value [cos-value [cos-value]]]
```

```
no match cos cos-value [cos-value [cos-value [cos-value]]]
```

## Syntax Description

### Supported Platforms Other Than the Cisco 10000 Series Routers

*cos-value* Specific IEEE 802.1Q/ISL CoS value. The *cos-value* is from 0 to 7; up to four CoS values, separated by a space, can be specified in one **match cos** statement.

### Cisco 10000 Series Routers

*cos-value* Specific packet CoS bit value. Specifies that the packet CoS bit value must match the specified CoS value. The *cos-value* is from 0 to 7; up to four CoS values, separated by a space, can be specified in one **match cos** statement.

## Command Default

Packets are not matched on the basis of a Layer 2 CoS/ISL marking.

## Command Modes

Class-map configuration (config-cmap)

## Command History

Release	Modification
12.1(5)T	This command was introduced.
12.0(25)S	This command was integrated into Cisco IOS Release 12.0(25)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was implemented on the Cisco 10000 series router.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	Support for the Cisco 7600 series router was added.
12.4(15)T2	This command was integrated into Cisco IOS Release 12.4(15)T2.
12.2(33)SB	Support for the Cisco 7300 series router was added.

## Examples

In the following example, the CoS values of 1, 2, and 3 are successful match criteria for the interface that contains the classification policy called cos:

```
Router(config)# class-map cos
Router(config-cmap)# match cos 1 2 3
```

In the following example, classes called voice and video-n-data are created to classify traffic based on the CoS values. QoS treatment is then given to the appropriate packets in the CoS-based-treatment policy map (in this case, the QoS treatment is priority 64 and bandwidth 512). The service policy configured in this example is attached to all packets leaving Fast Ethernet interface 0/0.1. The service policy can be attached to any interface that supports service policies.

```
Router(config)# class-map voice
Router(config-cmap)# match cos 7

Router(config)# class-map video-n-data
Router(config-cmap)# match cos 5

Router(config)# policy-map cos-based-treatment
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 64
Router(config-pmap-c)# exit
Router(config-pmap)# class video-n-data
Router(config-pmap-c)# bandwidth 512
Router(config-pmap-c)# exit
Router(config-pmap)# exit

Router(config)# interface fastethernet0/0.1
Router(config-if)# service-policy output cos-based-treatment
```

#### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set cos</b>	Sets the Layer 2 CoS value of an outgoing packet.
<b>show class-map</b>	Displays all class maps and their matching criteria.

# match cos inner

To match the inner cos of QinQ packets on a Layer 2 class of service (CoS) marking, use the **match cos inner** command in class-map configuration mode. To remove a specific Layer 2 CoS inner tag marking, use the **no** form of this command.

**match cos** *cos-value*

**no match cos** *cos-value*

<b>Syntax Description</b>	<i>cos-value</i>	Specific IEEE 802.1Q/ISL CoS value. The <i>cos-value</i> is from 0 to 7; up to four CoS values can be specified in one <b>match cos</b> statement.
---------------------------	------------------	--

<b>Command Default</b>	No match criteria are specified.
------------------------	----------------------------------

<b>Command Modes</b>	Class-map configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(18)SXE	This command was introduced.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.	

**Examples** In the following example, the inner CoS-values of 1, 2, and 3 are successful match criteria for the interface that contains the classification policy called cos:

```
Router(config)# class-map cos
Router(config-cmap)# match cos inner 1 2 3
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
	<b>set cos</b>	Sets the Layer 2 CoS value of an outgoing packet.
	<b>show class-map</b>	Displays all class maps and their matching criteria.

# match destination-address mac

To use the destination MAC address as a match criterion, use the **match destination-address mac** command in class-map configuration mode. To remove a previously specified destination MAC address as a match criterion, use the **no** form of this command.

**match destination-address mac** *address*

**no match destination-address mac** *address*

## Syntax Description

*address* Destination MAC address to be used as a match criterion.

## Command Default

No destination MAC address is specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following example specifies a class map called macaddress and specifies the destination MAC address to be used as the match criterion for this class:

```
class-map macaddress
  match destination-address mac 00:00:00:00:00:00
```

## Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

# match discard-class

To specify a discard class as a match criterion, use the **match discard-class** command in class-map configuration mode. To remove a previously specified discard class as a match criterion, use the **no** form of this command.

**match discard-class** *class-number*

**no match discard-class** *class-number*

Syntax Description	<i>class-number</i>	Number of the discard class being matched. Valid values are 0 to 7.
--------------------	---------------------	---

Command Default	Packets will not be classified as expected.
-----------------	---

Command Modes	Class-map configuration
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Command History	Release	Modification
	12.2(13)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 1000 series router.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines	A discard-class value has no mathematical significance. For example, the discard-class value 2 is not greater than 1. The value simply indicates that a packet marked with discard-class 2 should be treated differently than a packet marked with discard-class 1.
------------------	---

Packets that match the specified discard-class value are treated differently from packets marked with other discard-class values. The discard-class is a matching criterion only, used in defining per hop behavior (PHB) for dropping traffic.

Examples	The following example shows that packets in discard class 2 are matched:
----------	--

```
Router(config-cmap)# match discard-class 2
```

Related Commands	Command	Description
	<b>set discard-class</b>	Marks a packet with a discard-class value.

# match dscp

To identify one or more differentiated service code point (DSCP), Assured Forwarding (AF), and Certificate Server (CS) values as a match criterion, use the **match dscp** command in class-map configuration mode. To remove a specific DSCP value from a class map, use the **no** form of this command.

```
match [ip] dscp dscp-value [dscp-value dscp-value dscp-value dscp-value dscp-value dscp-value
dscp-value]
```

```
no match [ip] dscp dscp-value
```

Syntax Description	ip	(Optional) Specifies that the match is for IPv4 packets only. If not used, the match is on both IPv4 and IPv6 packets.
		<b>Note</b> For the Cisco 10000 series router, the <b>ip</b> keyword is required.
	<i>dscp-value</i>	The DSCP value used to identify a DSCP value. For valid values, see the “Usage Guidelines.”

Command Default	No match criteria is configured. If you do not enter the <b>ip</b> keyword, matching occurs on both IPv4 and IPv6 packets.
-----------------	---

Command Modes	Class-map configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(13)T	This command was introduced. This command replaces the <b>match ip dscp</b> command.
	12.0(28)S	Support for this command in IPv6 was added in Cisco IOS Release S12.0(28)S on the
	12.0(17)SL	This command was implemented on the Cisco 10000 series router.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

Usage Guidelines	DSCP Values
	You must enter one or more differentiated service code point (DSCP) values. The command may include any combination of the following: <ul style="list-style-type: none"> <li>• numbers (0 to 63) representing differentiated services code point values</li> <li>• af numbers (for example, af11) identifying specific AF DSCPs</li> <li>• cs numbers (for example, cs1) identifying specific CS DSCPs</li> <li>• <b>default</b>—Matches packets with the default DSCP.</li> <li>• <b>ef</b>—Matches packets with EF DSCP.</li> </ul>

For example, if you wanted the DSCP values of 0, 1, 2, 3, 4, 5, 6, or 7 (note that only one of the IP DSCP values must be a successful match criterion, not all of the specified DSCP values), enter the **match dscp 0 1 2 3 4 5 6 7** command.

This command is used by the class map to identify a specific DSCP value marking on a packet. In this context, *dscp-value* arguments are used as markings only and have no mathematical significance. For instance, the *dscp-value* of 2 is not greater than 1. The value simply indicates that a packet marked with the *dscp-value* of 2 is different than a packet marked with the *dscp-value* of 1. The treatment of these marked packets is defined by the user through the setting of Quality of Service (QoS) policies in policy-map class configuration mode.

### Match Packets on DSCP Values

To match DSCP values for IPv6 packets only, the **match protocol ipv6** command must also be used. Without that command, the DSCP match defaults to match both IPv4 and IPv6 packets.

To match DSCP values for IPv4 packets only, use the **ip** keyword. Without the **ip** keyword the match occurs on both IPv4 and IPv6 packets. Alternatively, the **match protocol ip** command may be used with **match dscp** to classify only IPv4 packets.

After the DSCP bit is set, other QoS features can then operate on the bit settings.

The network can give priority (or some type of expedited handling) to marked traffic. Typically, you set the precedence value at the edge of the network (or administrative domain); data is then queued according to the precedence. Weighted fair queueing (WFQ) can speed up handling for high-precedence traffic at congestion points. Weighted Random Early Detection (WRED) can ensure that high-precedence traffic has lower loss rates than other traffic during times of congestion.

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The Cisco 10000 series router supports DSCP matching of IPv4 packets only. You must include the **ip** keyword when specifying the DSCP values to use as match criterion.

You cannot use the **set ip dscp** command with the **set ip precedence** command to mark the same packet. DSCP and precedence values are mutually exclusive. A packet can have one value or the other, but not both.

### Examples

The following example shows how to set multiple match criteria. In this case, two IP DSCP value and one AF value.

```
Router(config)# class-map map1
Router(config-cmap)# match dscp 1 2 af11
```

### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match protocol ip</b>	Matches DSCP values for packets.
<b>match protocol ipv6</b>	Matches DSCP values for IPv6 packets.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set dscp</b>	Marks the DSCP value for packets within a traffic class.
<b>show class-map</b>	Displays all class maps and their matching criteria.

# match field

To configure the match criteria for a class map on the basis of the fields defined in the protocol header description files (PHDFs), use the **match field** command in class-map configuration mode. To remove the specified match criteria, use the **no** form of this command.

```
match field protocol protocol-field { eq [mask] | neq [mask] | gt | lt | range range | regex string }
value [next next-protocol]
```

```
no match field protocol protocol-field { eq [mask] | neq [mask] | gt | lt | range range | regex string }
value [next next-protocol]
```

## Syntax Description

<i>protocol</i>	Name of protocol whose PHDF has been loaded onto a router.
<i>protocol field</i>	Match criteria is based upon the specified field within the loaded protocol.
<b>eq</b>	Match criteria is met if the packet is equal to the specified value or mask.
<b>neq</b>	Match criteria is met if the packet is not equal to the specified value or mask.
<i>mask</i>	(Optional) Can be used when the <b>eq</b> or the <b>neq</b> keywords are issued.
<b>gt</b>	Match criteria is met if the packet does not exceed the specified value.
<b>lt</b>	Match criteria is met if the packet is less than the specified value.
<b>range</b> range	Match criteria is based upon a lower and upper boundary protocol field range.
<b>regex</b> string	Match criteria is based upon a string that is to be matched.
<i>value</i>	Value for which the packet must be in accordance with.
<b>next</b> next-protocol	Specify the next protocol within the stack of protocols that is to be used as the match criteria.

## Command Default

No match criteria are configured.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.4(4)T	This command was introduced.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

## Usage Guidelines

Before issuing the **match-field** command, you must load a PHDF onto the router via the **load protocol** command. Thereafter, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.

Match criteria are defined via a start point, offset, size, value to match, and mask. A match can be defined on a pattern with any protocol field.

**Examples**

The following example shows how to configure FPM for blaster packets. The class map contains the following match criteria: TCP port 135, 4444 or UDP port 69; and pattern 0x0030 at 3 bytes from start of IP header.

```
load protocol disk2:ip.phdf
load protocol disk2:tcp.phdf
load protocol disk2:udp.phdf

class-map type stack match-all ip-tcp
  match field ip protocol eq 0x6 next tcp

class-map type stack match-all ip-udp
  match field ip protocol eq 0x11 next udp

class-map type access-control match-all blaster1
  match field tcp dest-port eq 135
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster2
  match field tcp dest-port eq 4444
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster3
  match field udp dest-port eq 69
  match start 13-start offset 3 size 2 eq 0x0030

policy-map type access-control fpm-tcp-policy
  class blaster1
    drop
  class blaster2
    drop

policy-map type access-control fpm-udp-policy
  class blaster3
    drop

policy-map type access-control fpm-policy
  class ip-tcp
    service-policy fpm-tcp-policy
  class ip-udp
    service-policy fpm-udp-policy

interface gigabitEthernet 0/1
  service-policy type access-control input fpm-policy
```

**Related Commands**

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>load protocol</b>	Loads a PHDF onto a router.
<b>match start</b>	Configures the match criteria for a class map on the basis of the datagram header (Layer 2) or the network header (Layer 3).

# match flow pdp

To specify a Packet Data Protocol (PDP) flow as a match criterion in a class map, use the **match flow pdp** command in class-map configuration mode. To remove a PDP flow as a match criterion, use the **no** form of this command.

**match flow pdp**

**no match flow pdp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** A PDP flow is not specified as a match criterion.

**Command Modes** Class-map configuration (config-cmap)

## Command History

Release	Modification
12.3(8)XU	This command was introduced.
12.3(11)YJ	This command was integrated into Cisco IOS Release 12.3(11)YJ.
12.3(14)YQ	This command was integrated into Cisco IOS Release 12.3(14)YQ.
12.3(14)YU	This command was integrated into Cisco IOS Release 12.3(14)YU.
12.4(2)XB	This command was integrated into Cisco IOS Release 12.4(2)XB.
12.4(9)T	This command was integrated into Cisco IOS Release 12.4(9)T.

## Usage Guidelines

The **match flow pdp** command allows you to match and classify traffic on the basis of a PDP flow.

The **match flow pdp** command is included with the Flow-Based QoS for GGSN feature available with Cisco IOS Release 12.4(9)T. The Flow-Based QoS for GGSN feature is designed specifically for the Gateway General Packet Radio Service (GPRS) Support Node (GGSN).

### Per-PDP Policing

The Flow-Based QoS for GGSN feature includes per-PDP policing (session-based policing).

The **match flow pdp** command (when used in conjunction with the **class-map** command, the **policy-map** command, the **police rate pdp** command, and the **service-policy** command) allows you to configure per-PDP policing (session-based policing) for downlink traffic on a GGSN.

Note the following points related to per-PDP policing:

- When using the **class-map** command to define a class map for PDP flow classification, do not use the **match-any** keyword.
- Per-PDP policing functionality requires that you configure Universal Mobile Telecommunications System (UMTS) quality of service (QoS). For information on configuring UMTS QoS, see the “Configuring QoS on the GGSN” section of the [Cisco GGSN Release 6.0 Configuration Guide](#), Cisco IOS Release 12.4(2)XB.

- The policy map created to configure per-PDP policing cannot contain multiple classes within which only the **match flow pdp** command has been specified. In other words, if there are multiple classes in the policy map, the **match flow pdp** command must be used in conjunction with another match statement (for example, **match precedence**) in at least one class.

#### For More Information

For more information about the GGSN, along with the instructions for configuring the Flow-Based QoS for GGSN feature, see the [Cisco GGSN Release 6.0 Configuration Guide](#), Cisco IOS Release 12.4(2)XB.



**Note** To configure the Flow-Based QoS for GGSN feature, follow the instructions in the section called “[Configuring Per-PDP Policing](#).”

For more information about the GGSN-specific commands, see the [Cisco GGSN Release 6.0 Command Reference](#), Cisco IOS Release 12.4(2)XB.

#### Examples

The following example specifies PDP flows as the match criterion in a class map named “class-pdp”:

```
class-map class-pdp
  match flow pdp
```

#### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match precedence</b>	Identifies IP precedence values as match criteria.
<b>police rate pdp</b>	Configures PDP traffic policing using the police rate.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an interface.

# match fr-dlci

To specify the Frame Relay data-link connection identifier (DLCI) number as a match criterion in a class map, use the **match fr-dlci** command in class-map configuration mode. To remove a previously specified DLCI number as a match criterion, use the **no** form of this command.

**match fr-dlci** *dlci-number*

**no match fr-dlci** *dlci-number*

## Syntax Description

<i>dlci-number</i>	Number of the DLCI associated with the packet.
--------------------	--

## Command Default

No DLCI number is specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

## Usage Guidelines

This match criterion can be used in main interfaces and point-to-multipoint subinterfaces in Frame Relay networks, and it can also be used in hierarchical policy maps.

## Examples

In the following example a class map called “class1” has been created and the Frame Relay DLCI number of 500 has been specified as a match criterion. Packets matching this criterion are placed in class1.

```
Router(config)# class-map class1
Router(config-cmap)# match fr-dlci 500
Router(config-cmap)# end
```

## Related Commands

Command	Description
<b>show class-map</b>	Displays all class maps and their matching criteria.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# match input vlan

To configure a class map to match incoming packets that have a specific virtual local area network (VLAN) ID, use the **match input vlan** command in class map configuration mode. To remove the matching of VLAN IDs, use the **no** form of this command.

**match input vlan** *input-vlan-list*

**no match input vlan** *input-vlan-list*

## Syntax Description

*input-vlan-list*

One or more VLAN IDs to be matched. The valid range for VLAN IDs is from 1 to 4094, and the list of VLAN IDs can include one or all of the following:

- Single VLAN IDs, separated by spaces. For example:  
100 200 300
- One or more ranges of VLAN IDs, separated by spaces. For example:  
1-1024 2000-2499

## Command Default

By default, no matching is done on VLAN IDs.

## Command Modes

Class map configuration

## Command History

Release	Modification
12.2(18)SXE	This command was introduced for Cisco Catalyst 6500 series switches and Cisco 7600 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

The **match input vlan** command allows you to create a class map that matches packets with one or more specific VLAN IDs, as they were received on the input (ingress) interface. This enables hierarchical Quality of Service (HQoS) for Ethernet over MPLS (EoMPLS) Virtual Circuits (VC), allowing parent and child relationships between QoS class maps and policy maps. This in turn enables service providers to easily classify and shape traffic for a particular EoMPLS network.

In EoMPLS applications, the parent class map typically specifies the maximum bandwidth for all of the VCs in a specific EoMPLS network. Then the child class maps perform other QoS operations, such as traffic shaping, on a subset of this traffic.

Do not confuse the **match input vlan** command with the **match vlan** command, which is also a class-map configuration command.

- The **match vlan** command matches the VLAN ID on packets for the particular interface at which the policy map is applied. Policy maps using the **match vlan** command can be applied to either ingress or egress interfaces on the router, using the **service-policy {input | output}** command.
- The **match input vlan** command matches the VLAN ID that was on packets when they were received on the ingress interface on the router. Typically, policy maps using the **match input vlan** command are applied to egress interfaces on the router, using the **service-policy output** command.

The **match input vlan** command can also be confused with the **match input-interface vlan** command, which matches packets being received on a logical VLAN interface that is used for inter-VLAN routing.

**Tip**

Because class maps also support the **match input-interface** command, you cannot abbreviate the **input** keyword when giving the **match input vlan** command.

**Note**

The **match input vlan** command cannot be used only on Layer 2 LAN ports on FlexWAN, Enhanced FlexWAN, and Optical Service Modules (OSM) line cards.

**Restrictions**

The following restrictions apply when using the **match input vlan** command:

- You cannot attach a policy with **match input vlan** to an interface if you have already attached a service policy to a VLAN interface (a logical interface that has been created with the **interface vlan** command).
- Class maps that use the **match input vlan** command support only the **match-any** option. You cannot use the **match-all** option in class maps that use the **match input vlan** command.
- If the parent class contains a class map with a **match input vlan** command, you cannot use a **match exp** command in a child class map.

**Examples**

The following example creates a class map and policy map that matches packets with a VLAN ID of 1000. The policy map shapes this traffic to a committed information rate (CIR) value of 10 Mbps (10,000,000 bps). The final lines then apply this policy map to a specific gigabit Ethernet WAN interface.

```
Router# configure terminal
Router(config)# class-map match-any vlan1000
Router(config-cmap)# match input vlan 1000
Router(config-cmap)# exit
Router(config)# policy-map policy1000
Router(config-pmap)# class vlan1000
Router(config-pmap-c)# exit
Router(config-pmap)# shape average 10000000
Router(config-pmap)# interface GE-WAN 3/0
Router(config-if)# service-policy output policy1000
Router(config-if)#
```

The following example shows a class map being configured to match VLAN IDs 100, 200, and 300:

```
Router# configure terminal
Router(config)# class-map match-any hundreds
Router(config-cmap)# match input vlan 100 200 300
Router(config-cmap)#
```

The following example shows a class map being configured to match all VLAN IDs from 2000 to 2999 inclusive:

```
Router# configure terminal
Router(config)# class-map match-any vlan2000s
Router(config-cmap)# match input vlan 2000-2999
Router(config-cmap)#
```

The following example shows a class map being configured to match both a range of VLAN IDs, as well as specific VLAN IDs:

```
Router# configure terminal
Router(config)# class-map match-any misc
Router(config-cmap)# match input vlan 1 5 10-99 2000-2499
Router(config-cmap)#
```

### Related Commands

Command	Description
<b>clear cef linecard</b>	Clears Cisco Express Forwarding (CEF) information on one or more line cards, but does not clear the CEF information on the main route processor (RP). This forces the line cards to synchronize their CEF information with the information that is on the RP.
<b>match qos-group</b>	Identifies a specified QoS group value as a match criterion.
<b>mls qos trust</b>	Sets the trusted state of an interface, to determine which incoming QoS field on a packet, if any, should be preserved.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show platform qos policy-map</b>	Displays the type and number of policy maps that are configured on the router.

# match input-interface

To configure a class map to use the specified input interface as a match criterion, use the **match input-interface** command in class-map configuration mode. To remove the input interface match criterion from a class map, use the **no** form of this command.

**match input-interface** *interface-name*

**no match input-interface** *interface-name*

## Syntax Description

<i>interface-name</i>	Name of the input interface to be used as match criteria.
-----------------------	---

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.0(17)SL	This command was enhanced to include matching on the input interface.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

### Supported Platforms Other Than Cisco 10000 Series Routers

For class-based weighted fair queueing (CBWFQ), you define traffic classes based on match criteria including input interfaces, access control lists (ACLs), protocols, quality of service (QoS) labels, and experimental (EXP) field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match input-interface** command specifies the name of an input interface to be used as the match criterion against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match input-interface** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. After you identify the class, you can use one of the following commands to configure its match criteria:

- **match access-group**
- **match input-interface**
- **match mpls experimental**
- **match protocol**

If you specify more than one command in a class map, only the last command entered applies. The last command overrides the previously entered commands.

#### Cisco 10000 Series Routers

For CBWFQ, you define traffic classes based on match criteria including input interfaces, ACLs, protocols, QoS labels, and EXP field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

To use the **match input-interface** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.

#### Examples

The following example specifies a class map called ethernet1 and configures the input interface named ethernet1 to be used as the match criterion for this class:

```
class-map ethernet1
 match input-interface ethernet1
```

#### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match access-group</b>	Configures the match criteria for a class map based on the specified ACL.
<b>match mpls experimental</b>	Configures a class map to use the specified EXP field value as a match criterion.
<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.

# match ip dscp

The **match ip dscp** command is replaced by the **match dscp** command. See the **match dscp** command for more information.

# match ip precedence

The **match ip precedence** command is replaced by the **match precedence** command. See the **match precedence** command for more information.

# match ip rtp

To configure a class map to use the Real-Time Protocol (RTP) port as the match criterion, use the **match ip rtp** command in class-map configuration mode. To remove the RTP port match criterion, use the **no** form of this command.

**match ip rtp** *starting-port-number port-range*

**no match ip rtp**

## Syntax Description

<i>starting-port-number</i>	The starting RTP port number. Values range from 2000 to 65535.
<i>port-range</i>	The RTP port number range. Values range from 0 to 16383.

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command is used to match IP RTP packets that fall within the specified port range. It matches packets destined to all even User Datagram Port (UDP) port numbers in the range from the *starting port number* argument to the *starting port number* plus the *port range* argument.

Use of an RTP port range as the match criterion is particularly effective for applications that use RTP, such as voice or video.

## Examples

The following example specifies a class map called ethernet1 and configures the RTP port number 2024 and range 1000 to be used as the match criteria for this class:

```
class-map ethernet1
  match ip rtp 2024 1000
```

Related Commands	Command	Description
	<b>ip rtp priority</b>	Reserves a strict priority queue for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>match access-group</b>	Configures the match criteria for a class map based on the specified ACL number.

# match mpls experimental

To configure a class map to use the specified value or values of the experimental (EXP) field as a match criteria, use the **match mpls experimental** command in class-map configuration mode. To remove the EXP field match criteria from a class map, use the **no** form of this command.

**match mpls experimental** *number*

**no match mpls experimental** *number*

## Syntax Description

<i>number</i>	EXP field value (any number from 0 through 7) to be used as a match criterion. You can specify multiple values, separated by a space (for example, 3 4 7).
---------------	--

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(7)XE1	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(4)T	This command was implemented on the Cisco MGX 8850 switch and the MGX 8950 switch with a Cisco MGX RPM-PR card.
12.2(4)T2	This command was implemented on the Cisco 7500 series.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

### Supported Platforms Other Than the Cisco 10000 Series

For class-based weighted fair queueing (CBWFQ), you define traffic classes based on match criteria such as input interfaces, access control lists (ACLs), protocols, quality of service (QoS) labels, and experimental (EXP) field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match mpls experimental** command specifies the name of an EXP field value to be used as the match criterion against which packets are compared to determine if they belong to the class specified by the class map.

To use the **match mpls experimental** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. After you identify the class, you can use one of the following commands to configure its match criteria:

- **match access-group**
- **match input-interface**
- **match mpls experimental**
- **match protocol**

If you specify more than one command in a class map, only the last command entered applies. The last command overrides the previously entered commands.

#### Cisco 10000 Series

This command is available only on the ESR-PRE1 module.

For CBWFQ, you define traffic classes based on match criteria such as input interfaces, ACLs, protocols, QoS labels, and EXP field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

To use the **match mpls experimental** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.

#### Examples

The following example specifies a class map called ethernet1 and configures the Multiprotocol Label Switching (MPLS) experimental values of 1 and 2 to be used as the match criteria for this class:

```
Router(config)# class-map ethernet1
Router(config-cmap)# match mpls experimental 1 2
```

#### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match access-group</b>	Configures the match criteria for a class map based on the specified ACL.
<b>match input-interface</b>	Configures a class map to use the specified input interface as a match criterion.
<b>match mpls experimental topmost</b>	Matches the EXP value in the topmost label.
<b>match protocol</b>	Matches traffic by a particular protocol.
<b>match qos-group</b>	Configures the match criteria for a class map based on the specified protocol.

# match mpls experimental topmost

To match the experimental (EXP) value in the topmost label, use the **match mpls experimental topmost** command in QoS class-map configuration mode. To remove the EXP match criterion, use the **no** form of this command.

**match mpls experimental topmost** *number*

**no match mpls experimental topmost** *number*

<b>Syntax Description</b>	<i>number</i>	The Multiprotocol Label Switching (MPLS) EXP field in the topmost label header. Valid values are 0 to 7.
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**Command Default** No EXP match criterion is configured for the topmost label.

**Command Modes** QoS class-map configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(13)T	This command was introduced.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

**Usage Guidelines** You can enter this command on the input and the output interfaces. It will match only on MPLS packets.

**Examples** The following example shows that the EXP value 3 in the topmost label is matched:

```
match mpls experimental topmost 3
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>set mpls experimental topmost</b>	Sets the MPLS EXP field value in the topmost MPLS label header at the input or output interfaces.

# match not

To specify the single match criterion value to use as an unsuccessful match criterion, use the **match not** command in QoS class-map configuration mode. To remove a previously specified source value to not use as a match criterion, use the **no** form of this command.

**match not** *match-criterion*

**no match not** *match-criterion*

## Syntax Description

*match-criterion*

The match criterion value that is an unsuccessful match criterion. All other values of the specified match criterion will be considered successful match criteria.

## Command Default

No default behavior or values

## Command Modes

QoS class-map configuration

## Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.0(5)T	This command was integrated into Cisco IOS Release 12.0(5)T.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

The **match not** command is used to specify a quality of service (QoS) policy value that is not used as a match criterion. When the **match not** command is used, all other values of that QoS policy become successful match criteria.

For instance, if the **match not qos-group 4** command is issued in QoS class-map configuration mode, the specified class will accept all QoS group values except 4 as successful match criteria.

## Examples

In the following traffic class, all protocols except IP are considered successful match criteria:

```
Router(config)# class-map noip
Router(config-cmap)# match not protocol ip
Router(config-cmap)# exit
```

■ match not

Related Commands	Command	Description
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

## match packet length (class-map)

To specify the Layer 3 packet length in the IP header as a match criterion in a class map, use the **match packet length** command in class-map configuration mode. To remove a previously specified Layer 3 packet length as a match criterion, use the **no** form of this command.

```
match packet length {max maximum-length-value [min minimum-length-value] | min
minimum-length-value [max maximum-length-value]}
```

```
no match packet length {max maximum-length-value [min minimum-length-value] | min
minimum-length-value [max maximum-length-value]}
```

### Syntax Description

<b>max</b>	Maximum. Indicates that a maximum value for the Layer 3 packet length is to be specified.
<i>maximum-length-value</i>	Specifies the maximum length value of the Layer 3 packet length, in bytes. The range is from 1 to 2000.
<b>min</b>	Minimum. Indicates that a minimum value for the Layer 3 packet length is to be specified.
<i>minimum-length-value</i>	Specifies the minimum length value of the Layer 3 packet length, in bytes. The range is from 1 to 2000.

### Command Default

If only the minimum value is specified, a packet with a Layer 3 length greater than the minimum is viewed as matching the criterion.

If only the maximum value is specified, a packet with a Layer 3 length less than the maximum is viewed as matching the criterion.

### Command Modes

Class-map configuration

### Command History

Release	Modification
12.2(13)T	This command was introduced.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

This command considers only the Layer 3 packet length in the IP header. It does not consider the Layer 2 packet length in the IP header.

When using this command, you must at least specify the maximum or minimum value. However, you do have the option of entering both values.

## match packet length (class-map)

### Examples

In the following example a class map called “class 1” has been created, and the Layer 3 packet length has been specified as a match criterion. In this example, packets with a minimum Layer 3 packet length of 100 and a maximum Layer 3 packet length of 300 are viewed as meeting the match criteria.

```
Router> enable
Router# configure terminal
Router(config)# class-map match-all class1
Router(config-cmap)# match packet length min 100 max 300
Router(config-cmap)# end
```

### Related Commands

Command	Description
<b>show class-map</b>	Displays all class maps and their matching criteria.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# match port-type

To match the access policy on the basis of the port for a class map, use the **match port-type** command in class-map configuration mode. To delete the port type, use the **no** form of this command.

```
match port-type { routed | switched }
```

```
no match port-type { routed | switched }
```

## Syntax Description

<b>routed</b>	Matches the routed interface. Use this keyword if the class map has to be associated with only a routed interface.
<b>switched</b>	Matches the switched interface. Use this keyword if the class map has to be associated with only a switched interface.

## Command Default

Access policy is not matched.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.4(6)T	This command was introduced.

## Usage Guidelines

This command is used because, on the basis of the port on which a user is connecting, the access policies that are applied to it can be different.

## Examples

The following example shows that an access policy has been matched on the basis of the port for a class map:

```
Router(config-cmap)# match port-type routed
```

## Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match tag (class-map)</b>	Specifies the tag to be matched for a tag type of class map.

# match precedence

To identify IP precedence values to use as the match criterion, use the **match precedence** command in QoS class-map configuration mode. To remove IP precedence values from a class map, use the **no** form of this command.

```
match [ip] precedence precedence-criteria1 precedence-criteria2 precedence-criteria3
precedence-criteria4
```

```
no match [ip] precedence precedence-criteria1 precedence-criteria2 precedence-criteria3
precedence-criteria4
```

<b>Syntax Description</b>	<p><b>ip</b> (Optional) Specifies that the match is for IPv4 packets only. If not used, the match is on both IP and IPv6 packets.</p> <p><b>Note</b> For the Cisco 10000 series router, the <b>ip</b> keyword is required.</p> <p><i>precedence-criteria1</i> <i>precedence-criteria2</i> <i>precedence-criteria3</i> <i>precedence-criteria4</i></p>
	<p>Identifies the precedence value. You may enter up to four different values, separated by a space. See the “Usage Guidelines” for valid values.</p>

<b>Command Default</b>	<p>No match criterion is configured.</p> <p>If you do not enter the <b>ip</b> keyword, matching occurs on both IPv4 and IPv6 packets.</p>
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<b>Command Modes</b>	QoS class-map configuration mode
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(13)T	This command was introduced. This command replaces the <b>match ip precedence</b> command.
	12.0(17)SL	This command was implemented on the Cisco 10000 series router.
	12.0(28)S	Support for this command in IPv6 was added on the Cisco 12000 series Internet router.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

<b>Usage Guidelines</b>	<p>You may enter up to four matching criteria, as number abbreviation (0 to 7) or criteria names (critical, flash, and so on), in a single match statement. For example, if you wanted the precedence values of 0, 1, 2, or 3 (note that only one of the precedence values must be a successful match criterion, not all of the specified precedence values), enter the <b>match ip precedence 0 1 2 3</b> command. The <i>precedence-criteria</i> numbers are not mathematically significant; that is, the <i>precedence-criteria</i> of 2 is not greater than 1. The way that these different packets are treated depends upon quality of service (QoS) policies, set in the policy-map configuration mode.</p>
-------------------------	---

You can configure a QoS policy to include IP precedence marking for packets entering the network. Devices within your network can then use the newly marked IP precedence values to determine how to treat the packets. For example, class-based weighted random early detection (WRED) uses IP precedence values to determine the probability that a packet is dropped. You can also mark voice packets with a particular precedence. You can then configure low-latency queueing (LLQ) to place all packets of that precedence into the priority queue.

### Matching Precedence for IPv6 and IPv4 Packets on the Cisco 10000 and 7600 Series Routers

On the Cisco 7600 Series and 10000 Series Routers, you set matching criteria based on precedence values for only IPv6 packets using the **match protocol command with the ipv6** keyword. Without that keyword, the precedence match defaults to match both IPv4 and IPv6 packets. You set matching criteria based on precedence values for IPv4 packets only, use the **ip** keyword. Without the **ip** keyword the match occurs on both IPv4 and IPv6 packets.

### Precedence Values and Names

The following table lists all criteria conditions by value, name, binary value, and recommended use. You may enter up to four criteria, each separated by a space. Only one of the precedence values must be a successful match criterion. [Table 14](#) lists the IP precedence values.

**Table 14** IP Precedence Values

Precedence Value	Precedence Name	Binary Value	Recommended Use
0	routine	000	Default marking value
1	priority	001	Data applications
2	immediate	010	Data applications
3	flash	011	Call signaling
4	flash-override	100	Video conferencing and streaming video
5	critical	101	Voice
6	internet (control)	110	Network control traffic (such as routing, which is typically precedence 6)
7	network (control)	111	

Do not use IP precedence 6 or 7 to mark packets, unless you are marking control packets.

## Examples

### IPv4-Specific Traffic Match

The following example shows how to configure the service policy called “priority50” and attach service policy “priority50” to an interface, matching for IPv4 traffic only. In a network where both IPv4 and IPv6 are running, you might find it necessary to distinguish between the protocols for matching and traffic segregation. In this example, the class map called “ipprec5” will evaluate all IPv4 packets entering Fast Ethernet interface 1/0/0 for a precedence value of 5. If the incoming IPv4 packet has been marked with the precedence value of 5, the packet will be treated as priority traffic and will be allocated with bandwidth of 50 kbps.

```
Router(config)# class-map ipprec5
Router(config-cmap)# match ip precedence 5
Router(config)# exit
Router(config)# policy-map priority50
Router(config-pmap)# class ipprec5
```

```

Router(config-pmap-c)# priority 50
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface fa1/0/0
Router(config-if)# service-policy input priority50

```

### IPv6-Specific Traffic Match

The following example shows the same service policy matching on precedence for IPv6 traffic only. Notice that the **match protocol** command with the **ipv6** keyword precedes the **match precedence** command. The **match protocol** command is required to perform matches on IPv6 traffic alone.

```

Router(config)# class-map ipprec5
Router(config-cmap)# match protocol ipv6
Router(config-cmap)# match precedence 5
Router(config)# exit
Router(config)# policy-map priority50
Router(config-pmap)# class ipprec5
Router(config-pmap-c)# priority 50
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface fa1/0/0
Router(config-if)# service-policy input priority50

```

### Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match protocol</b>	Configures the match criteria for a class map on the basis of a specified protocol.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set ip precedence</b>	Sets the precedence value in the IP header.
<b>show class-map</b>	Displays all class maps and their matching criteria, or a specified class map and its matching criteria.

# match protocol

To configure the match criterion for a class map on the basis of the specified protocol, use the **match protocol** command in class-map configuration mode. To remove protocol-based match criterion from a class map, use the **no** form of this command.

**match protocol** *protocol-name*

**no match protocol** *protocol-name*

## Syntax Description

<i>protocol-name</i>	Name of the protocol (for example, bgp) used as a matching criterion. See the “Usage Guidelines” for a list of protocols supported by most routers.
----------------------	---

## Command Default

No match criterion is configured.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.2(13)T	This command was modified to remove apollo, vines, and xns from the list of protocols used as matching criteria. These protocols were removed because Apollo Domain, Banyan VINES, and Xerox Network Systems (XNS) were removed in Release 12.2(13)T. The <b>ipv6</b> keyword was added to support protocol matching on IPv6 packets.
12.0(28)S	Support for this command in IPv6 was added in Cisco IOS Release 12.0(28)S on the
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.2(18)SXE	Support for this command was added on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2 and implemented on the Cisco 10000 series router.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY. This command was modified to enhance Network-Based Application Recognition (NBAR) functionality on the Catalyst 6500 series switch that is equipped with the Supervisor 32/programmable intelligent services accelerator (PISA) engine.

## Usage Guidelines

### Supported Platforms Other Than Cisco 7600 Routers and Cisco 10000 Series Routers

For class-based weighted fair queueing (CBWFQ), you define traffic classes based on match criteria protocols, access control lists (ACLs), input interfaces, Quality of Service (QoS) labels, and Experimental (EXP) field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match protocol** command specifies the name of a protocol to be used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

The **match protocol ipx** command matches packets in the output direction only.

To use the **match protocol** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. After you identify the class, you can use one of the following commands to configure its match criteria:

- **match access-group**
- **match input-interface**
- **match mpls experimental**

If you specify more than one command in a class map, only the last command entered applies. The last command overrides the previously entered commands.

To configure network-based application recognition (NBAR) to match protocol types that are supported by NBAR traffic, use the **match protocol (NBAR)** command.

### Cisco 7600 Routers

The **match protocol** command in QoS class-map configuration configures NBAR and sends all traffic on the port, both ingress and egress, to be processed in the software on the MSFC2.

For class-based weighted fair queuing (CBWFQ), you define traffic classes based on match criteria like protocols, ACLs, input interfaces, QoS labels, and Multiprotocol Label Switching (MPLS) EXP field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match protocol** command specifies the name of a protocol to be used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

If you want to use the **match protocol** command, you must first enter the **class-map** command to specify the name of the class to which you want to establish the match criteria.

If you specify more than one command in a class map, only the last command entered applies. The last command overrides the previously entered commands.

This command can be used to match protocols that are known to the NBAR feature. For a list of protocols supported by NBAR, see the “Classification” part of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

### Cisco 10000 Series Routers

For CBWFQ, you define traffic classes based on match criteria including protocols, ACLs, input interfaces, QoS labels, and EXP field values. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match protocol** command specifies the name of a protocol to be used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

The **match protocol ipx** command matches packets in the output direction only.

To use the **match protocol** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.

If you are matching NBAR protocols, use the **match protocol (NBAR)** command.

### Supported Protocols

Table 15 lists the protocols supported by most routers. Some routers support a few additional protocols. For example, the Cisco 7600 router supports the aarp and deernet protocols, while the Cisco 7200 router supports the directconnect and pppoe protocols. For a complete list of supported protocols, see the online help for the **match protocol** command on the router that you are using.

**Table 15** Supported Protocols

Protocol Name	Description
arp*	IP Address Resolution Protocol (ARP)
bgp	Border Gateway Protocol
bridge*	bridging
cdp*	Cisco Discovery Protocol
citrix	Citrix Systems Metaframe
clns*	ISO Connectionless Network Service
clns_es*	ISO CLNS End System
clns_is*	ISO CLNS Intermediate System
cmns*	ISO Connection-Mode Network Service
compressedtcp*	compressed TCP
cuseme	CU-SeeMe desktop video conference
dhcp	Dynamic Host Configuration
directconnect	Direct Connect
dns	Domain Name Server lookup
edonkey	eDonkey
egp	Exterior Gateway Protocol
eigrp	Enhanced Interior Gateway Routing Protocol
exchange	Microsoft RPC for Exchange
fasttrack	FastTrack Traffic (KaZaA, Morpheus, Grokster, and so on)
finger	Finger
ftp	File Transfer Protocol
gnutella	Gnutella Version 2 Traffic (BearShare, Shareeza, Morpheus, and so on)

**Table 15**      **Supported Protocols (continued)**

<b>Protocol Name</b>	<b>Description</b>
<b>gopher</b>	Gopher
<b>gre</b>	Generic Routing Encapsulation
<b>h323</b>	H323 Protocol
<b>http</b>	World Wide Web traffic
<b>cmp</b>	Internet Control Message
<b>imap</b>	Internet Message Access Protocol
<b>ip*</b>	IP (version 4)
<b>ipinip</b>	IP in IP (encapsulation)
<b>ipsec</b>	IP Security Protocol (ESP/AH)
<b>ipv6*</b>	IP (version 6)
<b>irc</b>	Internet Relay Chat
<b>kazaa2</b>	Kazaa Version 2
<b>kerberos</b>	Kerberos
<b>l2tp</b>	Layer 2 Tunnel Protocol
<b>ldap</b>	Lightweight Directory Access Protocol
<b>llc2*</b>	llc2
<b>mgcp</b>	Media Gateway Control Protocol
<b>napster</b>	Napster traffic
<b>netbios</b>	NetBIOS
<b>netshow</b>	Microsoft Netshow
<b>nfs</b>	Network File System
<b>nntp</b>	Network News Transfer Protocol
<b>novadigm</b>	Novadigm Enterprise Desktop Manager (EDM)
<b>ntp</b>	Network Time Protocol
<b>ospf</b>	Open Shortest Path First
<b>pad*</b>	packet assembler/disassembler (PAD) links
<b>pcanywhere</b>	Symantec pcANYWHERE
<b>pop3</b>	Post Office Protocol
<b>printer</b>	print spooler/lpd
<b>rcmd</b>	Berkeley Software Distribution (BSD) r-commands (rsh, rlogin, rexec)
<b>rip</b>	Routing Information Protocol
<b>rsrb*</b>	Remote Source-Route Bridging
<b>rsvp</b>	Resource Reservation Protocol
<b>rtp</b>	Real-Time Protocol
<b>rtsp</b>	Real-Time Streaming Protocol
<b>secure-ftp</b>	FTP over Transport Layer Security/Secure Sockets Layer (TLS/SSL)

**Table 15 Supported Protocols (continued)**

Protocol Name	Description
<b>secure-http</b>	Secured HTTP
<b>secure-imap</b>	Internet Message Access Protocol over TLS/SSL
<b>secure-irc</b>	Internet Relay Chat over TLS/SSL
<b>secure-ldap</b>	Lightweight Directory Access Protocol over TLS/SSL
<b>secure-nntp</b>	Network News Transfer Protocol over TLS/SSL
<b>secure-pop3</b>	Post Office Protocol over TLS/SSL
<b>secure-telnet</b>	Telnet over TLS/SSL
<b>sip</b>	Session Initiation Protocol
<b>skinny</b>	Skinny Protocol
<b>smtp</b>	Simple Mail Transfer Protocol
<b>snapshot</b>	Snapshot routing support
<b>snmp</b>	Simple Network Protocol
<b>socks</b>	SOCKS
<b>sqlnet</b>	Structured Query Language (SQL)*NET for Oracle
<b>sqlserver</b>	Microsoft SQL Server
<b>ssh</b>	Secured shell
<b>streamwork</b>	Xing Technology StreamWorks player
<b>sunrpc</b>	Sun remote-procedure call (RPC)
<b>syslog</b>	System Logging Utility
<b>telnet</b>	Telnet
<b>tftp</b>	Trivial File Transfer Protocol
<b>vdolive</b>	VDOLive streaming video
<b>vofr*</b>	Voice over Frame Relay packets
<b>xwindows*</b>	X-Windows remote access

\* This protocol is not supported on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine.

#### **Match Protocol Command Restrictions (Catalyst 6500 Series Switches Only)**

Policy maps contain traffic classes. Traffic classes contain one or more **match** commands that can be used to match packets (and organize them into groups) on the basis of a protocol type or application. You can create as many traffic classes as needed.

Cisco IOS Release 12.2(18)ZY includes software intended for use on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine. For this release and platform, note the following restrictions for using policy maps and **match protocol** commands:

- A single traffic class can be configured to match a maximum of 8 protocols or applications.
- Multiple traffic classes can be configured to match a cumulative maximum of 95 protocols or applications.

**Examples**

The following example specifies a class map called ftp and configures the protocol as match criteria:

```
Router(config)# class-map ftp
Router(config-cmap)# match protocol ftp
```

**Related Commands**

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match access-group</b>	Configures the match criteria for a class map based on the specified ACL.
<b>match input-interface</b>	Configures a class map to use the specified input interface as a match criterion.
<b>match mpls experimental</b>	Configures a class map to use the specified value of the experimental field as a match criterion.
<b>match precedence</b>	Identifies IP precedence values as match criteria.
<b>match protocol (NBAR)</b>	Configures NBAR to match traffic by a protocol type known to NBAR.
<b>match qos-group</b>	Configures a class map to use the specified EXP field value as a match criterion.

# match protocol (NBAR)

To configure Network-Based Application Recognition (NBAR) to match traffic by a protocol type known to NBAR, use the **match protocol** command in class-map configuration mode. To disable NBAR from matching traffic by a known protocol type, use the **no** form of this command.

**match protocol** *protocol-name* [*variable-field-name value*]

**no match protocol** *protocol-name* [*variable-field-name value*]

## Syntax Description

<i>protocol-name</i>	Particular protocol type known to NBAR. These known protocol types can be used to match traffic. For a list of protocol types known to NBAR, see <a href="#">Table 16</a> in “Usage Guidelines.”
<i>variable-field-name</i>	(Optional and usable only with custom protocols) Predefined variable that was created when you created a custom protocol. The <i>variable-field-name</i> will match the <i>field-name</i> variable entered when you created the custom protocol.
<i>value</i>	(Optional and usable only with custom protocols) Specific value in the custom payload to match. A value can be entered along with a <i>variable-field-name</i> only. The value can be expressed in decimal or hexadecimal format.

## Command Default

Traffic is not matched by a protocol type known to NBAR.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.0(5)XE2	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E and the <i>variable-field-name value</i> option was added.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.1(13)T	This command was integrated into Cisco IOS Release 12.1(13)T and became available on Catalyst 6000 family switches without FlexWAN modules.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.4(2)T	This command was integrated into Cisco IOS Release 12.4(2)T and modified to include support for additional protocols, such as the BitTorrent protocol.
12.4(4)T	This command was modified to include support for additional protocols, such as the Skype and DirectConnect protocols.

Release	Modification
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY. This command was modified to enhance NBAR functionality on the Catalyst 6500 series switch that is equipped with the Supervisor 32/programmable intelligent services accelerator (PISA) engine.

### Usage Guidelines

Use the **match protocol** (NBAR) command to match protocol types that are known to NBAR. NBAR is capable of classifying the following types of protocols:

- Non-UDP and non-TCP IP protocols
- TCP and UDP protocols that use statically assigned port numbers
- TCP and UDP protocols that dynamically assign port numbers and therefore require stateful inspection.

[Table 16](#) lists the protocols NBAR can classify. This table organizes the NBAR supported protocols by category.

**Table 16** NBAR-Supported Protocols

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Enterprise Application	Citrix ICA	TCP/UDP	Dynamically Assigned	Citrix ICA traffic by application name	citrix citrix app	12.1(2)E 12.1(5)T
	PCAnywhere	TCP	5631, 65301	Symantic pcAnywhere	pcanywhere	12.0(5)XE2 12.1(1)E 12.1(5)T
	PCAnywhere	UDP	22, 5632	Symantic pcAnywhere	pcanywhere	12.0(5)XE2 12.1(1)E 12.1(5)T
	Novadigm	TCP/UDP	3460–3465	Novadigm Enterprise Desktop Manager (EDM)	novadigm	12.1(2)E 12.1(5)T
	SAP	TCP	3300–3315 (sap-pgm.pdlm) 3200–3215 (sap-app.pdlm) 3600–3615 (sap-msg.pdlm)	Application server to application server traffic (sap-pgm.pdlm) Client to application server traffic (sap-app.pdlm) Client to message server traffic (sap-msg.pdlm)	sap	12.3 12.3T 12.2T 12.1E

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Routing Protocol	BGP	TCP/UDP	179	Border Gateway Protocol	bgp	12.0(5)XE2 12.1(1)E 12.1(5)T
	EGP	IP	8	Exterior Gateway Protocol	egp	12.0(5)XE2 12.1(1)E 12.1(5)T
	EIGRP	IP	88	Enhanced Interior Gateway Routing Protocol	eigrp	12.0(5)XE2 12.1(1)E 12.1(5)T
	OSPF	TCP	Dynamically Assigned	Open Shortest Path First	ospf	12.3(8)T
	RIP	UDP	520	Routing Information Protocol	rip	12.0(5)XE2 12.1(1)E 12.1(5)T
Database	SQL*NET	TCP/UDP	Dynamically Assigned	SQL*NET for Oracle	sqlnet	12.0(5)XE2 12.1(1)E 12.1(5)T
	MS-SQLServer	TCP	1433	Microsoft SQL Server Desktop Videoconferencing	sqlserver	12.0(5)XE2 12.1(1)E 12.1(5)T
Security and Tunneling	GRE	IP	47	Generic Routing Encapsulation	gre	12.0(5)XE2 12.1(1)E 12.1(5)T
	IPINIP	IP	4	IP in IP	ipinip	12.0(5)XE2 12.1(1)E 12.1(5)T
	IPsec	IP	50, 51	IP Encapsulating Security Payload/Authentication-Header	ipsec	12.0(5)XE2 12.1(1)E 12.1(5)T
	L2TP	UDP	1701	L2F/L2TP Tunnel	l2tp	12.0(5)XE2 12.1(1)E 12.1(5)T
	MS-PPTP	TCP	1723	Microsoft Point-to-Point Tunneling Protocol for VPN	pptp	12.0(5)XE2 12.1(1)E 12.1(5)T
	SFTP	TCP	990	Secure FTP	secure-ftp	12.0(5)XE2 12.1(1)E 12.1(5)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Security and Tunneling (continued)	SHTTP	TCP	443	Secure HTTP	secure-http	12.0(5)XE2 12.1(1)E 12.1(5)T
	SIMAP	TCP/ UDP	585, 993	Secure IMAP	secure-imap	12.0(5)XE2 12.1(1)E 12.1(5)T
	SIRC	TCP/ UDP	994	Secure IRC	secure-irc	12.0(5)XE2 12.1(1)E 12.1(5)T
	SLDAP	TCP/ UDP	636	Secure LDAP	secure-ldap	12.0(5)XE2 12.1(1)E 12.1(5)T
	SNNTTP	TCP/ UDP	563	Secure NNTP	secure-nntp	12.0(5)XE2 12.1(1)E 12.1(5)T
	SPOP3	TCP/ UDP	995	Secure POP3	secure-pop3	12.0(5)XE2 12.1(1)E 12.1(5)T
	STELNET	TCP	992	Secure Telnet	secure-telnet	12.0(5)XE2 12.1(1)E 12.1(5)T
	SOCKS	TCP	1080	Firewall Security Protocol	socks	12.0(5)XE2 12.1(1)E 12.1(5)T
	SSH	TCP	22	Secured Shell	ssh	12.0(5)XE2 12.1(1)E 12.1(5)T
Network Management	ICMP	IP	1	Internet Control Message Protocol	icmp	12.0(5)XE2 12.1(1)E 12.1(5)T
	SNMP	TCP/ UDP	161, 162	Simple Network Management Protocol	snmp	12.0(5)XE2 12.1(1)E 12.1(5)T
	Syslog	UDP	514	System Logging Utility	syslog	12.0(5)XE2 12.1(1)E 12.1(5)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Network Mail Services	IMAP	TCP/UDP	143, 220	Internet Message Access Protocol	imap	12.0(5)XE2 12.1(1)E 12.1(5)T
	POP3	TCP/UDP	110	Post Office Protocol	pop3	12.0(5)XE2 12.1(1)E 12.1(5)T
	Exchange	TCP	135	MS-RPC for Exchange	exchange	12.0(5)XE2 12.1(1)E 12.1(5)T
	Notes	TCP/UDP	1352	Lotus Notes	notes	12.0(5)XE2 12.1(1)E 12.1(5)T
	SMTP	TCP	25	Simple Mail Transfer Protocol	smtp	12.0(5)XE2 12.1(1)E 12.1(5)T
Directory	DHCP/BOOTP	UDP	67, 68	Dynamic Host Configuration Protocol/Bootstrap Protocol	dhcp	12.0(5)XE2 12.1(1)E 12.1(5)T
	Finger	TCP	79	Finger User Information Protocol	finger	12.0(5)XE2 12.1(1)E 12.1(5)T
	DNS	TCP/UDP	53	Domain Name System	dns	12.0(5)XE2 12.1(1)E 12.1(5)T
	Kerberos	TCP/UDP	88, 749	Kerberos Network Authentication Service	kerberos	12.0(5)XE2 12.1(1)E 12.1(5)T
	LDAP	TCP/UDP	389	Lightweight Directory Access Protocol	ldap	12.0(5)XE2 12.1(1)E 12.1(5)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Streaming Media	CU-SeeMe	TCP/UDP	7648, 7649	Desktop Video Conferencing	cuseeme	12.0(5)XE2 12.1(1)E 12.1(5)T
	CU-SeeMe	UDP	24032	Desktop Video Conferencing	cuseeme	12.0(5)XE2 12.1(1)E 12.1(5)T
	Netshow	TCP/UDP	Dynamically Assigned	Microsoft Netshow	netshow	12.0(5)XE2 12.1(1)E 12.1(5)T
	RealAudio	TCP/UDP	Dynamically Assigned	RealAudio Streaming Protocol	realaudio	12.0(5)XE2 12.1(1)E 12.1(5)T
	StreamWorks	UDP	Dynamically Assigned	Xing Technology Stream Works Audio and Video	streamwork	12.0(5)XE2 12.1(1)E 12.1(5)T
	VDOLive	TCP/UDP	Dynamically Assigned	VDOLive Streaming Video	vdolive	12.0(5)XE2 12.1(1)E 12.1(5)T
Streaming Media/Multimedia	RTSP	TCP/UDP	Dynamically Assigned	Real Time Streaming Protocol	rtsp	12.3(11)T
	MGCP	TCP/UDP	2427, 2428, 2727	Media Gateway Control Protocol	mgcp	12.3(7)T
Internet	FTP	TCP	Dynamically Assigned	File Transfer Protocol	ftp	12.0(5)XE2 12.1(1)E 12.1(5)T
	Gopher	TCP/UDP	70	Internet Gopher Protocol	gopher	12.0(5)XE2 12.1(1)E 12.1(5)T
	HTTP	TCP	80 <sup>2</sup>	Hypertext Transfer Protocol	http	12.0(5)XE2 12.1(1)E 12.1(5)T
	IRC	TCP/UDP	194	Internet Relay Chat	irc	12.0(5)XE2 12.1(1)E 12.1(5)T
	Telnet	TCP	23	Telnet Protocol	telnet	12.0(5)XE2 12.1(1)E 12.1(5)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Internet (continued)	TFTP	UDP	Dynamically Assigned	Trivial File Transfer Protocol	tftp	12.0(5)XE2 12.1(1)E 12.1(5)T
	NNTP	TCP/UDP	119	Network News Transfer Protocol	nntp	12.0(5)XE2 12.1(1)E 12.1(5)T
Signaling	RSVP	UDP	1698, 1699	Resource Reservation Protocol	rsvp	12.0(5)XE2 12.1(1)E 12.1(5)T
RPC	NFS	TCP/UDP	2049	Network File System	nfs	12.0(5)XE2 12.1(1)E 12.1(5)T
	Sunrpc	TCP/UDP	Dynamically Assigned	Sun Remote Procedure Call	sunrpc	12.0(5)XE2 12.1(1)E 12.1(5)T
Non-IP and LAN/Legacy	NetBIOS	TCP/UDP	137, 138, 139	NetBIOS over IP (MS Windows)	netbios	12.0(5)XE2 12.1(1)E 12.1(5)T
Misc.	NTP	TCP/UDP	123	Network Time Protocol	ntp	12.0(5)XE2 12.1(1)E 12.1(5)T
	Printer	TCP/UDP	515	Printer	printer	12.1(2)E 12.1(5)T
	X Windows	TCP	6000–6003	X11, X Windows	xwindows	12.0(5)XE2 12.1(1)E 12.1(5)T
	r-commands	TCP	Dynamically Assigned	rsh, rlogin, rexec	rcmd	12.0(5)XE2 12.1(1)E 12.1(5)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Voice	H.323	TCP	Dynamically Assigned	H.323 Teleconferencing Protocol	h323	12.3(7)T
	RTCP	TCP/UDP	Dynamically Assigned	Real-Time Control Protocol	rtcp	12.1E 12.2T 12.3 12.3T 12.3(7)T
	RTP	TCP/UDP	Dynamically Assigned	Real-Time Transport Protocol Payload Classification	rtp	12.2(8)T
	SIP	TCP/UDP	5060	Session Initiation Protocol	sip	12.3(7)T
	SCCP/ Skinny	TCP	2000, 2001, 2002	Skiny Client Control Protocol	skinny	12.3(7)T
	Skype <sup>3</sup>	TCP/UDP	Dynamically Assigned	Peer-to-Peer VoIP Client Software <b>Note</b> Cisco currently supports Skype version 1 only.	skype	12.4(4)T

Table 16 NBAR-Supported Protocols (continued)

Category	Protocol	Type	Well-Known Port Number	Description	Syntax	Cisco IOS Release <sup>1</sup>
Peer-to-Peer File-Sharing Applications	BitTorrent	TCP	Dynamically Assigned, or 6881-6889	BitTorrent File Transfer Traffic	bittorrent	12.4(2)T
	Direct Connect	TCP/UDP	411	Direct Connect File Transfer Traffic	directconnect	12.4(4)T
	eDonkey/eMule	TCP	4662	eDonkey File-Sharing Application eMule traffic is also classified as eDonkey traffic in NBAR.	edonkey	12.3(11)T
	FastTrack	N/A	Dynamically Assigned	FastTrack	fasttrack	12.1(12c)E
	Gnutella	TCP	Dynamically Assigned	Gnutella	gnutella	12.1(12c)E
	KaZaA	TCP/UDP	Dynamically Assigned	KaZaA Note that earlier KaZaA version 1 traffic can be classified using FastTrack.	kazaa2	12.2(8)T
	WinMX	TCP	6699	WinMX Traffic	winmx	12.3(7)T

<sup>1</sup>Indicates the Cisco IOS maintenance release that first supported the protocol. This table is updated when a protocol is added to a new Cisco IOS release train.

<sup>2</sup>In Cisco IOS Release 12.3(4)T, the NBAR Extended Inspection for Hypertext Transfer Protocol (HTTP) Traffic feature was introduced. This feature allows NBAR to scan TCP ports that are not well known and identify HTTP traffic traversing these ports.

<sup>3</sup>Skype was introduced in Cisco IOS Release 12.4(4)T. As a result of this introduction, Skype is now native in (included with) Cisco IOS software and uses the NBAR infrastructure new to Cisco IOS Release 12.4(4)T.

#### Custom Protocols Created with the ip nbar custom Command

The *variable-field-name* value is used in conjunction with the *variable field-name field-length* options that are entered when you create a custom protocol using the **ip nbar custom** command. The variable option allows NBAR to match traffic on the basis of a specific value of a custom protocol. For instance, if **ip nbar custom ftd 125 variable scid 2 tcp range 5001 5005** is entered to create a custom protocol, and then a class map using the **match protocol ftd scid 804** is created, the created class map will match all traffic that has the value “804” at byte 125 entering or leaving TCP ports 5001 to 5000.

Up to 24 variable values per custom protocol can be expressed in class maps. For instance, in the following configuration, 4 variables are used and 20 more “scid” values could be used.

```
Router(config)# ip nbar custom ftdd field scid 125 variable 1 tcp range 5001 5005
Router(config)# class-map active-craft
Router(config-cmap)# match protocol ftdd scid 0x15
Router(config-cmap)# match protocol ftdd scid 0x21
```

```
Router(config)# class-map passive-craft
Router(config-cmap)# match protocol ftdd scid 0x11
Router(config-cmap)# match protocol ftdd scid 0x22
```

### Match Protocol Command Restrictions (Catalyst 6500 Series Switches Only)

Policy maps contain traffic classes. Traffic classes contain one or more **match** commands that can be used to match packets (and organize them into groups) on the basis of a protocol type or application. You can create as many traffic classes as needed.

Cisco IOS Release 12.2(18)ZY includes software intended for use on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine. For this release and platform, note the following restrictions for using policy maps and **match protocol** commands:

- A single traffic class can be configured to match a maximum of 8 protocols or applications.
- Multiple traffic classes can be configured to match a cumulative maximum of 95 protocols or applications.

### Examples

The following example configures NBAR to match FTP traffic:

```
Router(config-cmap)# match protocol ftp
```

In the following example, custom protocol ftdd is created by using a variable. A class map matching this custom protocol based on the variable is also created. In this example, class map matchscidinfthdd will match all traffic that has the value "804" at byte 125 entering or leaving TCP ports 5001 to 5005. The variable scid is 2 bytes in length.

```
Router(config)# ip nbar custom ftdd 125 variable scid 2 tcp range 5001 5005
```

```
Router(config)# class-map matchscidinfthdd
Router(config-cmap)# match protocol ftdd scid 804
```

The same example above can also be done by using hexadecimal values in the class map as follows:

```
Router(config)# ip nbar custom ftdd 125 variable scid 2 tcp range 5001 5005
```

```
Router(config)# class-map matchscidinfthdd
Router(config-cmap)# match protocol ftdd scid 0x324
```

In the following example, the **variable** keyword is used while you create a custom protocol, and class maps are configured to classify different values within the variable field into different traffic classes. Specifically, in the example below, variable scid values 0x15, 0x21, and 0x27 will be classified into class map active-craft, while scid values 0x11, 0x22, and 0x25 will be classified into class map passive-craft.

```
Router(config)# ip nbar custom ftdd field scid 125 variable 1 tcp range 5001 5005
```

```
Router(config)# class-map active-craft
Router(config-cmap)# match protocol ftdd scid 0x15
Router(config-cmap)# match protocol ftdd scid 0x21
Router(config-cmap)# match protocol ftdd scid 0x27
```

```
Router(config)# class-map passive-craft
Router(config-cmap)# match protocol ftdd scid 0x11
Router(config-cmap)# match protocol ftdd scid 0x22
Router(config-cmap)# match protocol ftdd scid 0x25
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>ip nbar custom</b>	Extends the capability of NBAR Protocol Discovery to classify and monitor additional static port applications, or allows NBAR to classify nonsupported static port traffic.

# match protocol citrix

To configure network-based application recognition (NBAR) to match Citrix traffic, use the **match protocol citrix** command in class-map configuration mode. To disable NBAR from matching Citrix traffic, use the **no** form of this command.

```
match protocol citrix [app application-name-string] [ica-tag ica-tag-value]
```

```
no match protocol citrix [app application-name-string] [ica-tag ica-tag-value]
```

## Syntax Description

<b>app</b>	(Optional) Specifies matching of an application name string.
<i>application-name-string</i>	(Optional) Specifies the string to be used as the subprotocol parameter.
<b>ica-tag</b>	(Optional) Specifies tagging of Independent Computing Architecture (ICA) packets.
<i>ica-tag-value</i>	(Optional) Specifies the priority tag of ICA packets. Priority tag values can be in the range of 0 to 3.

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.1(2)E	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.4(2)T	This command was modified to include the <b>ica-tag</b> keyword and the <i>ica-tag-value</i> argument.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Entering the **match protocol citrix** command without the **app** keyword establishes all Citrix traffic as successful match criteria.

Entering the **match protocol citrix** command with the **ica-tag** keyword prioritizes Citrix ICA traffic. The priority tag values can be a number from 0 to 3, with 0 having the highest priority and 3 the lowest.

## Examples

The following example configures NBAR to match all Citrix traffic:

```
match protocol citrix
```

The following example configures NBAR to match Citrix traffic with the application name of packet1:

```
match protocol citrix app packet1
```

The following example configures NBAR to give Citrix ICA traffic a priority of 1:

```
match protocol citrix ica-tag-1
```

# match protocol fasttrack

To configure network-based application recognition (NBAR) to match FastTrack peer-to-peer traffic, use the **match protocol fasttrack** command in class-map configuration mode. To disable NBAR from matching FastTrack traffic, use the **no** form of this command.

**match protocol fasttrack file-transfer** *“regular-expression”*

**no match protocol fasttrack file-transfer** *“regular-expression”*

## Syntax Description

<b>file-transfer</b>	Indicates that a regular expression will be used to identify specific FastTrack traffic.
<i>“regular-expression”</i>	Regular expression used to identify specific FastTrack traffic. For instance, entering “cisco” as the regular expression would classify the FastTrack traffic containing the string “cisco” as matches for the traffic policy.  To specify that all FastTrack traffic be identified by the traffic class, use “*” as the regular expression.

## Command Default

NBAR is not configured to match FastTrack peer-to-peer traffic

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.1(12c)E	This command was introduced.
12.1(13)E	This command became available on Catalyst 6000 family switches without FlexWAN modules.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

To specify that all FastTrack traffic be identified by the traffic class, use “\*” as the regular expression. Applications that use FastTrack include KaZaA, Grokster, and Morpheus (although newer versions of Morpheus use Gnutella).

## Examples

The following example configures NBAR to match all FastTrack traffic:

```
match protocol fasttrack file-transfer *
```

In the following example, all FastTrack files that have the “.mpeg” extension will be classified into class map nbar:

```
class-map match-all nbar
  match protocol fasttrack file-transfer "*.mpeg"
```

The following example configures NBAR to match FastTrack traffic that contains the string “cisco”:

```
match protocol fasttrack file-transfer "**cisco**"
```

# match protocol gnutella

To configure network-based application recognition (NBAR) to match Gnutella peer-to-peer traffic, use the **match protocol gnutella** command in class-map configuration mode. To disable NBAR from matching Gnutella traffic, use the **no** form of this command.

**match protocol gnutella file-transfer** *“regular-expression”*

**no match protocol gnutella file-transfer** *“regular-expression”*

Syntax Description	file-transfer	Indicates that a regular expression will be used to identify specific Gnutella traffic.
	<i>“regular-expression”</i>	The regular expression used to identify specific Gnutella traffic. For instance, entering “cisco” as the regular expression would classify the Gnutella traffic containing the string “cisco” as matches for the traffic policy.  To specify that all Gnutella traffic be identified by the traffic class, use “*” as the regular expression.

**Command Default** No behavior or values are predefined.

**Command Modes** Class-map configuration

Command History	Release	Modification
	12.1(12c)E	This command was introduced.
	12.1(13)E	This command became available on Catalyst 6000 family switches without FlexWAN modules.
	12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** To specify that all Gnutella traffic be identified by the traffic class, use “\*” as the regular expression.

Applications that use Gnutella include the following:

- BearShare
- Gnewtellium
- Gnucleus
- Gtk-Gnutella
- JTella
- LimeWire

- Morpheus
- Mutella
- Phex
- Qtella
- Swapper
- XoloX
- XCache

---

**Examples**

The following example configures NBAR to match all Gnutella traffic:

```
match protocol gnutella file-transfer "**"
```

In the following example, all Gnutella files that have the “.mpeg” extension will be classified into class map nbar:

```
class-map match-all nbar
  match protocol gnutella file-transfer "*.mpeg"
```

In the following example, only Gnutella traffic that contains the characters “cisco” is classified:

```
class-map match-all nbar
  match protocol gnutella file-transfer "**cisco**"
```

# match protocol http

To configure Network-Based Application Recognition (NBAR) to match HTTP traffic by URL, host, Multipurpose Internet Mail Extension (MIME) type, or fields in HTTP packet headers, use the **match protocol http** command in class-map configuration mode. To disable NBAR from matching HTTP traffic by URL, host, or MIME type, or fields in HTTP packet headers, use the **no** form of this command.

```
match protocol http [url url-string | host hostname-string | mime MIME-type | c-header-field
c-header-field-string | s-header-field s-header-field-string]
```

```
no match protocol http [url url-string | host hostname-string | mime MIME-type | c-header-field
c-header-field-string | s-header-field s-header-field-string]
```

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```
match protocol http [content-encoding content-encoding-name-string | from from-address-string
| host hostname-string | location location-name-string | mime MIME-type | referer
referer-address-string | server server-software-name-string | url url-string | user-agent
user-agent-software-name-string]
```

```
no match protocol http [content-encoding content-encoding-name-string | from
from-address-string | host hostname-string | location location-name-string | mime
MIME-type | referer referer-address-string | server server-software-name-string | url
url-string | user-agent user-agent-software-name-string]
```

### Syntax Description

<b>url</b>	(Optional) Specifies matching by a URL.
<i>url-string</i>	(Optional) User-specified URL of HTTP traffic to be matched.
<b>host</b>	(Optional) Specifies matching by a hostname.
<i>hostname-string</i>	(Optional) User-specified hostname to be matched.
<b>mime</b>	(Optional) Specifies matching by a MIME text string.
<i>MIME-type</i>	(Optional) User-specified MIME text string to be matched.
<b>c-header-field</b>	(Optional) Specifies matching by a string in the header field in HTTP client messages.
	<b>Note</b> HTTP client messages are often called HTTP request messages.
<i>c-header-field-string</i>	(Optional) User-specified text string within the HTTP client message (HTTP request message) to be matched.
<b>s-header-field</b>	(Optional) Specifies matching by a string in the header field in the HTTP server messages
	<b>Note</b> HTTP server messages are often called HTTP response messages.
<i>s-header-field-string</i>	(Optional) User-specified text within the HTTP server message (HTTP response message) to be matched.

**Catalyst 6500 Series Switch Equipped with the Supervisor 32/PISA Engine**

<b>content-encoding</b>	(Optional) Specifies matching by the encoding mechanism used to package the entity body.
<i>content-encoding-name-string</i>	(Optional) User-specified content-encoding name.
<b>from</b>	(Optional) Specifies matching by the e-mail address of the person controlling the user agent.
<i>from-address-string</i>	(Optional) User-specified e-mail address.
<b>location</b>	(Optional) Specifies matching by the exact location of the resource from request.
<i>location-name-string</i>	(Optional) User-specified location of the resource.
<b>referer</b>	(Optional) Specifies matching by the address from which the resource request was obtained.
<i>referer-address-name-string</i>	(Optional) User-specified address of the referer resource.
<b>server</b>	(Optional) Specifies matching by the software used by the origin server handling the request.
<i>server-software-name-string</i>	(Optional) User-specified software name.
<b>user-agent</b>	(Optional) Specifies matching by the software used by the agent sending the request.
<i>user-agent-software-name-string</i>	(Optional) User-specified name of the software used by the agent sending the request.

**Command Default**

NBAR does not match HTTP traffic by URL, host, MIME type, or fields in HTTP packet headers.

**Command Modes**

Class-map configuration (config-cmap)

**Command History**

Release	Modification
12.0(5)XE2	This command was introduced.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(2)E	This command was modified to include the <i>hostname-string</i> argument.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.1(13)E	This command became available on Catalyst 6000 family switches without FlexWAN modules.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T, and the NBAR Extended Inspection for HTTP Traffic feature was introduced. This feature allows NBAR to scan TCP ports that are not well known and to identify HTTP traffic traversing these ports.

Release	Modification
12.4(2)T	The command was integrated into Cisco IOS Release 12.4(2)T and was modified to include the <b>c-header-field</b> <i>c-header-field-string</i> and <b>s-header-field</b> <i>s-header-field-string</i> keywords and arguments.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(18)ZY2	This command was integrated into Cisco IOS Release 12.2(18)ZY2, and support was provided for the Catalyst 6500 series switch that is equipped with the Supervisor 32/PISA engine.  <b>Note</b> For this Cisco IOS release and this platform, the <b>c-header-field</b> <i>c-header-field-string</i> and <b>s-header-field</b> <i>s-header-field-string</i> keywords and arguments are not available. To achieve the same functionality, use the individual keywords and arguments as shown in the syntax for the Catalyst 6500 series switch.

## Usage Guidelines

### Classification of HTTP Traffic by Host, URL, or MIME

In Cisco IOS Release 12.3(4)T, the NBAR Extended Inspection for HTTP Traffic feature was introduced. This feature allows NBAR to scan TCP ports that are not well-known and that identify HTTP traffic traversing these ports. This feature is enabled automatically when a service policy containing the **match protocol http** command is attached to an interface.

When matching by MIME type, the MIME type can contain any user-specified text string. See the following web page for the IANA-registered MIME types:

<http://www.iana.org/assignments/media-types/index.html>

When matching by MIME type, NBAR matches a packet containing the MIME type and all subsequent packets until the next HTTP transaction.

When matching by host, NBAR performs a regular expression match on the host field contents inside the HTTP packet and classifies all packets from that host.

HTTP client request matching supports GET, PUT, HEAD, POST, DELETE, OPTIONS, and TRACE. When matching by URL, NBAR recognizes the HTTP packets containing the URL and then matches all packets that are part of the HTTP request. When specifying a URL for classification, include only the portion of the URL that follows the *www.hostname.domain* in the **match** statement. For example, for the URL *www.cisco.com/latest/whatsnew.html*, include only */latest/whatsnew.html* with the **match** statement (for instance, **match protocol http url /latest/whatsnew.html**).



#### Note

For Cisco IOS Release 12.2(18)ZY2 on the Cisco Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine, up to 56 parameters or sub-classifications can be specified with the **match protocol http** command. These parameters or sub-classifications can be a combination of any of the available match choices, such as HOST matches, MIME matches, server matches, URL matches, and so on. For other Cisco IOS releases and platforms, the maximum is 24 parameters or sub-classifications.

To match the `www.anydomain.com` portion, use the hostname matching feature. The parameter specification strings can take the form of a regular expression with the following options:

Option	Description
*	Match any zero or more characters in this position.
?	Match any one character in this position.
	Match one of a choice of characters.
(l)	Match one of a choice of characters in a range. For example <code>cisco.(gif   jpg)</code> matches either <code>cisco.gif</code> or <code>cisco.jpg</code> .
[ ]	Match any character in the range specified, or one of the special characters. For example, <code>[0-9]</code> is all of the digits. <code>[*]</code> is the “*” character and <code>[[]</code> is the “[” character.

### Classification of HTTP Header Fields

In Cisco IOS Release 12.3(11)T, NBAR introduced expanded ability for users to classify HTTP traffic using information in the HTTP Header Fields.

HTTP works using a client/server model: HTTP clients open connections by sending a request message to an HTTP server. The HTTP server then returns a response message to the HTTP client (this response message is typically the resource requested in the request message from the HTTP client). After delivering the response, the HTTP server closes the connection and the transaction is complete.

HTTP header fields are used to provide information about HTTP request and response messages. HTTP has numerous header fields. For additional information on HTTP headers, see section 14 of RFC 2616: *Hypertext Transfer Protocol—HTTP/1.1*. This document can be read at the following URL:

<http://www.w3.org/Protocols/rfc2616/rfc2616-sec14.html>

For request messages (client to server), the following HTTP header fields can be identified by using NBAR:

- User-Agent
- Referer

For response messages (server to client), the following header fields can be identified by using NBAR:

- Server
- Location
- Content-Encoding
- Content-Base



#### Note

Use of the Content-Base field has not been implemented by the HTTP community. (See RFC 2616 for details.) Therefore, the Content-Base field is not identified by NBAR on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine.

Within NBAR, the **match protocol http c-header-field** command is used to specify request messages (the “c” in the **c-header-field** portion of the command is for client). The **match protocol http s-header-field** command is used to specify response messages (the “s” in the **s-header-field** portion of the command is for server).

It is important to note that combinations of URL, host, MIME type, and HTTP headers can be used during NBAR configuration. These combinations provide customers with more flexibility to classify specific HTTP traffic based on their network requirements.

**Note**

For Cisco IOS Release 12.2(18)ZY2 on the Cisco Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine, the **c-header-field** and **s-header-field** keywords and associated arguments are not available. Instead, use the individual keywords and arguments as shown in the syntax to achieve the same functionality.

**Examples**

The following example classifies, within class map class1, HTTP packets based on any URL containing the string whatsnew/latest followed by zero or more characters:

```
class-map class1
  match protocol http url whatsnew/latest*
```

The following example classifies, within class map class2, packets based on any hostname containing the string cisco followed by zero or more characters:

```
class-map class2
  match protocol http host cisco*
```

The following example classifies, within class map class3, packets based on the JPEG MIME type:

```
class-map class3
  match protocol http mime "*jpeg"
```

In the following example, any response message that contains “gzip” in the Content-Base (if available), Content-Encoding, Location, or Server header fields will be classified by NBAR. Typically, the term “gzip” would be found in the Content-Encoding header field of the response message.

```
class-map class4
  match protocol http s-header-field "gzip"
```

In the following example, HTTP header fields are combined with a URL to classify traffic. In this example, traffic with a User-Agent field of “CERN-LineMode/3.0” and a Server field of “CERN/3.0”, along with URL “www.cisco.com”, will be classified using NBAR.

```
class-map match-all c-http
  match protocol http c-header-field "CERN-LineMode/3.0"
  match protocol http s-header-field "CERN/3.0"
  match protocol http url "www.cisco.com"
```

**Catalyst 6500 Series Router Equipped with a Supervisor 32/PISA Engine Example**

In the following two examples, the individual keywords and associated arguments are used to specify traffic (instead of the **c-header-field** and the **s-header-field** keywords).

In the first example, the **user-agent**, **referrer**, and **from** keywords are specified. In the second example, the server, location, content-encoding keywords are specified.

```
class-map match-all test1
  match protocol http user-agent Mozilla
  match protocol http referrer *10.0.10.50
  match protocol http from *cisco.com

class-map match-all test2
  match protocol http server Apache
  match protocol http location *cisco.com
  match protocol http content-encoding compress
```

# match protocol rtp

To configure network-based application recognition (NBAR) to match Real-Time Transfer Protocol (RTP) traffic, use the **match protocol rtp** command in class-map configuration mode. To disable NBAR from matching RTP traffic, use the **no** form of this command.

**match protocol rtp** [**audio** | **video** | **payload-type** *payload-string*]

**no match protocol rtp** [**audio** | **video** | **payload-type** *payload-string*]

## Syntax Description

<b>audio</b>	(Optional) Specifies matching by audio payload-type values in the range of 0 to 23. These payload-type values are reserved for audio traffic.
<b>video</b>	(Optional) Specifies matching by video payload-type values in the range of 24 to 33. These payload-type values are reserved for video traffic.
<b>payload-type</b>	(Optional) Specifies matching by a specific payload-type value, providing more granularity than is available with the <b>audio</b> or <b>video</b> keywords.
<i>payload-string</i>	(Optional) User-specified string that contains the specific payload-type values.  A <i>payload-string</i> argument can contain commas to separate payload-type values and hyphens to indicate a range of payload-type values. A <i>payload-string</i> argument can be specified in hexadecimal (prepend 0x to the value) and binary (prepend b to the value) notation in addition to standard number values.

## Command Default

No match criteria are specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.2(8)T	This command was introduced.
12.1(11b)E	This command was integrated into Cisco IOS Release 12.1(11b)E.
12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Entering the **match protocol rtp** command without any other keywords establishes all RTP traffic as successful match criteria.

RTP is a packet format for multimedia data streams. It can be used for media-on-demand as well as interactive services such as Internet telephony. RTP consists of a data and a control part. The control part is called Real-Time Transport Control Protocol (RTCP). It is important to note that the NBAR RTP Payload Classification feature does not identify RTCP packets and that RTCP packets run on odd-numbered ports while RTP packets run on even-numbered ports.

The payload type field of an RTP packet identifies the format of the RTP payload and is represented by a number. NBAR matches RTP traffic on the basis of this field in the RTP packet. A working knowledge of RTP and RTP payload types is helpful if you want to configure NBAR to match RTP traffic. For more information about RTP and RTP payload types, refer to RFC 1889, *RTP: A Transport Protocol for Real-Time Applications*.

---

## Examples

The following example configures NBAR to match all RTP traffic:

```
class-map class1
  match protocol rtp
```

The following example configures NBAR to match RTP traffic with the payload-types 0, 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 64:

```
class-map class2
  match protocol rtp payload-type "0, 1, 4-0x10, 10001b-10010b, 64"
```

# match qos-group

To identify a specific quality of service (QoS) group value as a match criterion, use the **match qos-group** command in class-map configuration mode. To remove a specific QoS group value from a class map, use the **no** form of this command.

**match qos-group** *qos-group-value*

**no match qos-group** *qos-group-value*

## Syntax Description

<i>qos-group-value</i>	The exact value from 0 to 99 used to identify a QoS group value.
------------------------	--

## Command Default

No match criterion is specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
11.1CC	This command was introduced.
12.05(XE)	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

The **match qos-group** command is used by the class map to identify a specific QoS group value marking on a packet. This command can also be used to convey the received Multiprotocol Label Switching (MPLS) experimental (EXP) field value to the output interface.

The *qos-group-value* argument is used as a marking only. The QoS group values have no mathematical significance. For instance, the *qos-group-value* of 2 is not greater than 1. The value simply indicates that a packet marked with the *qos-group-value* of 2 is different than a packet marked with the *qos-group-value* of 1. The treatment of these packets is defined by the user through the setting of QoS policies in QoS policy-map class configuration mode.

The QoS group value is local to the router, meaning that the QoS group value that is marked on a packet does not leave the router when the packet leaves the router. If you need a marking that resides in the packet, use IP precedence setting, IP differentiated services code point (DSCP) setting, or another method of packet marking.

This command can be used with the **random-detect discard-class-based** command.

**Examples**

The following example shows how to configure the service policy called “priority50” and attach service policy “priority50” to an interface. In this example, the class map called “qosgroup5” will evaluate all packets entering Fast Ethernet interface 1/0/0 for a QoS group value of 5. If the incoming packet has been marked with the QoS group value of 5, the packet will be treated with a priority level of 50.

```
Router(config)# class-map qosgroup5
Router(config-cmap)# match qos-group 5
Router(config)# exit
Router(config)# policy-map priority50
Router(config-pmap)# class qosgroup5
Router(config-pmap-c)# priority 50
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface fastethernet1/0/0
Router(config-if)# service-policy output priority50
```

**Related Commands**

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>random-detect discard-class-based</b>	Bases WRED on the discard class value of a packet.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set precedence</b>	Specifies an IP precedence value for packets within a traffic class.
<b>set qos-group</b>	Sets a group ID that can be used later to classify packets.

# match source-address mac

To use the source MAC address as a match criterion, use the **match source-address mac** command in QoS class-map configuration mode. To remove a previously specified source MAC address as a match criterion, use the **no** form of this command.

**match source-address mac** *address-destination*

**no match source-address mac** *address-destination*

<b>Syntax Description</b>	<i>address-destination</i>	The source destination MAC address to be used as a match criterion.
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<b>Command Default</b>	No default behavior or values	
------------------------	-------------------------------	--

<b>Command Modes</b>	QoS class-map configuration	
----------------------	-----------------------------	--

Command History	Release	Modification
	12.0(5)XE	This command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	This command can be used only on an input interface with a MAC address, for example, Fast Ethernet and Ethernet interfaces.
-------------------------	---

This command cannot be used on output interfaces with no MAC address, such as serial and ATM interfaces.

<b>Examples</b>	The following example uses the MAC address mac 0.0.0 as a match criterion:
-----------------	--

```
Router(config)# class-map matchsrcmac
Router(config-cmap)# match source-address mac 0.0.0
```

Related Commands	Command	Description
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

## match start

To configure the match criteria for a class map on the basis of the datagram header (Layer 2 ) or the network header (Layer 3), use the **match start** command in class-map configuration mode. To remove the specified match criteria, use the **no** form of this command.

```
match start {l2-start | l3-start} offset number size number
    {eq | neq | gt | lt | range range | regex string} {value [value2] | [string]}
```

```
no match start {l2-start | l3-start} offset number size number
    {eq | neq | gt | lt | range range | regex string} {value [value2] | [string]}
```

### Syntax Description

<b>l2-start</b>	Match criterion starts from the datagram header.
<b>l3-start</b>	Match criterion starts from the network header.
<b>offset</b> <i>number</i>	Match criterion can be made according to any arbitrary offset.
<b>size</b> <i>number</i>	Number of bytes in which to match.
<b>eq</b>	Match criteria is met if the packet is equal to the specified value or mask.
<b>neq</b>	Match criteria is met if the packet is not equal to the specified value or mask.
<i>mask</i>	(Optional) Can be used when the <b>eq</b> or the <b>neq</b> keywords are issued.
<b>gt</b>	Match criteria is met if the packet is greater than the specified value.
<b>lt</b>	Match criteria is met if the packet is less than the specified value.
<b>range</b> <i>range</i>	Match criteria is based upon a lower and upper boundary protocol field range.
<b>regex</b> <i>string</i>	Match criteria is based upon a string that is to be matched.
<i>value</i>	Value for which the packet must be in accordance with.

### Defaults

No match criteria are configured.

### Command Modes

Class-map configuration

### Command History

Release	Modification
12.4(4)T	This command was introduced.
12.2(18)ZY	This command was integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

**Usage Guidelines**

To the match criteria that is to be used for flexible packet matching, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. Thereafter, you can enter one of the following commands:

- **match-field** (which configures the match criteria for a class map on the basis of the fields defined in the protocol header description files [PHDFs])
- **match-start** (which can be used if a PHDF is not loaded onto the router)

**Examples**

The following example shows how to configure FPM for blaster packets. The class map contains the following match criteria: TCP port 135, 4444 or UDP port 69; and pattern 0x0030 at 3 bytes from start of IP header.

```
load protocol disk2:ip.phdf
load protocol disk2:tcp.phdf
load protocol disk2:udp.phdf

class-map type stack match-all ip-tcp
  match field ip protocol eq 0x6 next tcp

class-map type stack match-all ip-udp
  match field ip protocol eq 0x11 next udp

class-map type access-control match-all blaster1
  match field tcp dest-port eq 135
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster2
  match field tcp dest-port eq 4444
  match start 13-start offset 3 size 2 eq 0x0030

class-map type access-control match-all blaster3
  match field udp dest-port eq 69
  match start 13-start offset 3 size 2 eq 0x0030

policy-map type access-control fpm-tcp-policy
  class blaster1
  drop
  class blaster2
  drop

policy-map type access-control fpm-udp-policy
  class blaster3
  drop

policy-map type access-control fpm-policy
  class ip-tcp
  service-policy fpm-tcp-policy
  class ip-udp
  service-policy fpm-udp-policy

interface gigabitEthernet 0/1
  service-policy type access-control input fpm-policy
```

**Related Commands**

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

<b>Command</b>	<b>Description</b>
<b>load protocol</b>	Loads a PHDF onto a router.
<b>match field</b>	Configures the match criteria for a class map on the basis of the fields defined in the PHDFs.

# match tag (class-map)

To specify the tag to be matched for a tag type of class map, use the **match tag** command in class-map configuration mode. To delete the tag, use the **no** form of this command.

**match tag** *tag-name*

**no match tag** *tag-name*

Syntax Description	<i>tag-name</i>	Name of the tag.
--------------------	-----------------	------------------

Command Default	No match tags are defined.
-----------------	----------------------------

Command Modes	Class-map configuration
---------------	-------------------------

Command History	Release	Modification
	12.4(6)T	This command was introduced.

Usage Guidelines	The access control server (ACS) sends the tag attribute to the network access device (NAD) using the Cisco attribute-value (AV) pair. (The tag attribute can also be sent to the NAD using the IETF attribute 88.)
------------------	--

Examples	The following example shows that the tag to be matched is named “healthy”:
----------	--

```
Router(config)# class-map type tag healthy_class
Router(config-cmap)# match tag healthy
Router(config-cmap)# end
```

Related Commands	Command	Description
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

## match vlan (QoS)

To match and classify traffic on the basis of the virtual local-area network (VLAN) identification number, use the **match vlan** command in class-map configuration mode. To remove a previously specified VLAN identification number as a match criterion, use the **no** form of this command.

**match vlan** *vlan-id-number*

**no match vlan** *vlan-id-number*

### Syntax Description

<i>vlan-id-number</i>	VLAN identification number, numbers, or range of numbers. Valid VLAN identification numbers must be in the range of 1 to 4095.
-----------------------	--

### Command Default

Traffic is not matched on the basis of the VLAN identification number.

### Command Modes

Class-map configuration

### Command History

Release	Modification
12.2(31)SB2	This command was introduced for use on Cisco 10000 series routers only.

### Usage Guidelines

#### Specifying VLAN Identification Numbers

You can specify a single VLAN identification number, multiple VLAN identification numbers separated by spaces (for example, 2 5 7), or a range of VLAN identification numbers separated by a hyphen (for example, 25-35).

#### Support Restrictions

The following restrictions apply to the **match vlan** command:

- The **match vlan** command is supported for IEEE 802.1q and Inter-Switch Link (ISL) VLAN encapsulations only.
- As of Cisco IOS Release 12.2(31)SB2, the **match vlan** command is supported on Cisco 10000 series routers only.

### Examples

In the following sample configuration, the **match vlan** command is enabled to classify and match traffic on the basis of a range of VLAN identification numbers. Packets with VLAN identification numbers in the range of 25 to 50 are placed in the class called class1.

```
Router> enable
Router# configure terminal
Router(config)# class-map class1
Router(config-cmap)# match vlan 25-50
Router(config-cmap)# end
```

**Note**

Typically, the next step would be to configure class1 in a policy map, enable a quality of service (QoS) feature (for example, class-based weighted fair queueing [CBWFQ]) in the policy map, and attach the policy map to an interface. To configure a policy map, use the **policy-map** command. To enable CBWFQ, use the **bandwidth** command (or use the command for the QoS feature that you want to enable). To attach the policy map to an interface, use the **service-policy** command. For more information about classifying network traffic on the basis of a match criterion, see the “Classification” part of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Related Commands**

Command	Description
<b>bandwidth</b> (policy-map class)	Specify or modifies the bandwidth allocated for a class belonging to a policy map.
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces.
<b>service-policy</b>	Attached a policy map to an interface.

# match vlan inner

To configure a class map to match the innermost VLAN ID in an 802.1q tagged frame, use the **match vlan inner** command in ATM interface configuration mode. To remove matching on the innermost VLAN ID of an 802.1q tagged frame, use the **no** form of this command.

**match vlan inner** *vlan-ids*

**no match vlan inner** *vlan-ids*

## Syntax Description

<i>vlan-ids</i>	One or more VLAN IDs to be matched. The valid range for VLAN IDs is from 1 to 4095, and the list of VLAN IDs can include one or all of the following: <ul style="list-style-type: none"> <li>• Single VLAN IDs, separated by spaces. For example: 100 200 300</li> <li>• One or more ranges of VLAN IDs, separated by spaces. For example: 1-1024 2000-2499</li> </ul>
-----------------	--

## Command Default

Packets are not matched on the basis of incoming dot1q VLAN inner IDs.

## Command Modes

Class map configuration

## Command History

Release	Modification
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(18)SXF	This command was implemented on Cisco 7600 series routers.

## Examples

The following example creates a class map that matches packets with a VLAN IDs of 100 to 300.

```
Router(config)# class-map match-all vlan100
Router(config-cmap)# match vlan inner 100
Router(config-cmap)# exit
Router(config)# class-map match-all vlan200
Router(config-cmap)# match vlan inner 200
Router(config-cmap)# exit
Router(config)# class-map match-all vlan300
Router(config-cmap)# match vlan inner 300
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear cef linecard</b>	Clears Cisco Express Forwarding (CEF) information on one or more line cards, but does not clear the CEF information on the main route processor (RP). This forces the line cards to synchronize their CEF information with the information that is on the RP.
<b>match qos-group</b>	Identifies a specified QoS group value as a match criterion.
<b>mls qos trust</b>	Sets the trusted state of an interface to determine which incoming QoS field on a packet, if any, should be preserved.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show platform qos policy-map</b>	Displays the type and number of policy maps that are configured on the router.

# maximum (local policy)

To set the limits for Resource Reservation Protocol (RSVP) resources, use the **maximum** command in local policy configuration mode. To delete the limits, use the **no** form of this command.

**maximum** [**bandwidth** [**group** *x*] [**single** *y*] | **senders** *n*]

**no maximum** [**bandwidth** [**group** *x*] [**single** *y*] | **senders** *n*]

## Syntax Description

<b>bandwidth</b>	(Optional) Indicates bandwidth limits for RSVP reservations.
<b>group</b> <i>x</i>	(Optional) Specifies the amount of bandwidth, in kbps, that can be requested by all the reservations covered by a local policy. The <i>x</i> value ranges from 1 to 10000000.
<b>single</b> <i>y</i>	(Optional) Specifies the maximum bandwidth, in kbps, that can be requested by any specific RSVP reservation covered by a local policy. The <i>y</i> value ranges from 1 to 10000000.
<b>senders</b> <i>n</i>	(Optional) Limits the number of RSVP senders affected by a local policy that can be active at the same time on a router. The value for <i>n</i> ranges from 1 to 50000; the default is 1000.

## Command Default

No maximum bandwidth limit is set and no RSVP senders are configured.

## Command Modes

Local policy configuration

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.4(6)T	This command was modified to apply to RESV messages.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

Previously, the **maximum bandwidth** command applied only to PATH messages. However, as part of the application ID enhancement, this command now applies only to RESV messages. This change has the following benefits:

- Allows the local policy bandwidth limit to be used by RSVP's admission control process for both shared and nonshared reservations. Previous releases that performed group bandwidth checks on PATH messages could not account for bandwidth sharing and, as a result, you had to account for sharing by creating a larger maximum group bandwidth for the policy.
- Allows a local policy to trigger preemption during the admission control function if there is insufficient policy bandwidth to meet the needs of an incoming RESV message.

---

**Examples**

The following example specifies the maximum bandwidth for a group of reservations and for a single reservation, respectively:

```
Router(config-rsvp-local-policy)# maximum bandwidth group 500
Router(config-rsvp-local-policy)# maximum bandwidth single 50
```

---

**Related Commands**

Command	Description
<b>ip rsvp policy local</b>	Determines how to perform authorization on RSVP requests.

---

# maximum header

To specify the maximum size of the compressed IP header, use the **maximum header** command in IPHC-profile configuration mode. To return the maximum size of the compressed IP header to the default size, use the **no** form of this command.

**maximum header** *number-of-bytes*

**no maximum header**

<b>Syntax Description</b>	<i>number-of-bytes</i>	The maximum header size, in bytes. Valid entries are numbers from 20 to 168. Default is 168.
---------------------------	------------------------	--

**Command Default** The maximum size of the compressed IP header is 168 bytes.

**Command Modes** IPHC-profile configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(9)T	This command was introduced.

**Usage Guidelines** The **maximum header** command allows you to define the maximum size of the IP header of a packet to be compressed. Any packet with an IP header that exceeds the maximum size is sent uncompressed. Use the *number-of-bytes* argument of the **maximum header** command to restrict the size of the IP header to be compressed.

### Intended for Use with IPHC Profiles

The **maximum header** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

### Prerequisite

Before using the **maximum header** command, you must enable either TCP header compression or non-TCP header compression. To enable TCP header compression, use the **tcp** command. To enable non-TCP header compression, use the **non-tcp** command.

**Examples**

The following is an example of an IPHC profile called profile2. In this example, the maximum size of the compressed IP header is set to 75 bytes.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp
Router(config-iphcp)# maximum header 75
Router(config-iphcp)# end
```

**Related Commands**

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.
<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.
<b>tcp</b>	Enables TCP header compression within an IPHC profile.

# max-reserved-bandwidth

To change the percent of interface bandwidth allocated for Resource Reservation Protocol (RSVP), class-based weighted fair queueing (CBWFQ), low latency queueing (LLQ), IP RTP Priority, Frame Relay IP RTP Priority, and Frame Relay PVC Interface Priority Queueing (PIPQ), use the **max-reserved-bandwidth** command in interface configuration mode. To restore the default value, use the **no** form of this command.

**max-reserved-bandwidth** *percent*

**no max-reserved-bandwidth**

<b>Syntax Description</b>	<i>percent</i>	Percent of interface bandwidth allocated for RSVP, CBWFQ, LLQ, IP RTP Priority, Frame Relay IP RTP Priority, and Frame Relay PIPQ.
---------------------------	----------------	--

<b>Command Default</b>	75 percent on all supported platforms except the Cisco 7500 series routers, which do not have this restriction.
------------------------	---

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	<p>The sum of all bandwidth allocation on an interface should not exceed 75 percent of the available bandwidth on an interface. The remaining 25 percent of bandwidth is used for overhead, including Layer 2 overhead, control traffic, and best-effort traffic.</p> <p>If you need to allocate more than 75 percent for RSVP, CBWFQ, LLQ, IP RTP Priority, Frame Relay IP RTP Priority, and Frame Relay PIPQ, you can use the <b>max-reserved-bandwidth</b> command. The <i>percent</i> argument specifies the maximum percentage of the total interface bandwidth that can be used.</p> <p>If you do use the <b>max-reserved-bandwidth</b> command, make sure that not too much bandwidth is taken away from best-effort and control traffic.</p>
-------------------------	--

<b>Examples</b>	In the following example, the policy map called policy1 is configured for three classes with a total of 8 Mbps configured bandwidth, as shown in the output from the <b>show policy-map</b> command:
-----------------	--

```
Router# show policy-map policy1
```

```
Policy Map policy1
  Weighted Fair Queueing
```

```

Class class1
  Bandwidth 2500 (kbps) Max Threshold 64 (packets)
Class class2
  Bandwidth 2500 (kbps) Max Threshold 64 (packets)
Class class3
  Bandwidth 3000 (kbps) Max Threshold 64 (packets)

```

When you enter the **service-policy** command in an attempt to attach the policy map on a 10-Mbps Ethernet interface, an error message such as the following is produced:

```
I/f Ethernet1/1 class class3 requested bandwidth 3000 (kbps) Available only 2500 (kbps)
```

The error message is produced because the default maximum configurable bandwidth is 75 percent of the available interface bandwidth, which in this example is 7.5 Mbps. To change the maximum configurable bandwidth to 80 percent, use the **max-reserved-bandwidth** command in interface configuration mode, as follows:

```

max-reserved-bandwidth 80
service output policy1
end

```

To verify that the policy map was attached, enter the **show policy-map interface** command:

```

Router# show policy-map interface e1/1

Ethernet1/1  output :policy1
  Weighted Fair Queueing
    Class class1
      Output Queue:Conversation 265
        Bandwidth 2500 (kbps) Packets Matched 0 Max Threshold 64 (packets)
        (discards/tail drops) 0/0
    Class class2
      Output Queue:Conversation 266
        Bandwidth 2500 (kbps) Packets Matched 0 Max Threshold 64 (packets)
        (discards/tail drops) 0/0
    Class class3
      Output Queue:Conversation 267
        Bandwidth 3000 (kbps) Packets Matched 0 Max Threshold 64 (packets)
        (discards/tail drops) 0/0

```

### Virtual Template Configuration Example

The following example configures a strict priority queue in a virtual template configuration with CBWFQ. The **max-reserved-bandwidth** command changes the maximum bandwidth allocated between CBWFQ and IP RTP Priority from the default (75 percent) to 80 percent.

```

multilink virtual-template 1
interface virtual-template 1
  ip address 172.16.1.1 255.255.255.0
  no ip directed-broadcast
  ip rtp priority 16384 16383 25
  service-policy output policy1
  ppp multilink
  ppp multilink fragment-delay 20
  ppp multilink interleave
  max-reserved-bandwidth 80
end

interface Serial0/1
  bandwidth 64
  ip address 10.1.1.2 255.255.255.0
  no ip directed-broadcast

```

```
encapsulation ppp
ppp multilink
end
```

**Note**

To make the virtual access interface function properly, do not configure the **bandwidth** command on the virtual template. Configure it on the actual interface, as shown in the example.

**Related Commands**

Command	Description
<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>ip rtp priority</b>	Reserves a strict priority queue for a set of RTP packet flows belonging to a range of UDP destination ports.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays the configuration of all classes comprising the specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# mls ip pbr

To enable the multilayer switching (MLS) support for policy-routed packets, use the **mls ip pbr** command in global configuration mode. To disable the MLS support for policy-routed packets, use the **no** form of this command.

**mls ip pbr [null0]**

**no mls ip pbr**

## Syntax Description

**null0** (Optional) Enables the hardware support for the interface null0 in the route-maps.

## Command Default

MLS support for policy-routed packets is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(17d)SXB	This command was introduced on the Supervisor Engine 2 and introduced into Cisco IOS Release 12.2(17d)SXB.
12.2(18)SXE	This command was changed to support the <b>null0</b> keyword.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 720.



### Note

Do not enable PBR and SLB on the same interface; PBR-based packets are not forwarded correctly.

When you enable the hardware-policy routing by entering the **mls ip pbr** command, all policy routing occurs in the hardware and is applied to all interfaces, regardless of which interface was configured for policy routing.

Use the **null0** keyword when you have routed traffic only to enable the hardware support for the **set interface null0** in the route-maps.

## Examples

This example shows how to enable the MLS support for policy-routed packets:

```
Router(config)# mls ip pbr
```

## Related Commands

Command	Description
<b>show tcam interface</b>	Displays information about the interface-based TCAM.
<b>vlan acl</b>	

# mls qos (global configuration mode)

To enable the quality of service (QoS) functionality globally, use the **mls qos** command in global configuration mode. To disable the QoS functionality globally, use the **no** form of this command.

**mls qos**

**no mls qos**

**Syntax Description** This command has no arguments or keywords.

**Command Default** QoS is globally disabled.

**Command Modes** Global configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

If you enable QoS globally, QoS is enabled on all interfaces with the exception of the interfaces where you disabled QoS. If you disable QoS globally, all traffic is passed in QoS pass-through mode.

In port-queueing mode, Policy Feature Card (PFC) QoS (marking and policing) is disabled, and packet type of service (ToS) and class of service (CoS) are not changed by the PFC. All queueing on rcv and xmt is based on a QoS tag in the incoming packet, which is based on the incoming CoS.

For 802.1Q or Inter-Switch Link (ISL)-encapsulated port links, queueing is based on the packet 802.1Q or ISL CoS.

For the router main interfaces or access ports, queueing is based on the configured per-port CoS (the default CoS is 0).

This command enables or disables ternary content addressable memory (TCAM) QoS on all interfaces that are set in the OFF state.

## Examples

This example shows how to enable QoS globally:

```
Router(config)# mls qos
Router(config)#
```

This example shows how to disable QoS globally on the Cisco 7600 series router:

```
Router(config)# no mls qos
Router(config)#
```

Related Commands	Command	Description
	<b>mls qos (interface configuration mode)</b>	Enables the QoS functionality on an interface.
	<b>show mls qos</b>	Displays MLS QoS information.

# mls qos (interface configuration mode)

To enable the quality of service (QoS) functionality on an interface, use the **mls qos** command in interface configuration command mode. To disable QoS functionality on an interface, use the **no** form of this command.

**mls qos**

**no mls qos**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Enabled

**Command Modes** Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is deprecated on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Although the CLI allows you to configure PFC-based QoS on the WAN ports on the OC-12 ATM OSMs and on the WAN ports on the channelized OSMs, PFC-based QoS is not supported on the WAN ports on these OSMs.

If you disable QoS globally, it is also disabled on all interfaces.

This command enables or disables TCAM QoS (classification, marking, and policing) for the interface.

## Examples

This example shows how to enable QoS on an interface:

```
Router(config-if)# mls qos
```

## Related Commands

Command	Description
<b>mls qos (global configuration mode)</b>	Enables the QoS functionality globally.
<b>show mls qos</b>	Displays MLS QoS information.

# mls qos aggregate-policer

To define a named aggregate policer for use in policy maps, use the **mls qos aggregate-policer** command in global configuration mode. To delete a named aggregate policer, use the **no** form of this command.

```
mls qos aggregate-policer name rate-bps [normal-burst-bytes [maximum-burst-bytes | pir
peak-rate-bps | action-type action]]
```

```
no mls qos aggregate-policer name
```

## Syntax Description

<i>name</i>	Name of the aggregate policer. See the “Usage Guidelines” section for naming conventions.
<i>rate-bps</i>	Maximum bits per second. Range is 32000 to 10000000000.
<i>normal-burst-bytes</i>	(Optional) Normal burst bytes. Range is 1000 to 31250000.
<i>maximum-burst-bytes</i>	(Optional) Maximum burst bytes. Range is 1000 to 31250000 (if entered, this value must be set equal to normal-burst-bytes).
<b>pir</b> <i>peak-rate-bps</i>	(Optional) Keyword and argument that set the peak information rate (PIR). Range is 32000 to 10000000000. Default is equal to the normal ( <b>cir</b> ) rate.

*action-type action*

(Optional) Action type keyword. This command may include multiple *action types* and corresponding *actions* to set several actions simultaneously. Valid values are:

- **conform-action**—Keyword that specifies the action to be taken when the rate is not exceeded. Valid actions are:
  - **drop**—Drops the packet.
  - **set-dscp-transmit** *value*—Sets the DSCP value and sends the packet. Valid entries are: 0 to 63 (differentiated code point value), af11 to af43 (match packets with specified AF DSCP), cs1 to cs7 (match packets with specified CS DSCP), default, or ef (match packets with the EF DSCP).
  - **set-mps-exp-imposition-transmit** *number*—Sets experimental (exp) bits at the tag imposition. Valid range is 0 to 7.
  - **set-prec-transmit**—Rewrites packet precedence and sends the packet.
  - **transmit**—Transmits the packet. This is the default.
- **exceed-action**—Keyword that specifies the action to be taken when QoS values are exceeded. Valid actions are:
  - **drop**—Drops the packet. This is the default.
  - **policed-dscp-transmit**—Changes the DSCP value according to the policed-dscp map and sends the packet.
  - **transmit**—Transmits the packet.
- **violate-action**—Keyword that specifies the action to be taken when QoS values are violated. Valid actions are:
  - **drop**—Drops the packet.
  - **policed-dscp-transmit**—Changes the DSCP value according to the policed-dscp map and sends the packet.
  - **transmit**—Transmits the packet.

**Command Default**

The defaults are as follows:

- **conform-action** is **transmit**.
- **exceed-action** is **drop**.
- **violate-action** is equal to the **exceed-action**.
- **pir** *peak-rate-bps* is equal to the normal (**cir**) rate.

**Command Modes**

Global configuration

**Command History**

Release	Modification
12.2(14)SX	This command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was integrated into Cisco IOS Release 12.2(17d)SXB.

Release	Modification
12.3	This command was implemented on the Cisco 6500 and Cisco 7600.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

This policer can be shared by different policy map classes and on different interfaces. The Cisco 7600 series router supports up to 1023 aggregates and 1023 policing rules.

The **mls qos aggregate-policer** command allows you to configure an aggregate flow and a policing rule for that aggregate. When you enter the rate and burst parameters, the range for the average rate is 32 kbps to 10 Gbps (entered as 32000 and 10000000000) and the range for the burst size is 1 KB (entered as 1000) to 31.25 MB (entered as 31250000). Modifying an existing aggregate rate limit entry causes that entry to be modified in NVRAM and in the Cisco 7600 series router if that entry is currently being used.



### Note

Because of hardware granularity, the rate value is limited, so the burst that you configure may not be the value that is used.

Modifying an existing microflow or aggregate rate limit modifies that entry in NVRAM as well as in the Cisco 7600 series router if it is currently being used.

When you enter the aggregate policer name, follow these naming conventions:

- Maximum of 31 characters and may include a-z, A-Z, 0-9, the dash character (-), the underscore character (\_), and the period character (.).
- Must start with an alphabetic character and must be unique across all ACLs of all types.
- Case sensitive.
- Cannot be a number.
- Must not be a keyword; keywords to avoid are **all**, **default-action**, **map**, **help**, and **editbuffer**.

Aggregate policing works independently on each DFC-equipped switching module and independently on the PFC2, which supports any non-DFC-equipped switching modules. Aggregate policing does not combine flow statistics from different DFC-equipped switching modules. You can display aggregate policing statistics for each DFC-equipped switching module, PFC2, and any non-DFC-equipped switching modules that are supported by the PFC2 by entering the **show mls qos aggregate policer** command.

### Examples

The following example shows how to configure a QoS aggregate policer to allow a maximum of 100000 bits per second with a normal burst byte size of 10000, to set DSCP to 48 when these rates are not exceeded, and to drop packets when these rates are exceeded:

```
Router(config)# mls qos aggregate-policer micro-one 10000 10000 conform-action
set-dscp-transmit 48 exceed-action drop
```

Related Commands	Command	Description
	<b>police (policy map)</b>	Creates a per-interface policer and configures the policy-map class to use it.
	<b>set ip dscp (policy-map configuration)</b>	Marks a packet by setting the IP DSCP in the ToS byte.
	<b>show mls qos aggregate policer</b>	Displays information about the aggregate policer for MLS QoS.

# mls qos bridged

To enable the microflow policing for bridged traffic on Layer 3 LAN interfaces, use the **mls qos bridged** command in interface configuration mode. To disable microflow policing for bridged traffic, use the **no** form of this command.

**mls qos bridged**

**no mls qos bridged**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** This command is supported on SVIs only.

On Cisco 7600 series routers that are configured with a Supervisor Engine 2, you must enable the **mls qos bridged** command on an SVI for the microflow policing of IPv4 multicast packets if the user policy is attached to an SVI.

**Examples** This example shows how to enable the microflow policing for bridged traffic on a VLAN interface:

```
Router(config-if)# mls qos bridged
```

Related Commands	Command	Description
	show mls qos	Displays MLS QoS information.

# mls qos channel-consistency

To enable the quality of service (QoS)-port attribute checks on EtherChannel bundling, use the **mls qos channel-consistency** command in interface configuration mode. To disable the QoS-port attribute checks on EtherChannel bundling, use the **no** form of this command.

**mls qos channel-consistency**

**no mls qos channel-consistency**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Enabled

**Command Modes** Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** The **mls qos channel-consistency** command is supported on port channels only.

## Examples

This example shows how to enable the QoS-port attribute checks on the EtherChannel bundling:

```
Router(config-if)# mls qos channel-consistency
```

This example shows how to disable the QoS-port attribute checks on the EtherChannel bundling:

```
Router(config-if)# no mls qos channel-consistency
```

# mls qos cos

To define the default multilayer switching (MLS) class of service (CoS) value of a port or to assign the default CoS value to all incoming packets on the port, use the **mls qos cos** command in interface configuration mode. To return to the default CoS setting, use the **no** form of this command.

## Cisco 3660, 3845, 6500, 7200, 7400, and 7500 Series Routers

```
mls qos cos {cos-value | override}
```

```
no mls qos cos {cos-value | override}
```

## Cisco 7600 Series Routers

```
mls qos cos cos-value
```

```
no mls qos cos cos-value
```

### Syntax Description

<i>cos-value</i>	Assigns a default CoS value to a port. If the port is CoS trusted and packets are untagged, the default CoS value is used to select one output queue as an index into the CoS-to-DSCP map. The CoS range is 0 to 7. The default is 0.
<b>override</b>	Overrides the CoS of the incoming packets and applies the default CoS value on the port to all incoming packets.

### Command Default

The defaults are as follows:

- Default CoS value (*cos-value*) value for a port is **0**.
- CoS override is not configured.

### Command Modes

Interface configuration

### Command History

Release	Modification
12.1(6)EA2	This command was introduced. It replaced the <b>switchport priority</b> command.
12.2(14)SX	Support for this command was introduced on the Cisco 7600 series router.
12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(17d)SXB	This command was implemented on the Cisco 7600 series router and integrated into Cisco IOS Release 12.2(17d)SXB.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines****Cisco 3660, 3845, 6500, 7200, 7400, and 7500 Series Routers**

You can assign the default CoS and differentiated services code point (DSCP) value to all packets entering a port if the port has been configured by use of the **override** keyword.

Use the **override** keyword when all incoming packets on certain ports deserve a higher or lower priority than packets the enter from other ports. Even if a port was previously set to trust DSCP or CoS, this command overrides that trust state, and all the CoS values on the incoming packets are changed to the default CoS value that is configured with the **mls qos cos** command. If an incoming packet is tagged, the CoS value of the packet is modified at the ingress port. It is changed to the default CoS of that port.

Use the **show mls qos interface** privileged EXEC command to verify your settings.

**Cisco 7600 Series Routers**

CoS values are configurable on physical LAN ports only.

On Cisco 7600 series routers that are configured with a Supervisor Engine 2, the following restrictions apply:

- This command is not supported on any WAN interface on the Optical Service Modules (OSMs).
- This command is not supported on 4-port Gigabit Ethernet WAN ports.

**Examples****Cisco 3660, 3845, 6500, 7200, 7400, and 7500 Series Routers**

The following example shows how to assign 4 as the default port CoS:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# mls qos trust cos
Router(config-if)# mls qos cos 4
```

The following example shows how to assign 4 as the default port CoS value for all packets the enter the port:

```
Router(config)# interface gigabitethernet0/1
Router(config-if)# mls qos cos 4
Router(config-if)# mls qos cos override
```

**Cisco 7600 Series Routers**

The following example shows how to configure the default QoS CoS value as 6:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# mls qos cos 6
```

**Related Commands**

Command	Description
<b>mls qos map</b>	Defines the CoS-to-DSCP map or the DSCP-to-CoS map.
<b>mls qos trust</b>	Configures the port trust state.
<b>show interface fax/y switchport</b>	Displays switch port interfaces.
<b>show mls qos</b>	Displays MLS QoS information.
<b>show mls qos interface</b>	Displays QoS information.

# mls qos cos-mutation

To attach an ingress-class-of-service (CoS) mutation map to the interface, use the **mls qos cos-mutation** command in interface configuration mode. To remove the ingress-CoS mutation map from the interface, use the **no** form of this command.

**mls qos cos-mutation** *cos-mutation-table-name*

**no mls qos cos-mutation**

## Syntax Description

<i>cos-mutation-table-name</i>	Name of the ingress-CoS mutation table.
--------------------------------	---

## Command Default

No ingress-CoS mutation table is defined.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(17b)SXA	This command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

## Examples

This example shows how to attach the ingress-CoS mutation map named mutemap2:

```
Router(config-if)# mls qos cos-mutation mutemap2
```

## Related Commands

Command	Description
<b>mls qos map cos-mutation</b>	Maps a packet's CoS to a new CoS value.
<b>show mls qos</b>	Displays MLS QoS information.

# mls qos dscp-mutation

To attach an egress-differentiated-services-code-point (DSCP) mutation map to the interface, use the **mls qos dscp-mutation** command in interface configuration mode. To remove the egress-DSCP mutation map from the interface, use the **no** form of this command.

**mls qos dscp-mutation** *dscp-mutation-table-name*

**no mls qos dscp-mutation**

<b>Syntax Description</b>	<i>dscp-mutation-table-name</i> Name of the egress-DSCP mutation table.
---------------------------	---

<b>Command Default</b>	No table is defined.
------------------------	----------------------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	

<b>Usage Guidelines</b>	This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.
-------------------------	--

<b>Examples</b>	This example shows how to attach the egress-DSCP mutation map named mutemap1:
-----------------	---

```
Router(config-if)# mls qos dscp-mutation mutemap1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>mls qos map dscp-mutation</b>	Defines a named DSCP mutation map.
<b>show mls qos</b>	Displays MLS QoS information.	

# mls qos exp-mutation

To attach an egress-EXP mutation map to the interface in the interface configuration command mode, use the **mls qos exp-mutation** command. Use the **no** form of this command to remove the egress-EXP mutation map from the interface.

**mls qos exp-mutation** *exp-mutation-table-name*

**no mls qos exp-mutation**

<b>Syntax Description</b>	<i>exp-mutation-table-name</i>	Name of the egress-EXP mutation table.
---------------------------	--------------------------------	--

<b>Command Default</b>	No table is defined.
------------------------	----------------------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

<b>Usage Guidelines</b>	This command is supported in PFC3BXL or PFC3B mode only. This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.
-------------------------	--

<b>Examples</b>	This example shows how to attach the egress-exp mutation map named mutemap2:
-----------------	--

```
Router(config-if)# mls qos exp-mutation mutemap2
Router(config-if)#
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>mls qos map dscp-mutation</b>	Defines a named DSCP mutation map.
	<b>show mls qos mpls</b>	Displays an interface summary for MPLS QoS classes in the policy maps.

# mls qos loopback

To remove a router port from the Switched Virtual Interface (SVI) flood for VLANs that are carried through by the loopback cable, use the **mls qos loopback** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos loopback**

**no mls qos loopback**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** With **mls qos loopback** applied at the interface, the packets are not forwarded to the destination. Before you enter the **mls qos loopback** command, you must specify a MAC address for the Optical Services Modules (OSM) interface. The MAC address must be different from the LAN router MAC address that is used in PFC2 hardware switching.

**Examples** This example shows how to prevent packets from being forwarded to the destination:

```
Router(config-if)# mls qos loopback
```

# mls qos map cos-dscp

To define the ingress Class of Service (CoS)-to-differentiated services code point (DSCP) map for trusted interfaces, use the **mls qos map cos-dscp** command in global configuration mode. Use the **no** form of this command to remove a prior entry.

```
mls qos map cos-dscp dscp1...dscp8
```

```
no mls qos map cos-dscp
```

## Syntax Description

*dscp1...dscp8* Defines the CoS-to-DSCP map.  
 For *dscp1...dscp8*, enter eight DSCP values that correspond to CoS values 0 to 7. Separate consecutive DSCP values from each other with a space.  
 The supported DSCP values are 0, 8, 10, 16, 18, 24, 26, 32, 34, 40, 46, 48, and 56.

## Command Default

The default CoS-to-DSCP configuration is listed in [Table 17](#).

**Table 17** CoS-to-DSCP Default Map

CoS	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(6)EA2	This command was introduced.
12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

All of the CoS-to-DSCP and DSCP-to-CoS maps are globally defined. You apply all maps to all ports. If you enter the **mls qos trust cos** command, the default CoS-to-DSCP map is applied. If you enter the **mls qos trust dscp** command, the default DSCP-to-CoS map is applied. After a default map is applied, you can define the CoS-to-DSCP or DSCP-to-CoS map by entering consecutive **mls qos map** commands.

If the **mls qos trust dscp** command is entered and a packet with an untrusted DSCP value is at an ingress port, the packet CoS value is set to 0.

Use the **show mls qos maps** privileged EXEC command to verify your settings.

---

### Examples

The following example shows how to define the CoS-to-DSCP map. CoS values 0 to 7 are mapped to DSCP values 8, 8, 8, 8, 24, 32, 56, and 56.

```
Router# configure terminal
Router(config)# mls qos map cos-dscp 8 8 8 8 24 32 56 56
```

---

### Related Commands

Command	Description
<b>mls qos map dscp-cos</b>	Defines an egress DSCP-to-CoS map.
<b>mls qos map ip-prec-dscp</b>	Defines an ingress-IP precedence-to-DSCP map for trusted interfaces.
<b>mls qos map policed-dscp</b>	Sets the mapping of policed DSCP values to marked-down DSCP values.
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

# mls qos map cos-mutation

To map a class of service (CoS) value to a new CoS value for a packet, use the **mls qos map cos-mutation** command in the global configuration mode. To remove the map, use the **no** form of this command

```
mls qos map cos-mutation name mutated-cos1 mutated-cos2 mutated-cos3 mutated-cos4
mutated-cos5 mutated-cos6 mutated-cos7 mutated-cos8
```

```
no mls qos map cos-mutation name
```

## Syntax Description

<i>name</i>	Name of the CoS map.
<i>mutated-cos1 ... mutated-cos8</i>	Eight CoS out values, separated by spaces; valid values are from 0 to 7. See the “Usage Guidelines” section for additional information.

## Command Default

If the CoS-to-CoS mutation map is not configured, the default CoS-to-CoS mutation mapping is listed in [Table 18](#).

**Table 18** CoS-to-CoS Default Map

CoS-in	0	1	2	3	4	5	6	7
CoS-out	0	1	2	3	4	5	6	7

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(17b)SXA	This command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on the Catalyst 6500 series switches and the Cisco 7600 series routers that are configured with a Supervisor Engine 2.

This command is supported on the Catalyst 6500 series switches and the Cisco 7600 series routers that are configured with the following modules only:

- WS-X6704-10GE
- WS-X6724-SFP
- WS-X6748-GE-TX

CoS mutation is not supported on non-802.1Q tunnel ports.

When you enter the **mls qos map cos-mutation** command, you are configuring the mutated-CoS values map to sequential ingress-CoS numbers. For example, by entering the **mls qos map cos-mutation 2 3 4 5 6 7 0 1** command, you configure this map:

<b>CoS-in</b>	0	1	2	3	4	5	6	7
<b>CoS-out</b>	2	3	4	5	6	7	0	1

Separate the eight CoS values by a space.

After you define the map in global configuration mode, you can attach the map to a port.

If QoS is disabled, the port is not in a trust CoS mode, and the port is not in 802.1Q tunneling mode. The changes appear once you put the port into trust CoS mode and the port is configured as an 802.1Q tunnel port.

Release 12.2(17b)SXA and later releases support ingress-CoS mutation on 802.1Q tunnel ports and is on a per-port group basis only.

To avoid ingress-CoS mutation configuration failures, only create EtherChannels where all member ports support ingress-CoS mutation or where no member ports support ingress-CoS mutation. Do not create EtherChannels with mixed support for ingress-CoS mutation.

If you configure ingress-CoS mutation on a port that is a member of an EtherChannel, the ingress-CoS mutation is applied to the port-channel interface.

You can configure ingress-CoS mutation on port-channel interfaces.

## Examples

This example shows how to define a CoS-to-CoS map:

```
Router(config)# mls qos map cos-mutation test-map 1 2 3 4 5 6 7 1
```

## Related Commands

Command	Description
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

# mls qos map dscp-cos

To define an egress differentiated services code point (DSCP)-to-class of service (CoS) map, use the **mls qos map dscp-cos** command in global configuration mode. To remove a prior entry, use the **no** form of this command.

**mls qos map dscp-cos** *dscp-values* **to** *cos-values*

**no mls qos map dscp-cos**

## Syntax Description

*dscp-values* **to** *cos-values* Defines the DSCP-to-CoS map.

For *dscp-list*, enter up to 13 DSCP values separated by spaces. Then enter the **to** keyword. The supported DSCP values are 0, 8, 10, 16, 18, 24, 26, 32, 34, 40, 46, 48, and 56.

For *cos*, enter the CoS value to which the DSCP value or values correspond. Range: 0 to 7.

## Command Default

The default DSCP-to-CoS map is listed in [Table 19](#).

**Table 19** *DSCP-to-CoS Default Map*

DSCP	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
CoS	0	1	2	3	4	5	6	7

## Command Modes

Global configuration

## Command History

Release	Modification
12.1(6)EA2	This command was introduced.
12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

The DSCP-to-CoS map is used to map the final DSCP classification to a final CoS. This final map determines the output queue and threshold to which the packet is assigned. The CoS map is written into the Inter-Switch Link (ISL) header or 802.1Q tag of the transmitted packet on trunk interfaces and contains a table of 64 DSCP values and the corresponding CoS values. The Catalyst 6500 series switch and the Cisco 7600 series router have one map.

All of the CoS-to-DSCP and DSCP-to-CoS maps are globally defined. You apply all maps to all ports.

If you enter the **mls qos trust cos** command, the default CoS-to-DSCP map is applied.

If you enter the **mls qos trust dscp** command, the default DSCP-to-CoS map is applied.

After a default map is applied, you can define the CoS-to-DSCP or DSCP-to-CoS map by entering consecutive **mls qos map** commands.

If the **mls qos trust dscp** command is entered and a packet with an untrusted DSCP value is at an ingress port, the packet CoS value is set to 0.

Use the **show mls qos maps** privileged EXEC command to verify your settings.

### Examples

The following example shows how to define the DSCP-to-CoS map. DSCP values 16, 18, 24, and 26 are mapped to CoS 1. DSCP values 0, 8, and 10 are mapped to CoS 0.

```
Router# configure terminal
Router(config)# mls qos map dscp-cos 16 18 24 26 to 1
Router(config)# mls qos map dscp-cos 0 8 10 to 0
```

### Related Commands

Command	Description
<b>mls qos map cos-dscp</b>	Defines the ingress CoS-to-DSCP map for trusted interfaces.
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

# mls qos map dscp-exp

To map the final differentiated services code point (DSCP) value to the final experimental (EXP) value, use the **mls qos map dscp-exp** command in global configuration mode. To remove a prior entry, use the **no** form of this command.

**mls qos map dscp-exp** *dscp-values* **to** *exp-values*

**no mls qos map dscp-exp**

## Syntax Description

<i>dscp-values</i>	DSCP values; valid values are from 0 to 63.
<b>to</b>	Defines mapping.
<i>exp-values</i>	EXP values; valid values are from 0 to 7.

## Command Default

The default DSCP-to-EXP map is listed in [Table 20](#).

**Table 20** *DSCP-to-EXP Default Map*

DSCP	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
EXP	0	1	2	3	4	5	6	7

## Command Modes

Global configuration

## Command History

Release	Modification
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	Support for this command on the Supervisor Engine 2 was extended to Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is supported in PFC3BXL or PFC3B mode only.

The DSCP-to-EXP map is used to map the final DSCP value to a final EXP value. This final map determines the output queue and threshold to which the packet is assigned. The EXP map contains a table of 64 DSCP values and the corresponding EXP values. The Catalyst 6500 series switch and the Cisco 7600 series router have one map.

You can enter up to eight DSCP values separated by a space. You can enter up to eight EXP values separated by a space.

---

**Examples**

This example shows how to configure the final DSCP value to a final EXP value:

```
Router(config)# mls qos map dscp-exp 20 25 to 3
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

---

# mls qos map dscp-mutation

To define a named differentiated services code point (DSCP) mutation map, use the **mls qos map dscp-mutation** command in global configuration mode. To return to the default mapping, use the **no** form of this command.

```
mls qos map dscp-mutation map-name input-dscp1 [input-dscp2 [input-dscp3 [input-dscp4
input-dscp5 [input-dscp6 [input-dscp7 [input-dscp8]]]]]]] to output-dscp
```

```
no mls qos map dscp-mutation map-name
```

Syntax Description	
<i>map-name</i>	Name of the DSCP mutation map.
<i>input-dscp#</i>	Internal DSCP value; valid values are from 0 to 63. See the “Usage Guidelines” section for additional information.
<b>to</b>	Defines mapping.
<i>output-dscp</i>	Egress DSCP value; valid values are from 0 to 63.

**Command Default** *output-dscp* equals *input-dscp*.

**Command Modes** Global configuration

Command History	Release	Modification
	12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** This command is not supported on the Catalyst 6500 series switches and the Cisco 7600 series routers that are configured with a Supervisor Engine 2.

When configuring a named DSCP mutation map, note the following:

- You can enter up to eight input DSCP values that map to a mutated DSCP value.
- You can enter multiple commands to map additional DSCP values to a mutated DSCP value.
- You can enter a separate command for each mutated DSCP value.

You can configure 15 egress-DSCP mutation maps to mutate the internal DSCP value before it is written as the egress-DSCP value. You can attach egress-DSCP mutation maps to any interface that Policy Feature Card (PFC) QoS supports.

PFC QoS derives the egress-class-of-service (CoS) value from the internal DSCP value. If you configure egress-DSCP mutation, PFC QoS does not derive the egress-CoS value from the mutated DSCP value.

---

**Examples**

This example shows how to map DSCP 30 to mutated DSCP value 8:

```
Router(config)# mls qos map dscp-mutation mutemap1 30 to 8
```

---

**Related Commands**

Command	Description
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

---

# mls qos map exp-dscp

To define the ingress Experimental (EXP) value to the internal differentiated services code point (DSCP) map, use the **mls qos map exp-dscp** command in global configuration mode. To return to the default mapping, use the **no** form of this command.

```
mls qos map exp-dscp dscp-values
```

```
no mls qos map exp-dscp
```

## Syntax Description

*dscp-values* Defines the ingress EXP value to the internal DSCP map. Range: 0 to 63.

## Command Default

The default EXP-to-DSCP map is listed in [Table 21](#).

**Table 21** EXP-to-DSCP Default Map

EXP	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

## Command Modes

Global configuration

## Command History

Release	Modification
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is supported in PFC3BXL or PFC3B mode only.

The DSCP in these maps refers to the internal DSCP, not the packet DSCP.

The EXP-to-DSCP map is used to map the received EXP value to the internal DSCP map. This final map determines the output queue and threshold to which the packet is assigned. The EXP map contains a table of 64 DSCP values and the corresponding EXP values. The Catalyst 6500 series switch and the Cisco 7600 series router have one map.

You can enter up to eight DSCP values separated by a space.

## Examples

This example shows how to configure the received EXP value to an internal DSCP value:

```
Router(config)# mls qos map exp-dscp 20 25 30 31 32 32 33 34
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>mls qos map exp-mutation</b>	Maps a packet's EXP to a new EXP value.
<b>show mls qos mpls</b>	Displays an interface summary for MPLS QoS classes in the policy maps.

# mls qos map exp-mutation

To map the Experimental (EXP) value of a packet to a new EXP value, use the **mls qos map exp-mutation** command in global configuration mode. To return to the default mapping, use the **no** form of this command.

```
mls qos map exp-mutation map-name mutated-exp1 mutated-exp2 mutated-exp3 mutated-exp4
mutated-exp5 mutated-exp6 mutated-exp7 mutated-exp8
```

```
no mls qos map exp-mutation map-name
```

## Syntax Description

<i>map-name</i>	Name of the EXP-mutation map.
<i>mutated-exp#</i>	Eight EXP values, separated by spaces; valid values are from 0 to 7. See the “Usage Guidelines” section for additional information.

## Command Default

If the EXP-to-EXP mutation map is not configured, the default EXP-to-EXP mutation mapping is listed in [Table 22](#).

**Table 22** EXP-to-EXP Mutation Default Map

EXP-in	0	1	2	3	4	5	6	7
EXP-out	0	1	2	3	4	5	6	7

## Command Modes

Global configuration

## Command History

Release	Modification
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on the Catalyst 6500 series switch and the Cisco 7600 series router that are configured with a Supervisor Engine 2.

This command is supported in PFC3BXL or PFC3B mode only.

When you enter the **mls qos map exp-mutation** command, you are configuring the mutated EXP values map to the sequential EXP numbers. For example, by entering the **mls qos map exp-mutation 2 3 4 5 6 7 0 1** command, you configure the map as shown in [Table 23](#) below:

**Table 23** Mutated EXP Values Mapped to Sequential EXP Values

EXP-in	0	1	2	3	4	5	6	7
EXP-out	2	3	4	5	6	7	0	1

Separate the eight EXP values by a space.

After you define the map in global configuration mode, you can attach the map to a port.

You can configure 15 ingress-EXP mutation maps to mutate the internal EXP value before it is written as the ingress-EXP value. You can attach ingress-EXP mutation maps to any interface that Policy Feature Card (PFC) quality of service (QoS) supports.

The PFC QoS derives the egress EXP value from the internal differentiated services code point (DSCP) value. If you configure ingress-EXP mutation, PFC QoS does not derive the ingress-EXP value from the mutated EXP value.

---

### Examples

This example shows how to map the EXP value of a packet to a new EXP value:

```
Router(config)# mls qos map exp-mutation mutemap1 1 2 3 4 5 6 7 0
```

---

### Related Commands

Command	Description
<b>mls qos map exp-dscp</b>	Defines the ingress EXP value to the internal DSCP map.
<b>show mls qos mpls</b>	Displays an interface summary for MPLS QoS classes in the policy maps.

# mls qos map ip-prec-dscp

To define an ingress-IP precedence-to-differentiated-services-code-point (DSCP) map for trusted interfaces, use the **mls qos map ip-prec-dscp** command in global configuration mode. To remove a prior entry, use the **no** form of this command.

```
mls qos map ip-prec-dscp dscp-values
```

```
no mls qos map ip-prec-dscp
```

## Syntax Description

*dscp-values* DSCP values corresponding to IP precedence values 0 to 7; valid values are from 0 to 63.

## Command Default

The default IP precedence-to-DSCP configuration is listed in [Table 24](#).

**Table 24** IP Precedence-to-DSCP Default Map

IP-Precedence	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

## Command Modes

Global configuration

## Command History

Release	Modification
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Use the **mls qos map ip-prec-dscp** command to map the IP precedence of IP packets arriving on trusted interfaces (or flows) to a DSCP when the trust type is trust-ipprec.

You can enter up to eight DSCP values separated by a space.

This map is a table of eight precedence values (0 through 7) and their corresponding DSCP values. The Catalyst 6500 series switch and the Cisco 7600 series router have one map. The IP precedence values are as follows:

- network 7
- internet 6
- critical 5
- flash-override 4

- flash 3
- immediate 2
- priority 1
- routine 0

---

**Examples**

This example shows how to configure the ingress-IP precedence-to-DSCP mapping for trusted interfaces:

```
Router(config)# mls qos map ip-prec-dscp 20 30 1 43 63 12 13 8
```

---

**Related Commands**

Command	Description
<b>mls qos map cos-dscp</b>	Defines the ingress CoS-to-DSCP map for trusted interfaces.
<b>mls qos map dscp-cos</b>	Defines an egress DSCP-to-CoS map.
<b>mls qos map policed-dscp</b>	Sets the mapping of policed DSCP values to marked-down DSCP values.
<b>show mls qos maps</b>	Displays information about the QoS-map configuration and runtime-version.

# mls qos map policed-dscp

To set the mapping of policed differentiated services code point (DSCP) values to marked-down DSCP values, use the **mls qos map policed-dscp** command in global configuration mode. To remove a prior entry, use the **no** form of this command.

```
mls qos map policed-dscp dscp-list to policed-dscp
```

```
no mls qos map policed-dscp
```

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```
mls qos map policed-dscp { normal-burst | max-burst } dscp1 [dscp2 [dscp3 [dscp4 [dscp5 [dscp6 [dscp7 [dscp8]]]]]]] to policed-dscp
```

```
no mls qos map policed-dscp
```

Syntax Description		
<b>normal-burst</b>		Configures the markdown map used by the <b>exceed-action policed-dscp-transmit</b> keywords.
<b>max-burst</b>		Configures the markdown map used by the <b>violate-action policed-dscp-transmit</b> keywords.
<i>dscp1</i>		DSCP value. Range: 0 to 63.
<i>dscp2</i> through <i>dscp8</i>		(Optional) DSCP values. Range: 0 to 63.
<b>to</b>		Defines mapping.
<i>policed-dscp</i>		Policed-to-DSCP values; valid values are from 0 to 63.

**Command Default** No marked-down values are configured.

**Command Modes** Global configuration

Command History	Release	Modification
	12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** The DSCP-to-policed-DSCP map determines the marked-down DSCP value that is applied to out-of-profile flows. The Catalyst 6500 series switch and the Cisco 7600 series router have one map. You can enter up to eight DSCP values separated by a space. You can enter up to eight policed DSCP values separated by a space.

**Note**

To avoid out-of-sequence packets, configure the DSCP-to-policed-DSCP map so that marked-down packets remain in the same queue as the in-profile traffic.

**Examples**

This example shows how to map multiple DSCPs to a single policed-DSCP value:

```
Router(config)# mls qos map policed-dscp 20 25 43 to 4
```

**Related Commands**

Command	Description
<b>mls qos map cos-dscp</b>	Defines the ingress CoS-to-DSCP map for trusted interfaces.
<b>mls qos map dscp-cos</b>	Defines an egress DSCP-to-CoS map.
<b>mls qos map in-prec-dscp</b>	Defines an ingress-IP precedence-to-DSCP map for trusted interfaces.
<b>show mls qos</b>	Displays MLS QoS information.

# mls qos marking ignore port-trust

To mark packets even if the interface is trusted, use the **mls qos marking ignore port-trust** command in global configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos marking ignore port-trust**

**no mls qos marking ignore port-trust**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Port trust is enabled.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(18)SXF5	This command was introduced.

**Usage Guidelines** Use the **mls qos marking ignore port-trust** command to mark packets even if the interface is trusted.

**Examples** This example shows how to mark packets even if the interface is trusted:

```
mls qos marking ignore port-trust
```

This example shows how to re-enable port trust:

```
no mls qos marking ignore port-trust
```

Related Commands	Command	Description
	<b>mls qos trust</b>	Sets the trusted state of an interface.

# mls qos marking statistics

To disable allocation of the policer-traffic class identification with set actions, use the **mls qos marking statistics** command in global configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos marking statistics**

**no mls qos marking statistics**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Enabled

**Command Modes** Global configuration

## Command History

Release	Modification
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(18)SXE	This command was changed to add the collection of statistics for a policy that sets a trust state.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Use the **show policy-map interface** command to display policy-map statistics.

## Examples

This example shows how to disable allocation of the policer-traffic class identification with set actions:

```
Router(config)# mls qos marking statistics
```

This example shows how to allow allocation of the policer-traffic class identification with set actions:

```
Router(config)# no mls qos marking statistics
```

## Related Commands

Command	Description
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

# mls qos mpls trust exp

To set the trusted state of Multiprotocol Label Switching (MPLS) packets only, use the **mls qos mpls trust exp** command in interface configuration mode. To set the trusted state of MPLS packets to untrusted, use the **no** form of this command.

**mls qos mpls trust exp**

**no mls qos mpls trust exp**

## Syntax Description

This command has no arguments or keywords.

## Command Default

With the trusted state enabled, the defaults are as follows:

- Untrusted—The packets are marked to 0 or by policy.
- trust-cos.

With the trusted state disabled, the defaults are as follows:

- trust-exp—The port or policy trust state is ignored.
- The packets are marked by policy.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(18)SXF2	This command was introduced on the Supervisor Engine 720.

## Usage Guidelines

You can enter the **mls qos mpls trust exp** command to treat MPLS packets as other Layer 2 packets for class of service (CoS) and egress queueing purposes (for example, to apply port or policy trust). All trusted cases (trust CoS/IP/Differentiated Services Code Point (DSCP)) are treated as trust-cos.

Class of Service (CoS) refers to three bits in either an ISL header or an 802.1Q header that are used to indicate the priority of the Ethernet frame as it passes through a switched network. The CoS bits in the 802.1Q header are commonly referred to as the 802.1p bits. To maintain QoS when a packet traverses both Layer 2 and Layer 3 domain, the ToS and CoS values can be mapped to each other.

## Examples

This example shows how to set the trusted state of MPLS packets to trust-cos:

```
mls qos mpls trust exp
```

This example shows how to set the trusted state of MPLS packets to untrusted:

```
no mls qos mpls trust exp
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show mls qos mpls</b>	Displays an interface summary for MPLS QoS classes in the policy maps.

---

# mls qos police redirected

To turn on access control list (ACL)-redirected packet policing, use the **mls qos police redirected** command in global configuration mode. To turn off ACL-redirected packet policing, use the **no** form of this command.

**mls qos police redirected**

**no mls qos police redirected**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Enabled

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(17b)SXA	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is supported on PFC3BXL or PFC3B mode only. With Release 12.2(17b)SXA, enter the **show platform earl-mode** command to display the PFC3 mode.

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Use the **no mls qos police redirected** command whenever you require NetFlow Data Export (NDE) accuracy (if you do not require QoS-redirected packets).

## Examples

This example shows how to turn on the ACL-redirected packet policing:

```
Router(config)# mls qos police redirected
```

This example shows how to turn off the ACL-redirected packet policing:

```
Router(config)# no mls qos police redirected
```

## Related Commands

Command	Description
<b>show platform earl-mode</b>	Displays platform information.

# mls qos police serial

To enable serial mode for ingress and egress policers on the PFC3C or PFC3CXL, use the **mls qos police serial** command in global configuration mode. To reset the policing mode to parallel, use the **no** form of the command.

**mls qos police serial**

**no mls qos police serial**

**Syntax Description** This command has no arguments or keywords.

**Command Default** This command is disabled by default.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(33)SRB	This command was introduced.

**Usage Guidelines** You can use the **mls qos police serial** command to configure the PFC3C or PFC3CXL ingress and egress policers to operate independently of each other (in *serial mode*). Normally, ingress and egress policers operate in parallel mode, where action by one policer causes a corresponding action in the other. For example, if the egress policer drops a packet, the ingress policer does not count the packet either. In serial mode, however, action by one policer does not cause a corresponding action in the other.



**Note** This command does not affect marking using policers.

**Examples** The following command example shows how to enable serial policing mode on the PFC3C or PFC3CXL:

```
Router(config)# mls qos police serial
```

# mls qos protocol

To define routing-protocol packet policing, use the **mls qos protocol** command in global configuration mode. To return to the default settings, use the **no** form of this command.

```
mls qos protocol protocol-name pass-through | police rate burst | precedence value [police rate burst]
```

```
no mls qos protocol
```

## Syntax Description

<i>protocol-name</i>	Protocol name; valid values are <b>arp</b> , <b>bgp</b> , <b>eigrp</b> , <b>igrp</b> , <b>isis</b> , <b>ldp</b> , <b>nd</b> , <b>ospf</b> , and <b>rip</b> .
<b>pass-through</b>	Specifies pass-through mode.
<b>police</b> <i>rate</i>	Specifies the maximum bits per second (bps) to be policed; valid values are from 32000 to 4000000000 bps.
<i>burst</i>	Normal burst bytes; valid values are from 1000 to 31250000 bytes.
<b>precedence</b> <i>value</i>	Specifies the IP-precedence value of the protocol packets to rewrite; valid values are from 0 to 7.

## Command Default

The defaults are as follows:

- *burst* is 1000 bits per second.
- If quality of service (QoS) is enabled, the differentiated services code point (DSCP) value is rewritten to zero.
- If QoS is disabled, the port is in a pass-through mode (no marking or policing is applied).

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was changed to support the ISIS protocol.
12.2(18)SXE	This command was changed as follows on the Supervisor Engine 720 only: <ul style="list-style-type: none"> <li>• Support for the marking of global <b>mls qos protocol</b> QoS policies was added.</li> <li>• Support for this command was introduced on the Supervisor Engine 2 but does not support Address Resolution Protocol (ARP), Integrated Intermediate System-to-Intermediate System (ISIS), or Enhanced Interior Gateway Routing Protocol (EIGRP).</li> <li>• The <b>nd</b> keyword was added to support neighbor discovery protocol packets.</li> <li>• The <b>igrp</b> keyword was removed.</li> </ul>

Release	Modification
12.2(18)SXF	The <b>no</b> form of this command was changed to remove the arguments and keywords.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

This command does not support ARP, ISIS, or EIGRP on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

If you enter the **precedence value** keyword and arguments without entering the **police rate burst** keyword and arguments, only the packets from an untrusted port are marked.

You can make the protocol packets avoid the per-interface policy maps by entering the **police rate**, **pass-through**, or **precedence value** keywords and arguments.

The **mls qos protocol** command allows you to define the routing-protocol packet policing as follows:

- When you specify the **pass-through** mode, the DSCP value does not change and is not policed.
- When you set the **police rate**, the DSCP value does not change and is policed.
- When you specify the **precedence value**, the DSCP value changes for the packets that come from an untrusted port, the class of service (CoS) value that is based on DSCP-to-CoS map changes, and the traffic is not policed.
- When you specify the **precedence value** and the **police rate**, the DSCP value changes, the CoS value that is based on DSCP-to-CoS map changes, and the DSCP value is policed. In this case, the DSCP value changes are based on the trust state of the port; the DSCP value is changed only for the packets that come from an untrusted port.
- If you do not enter a **precedence value**, the DSCP value is based on whether or not you have enabled multilayer switching (MLS) QoS as follows:
  - If you enabled MLS QoS and the port is untrusted, the internal DSCP value is overwritten to zero.
  - If you enabled MLS QoS and the port is trusted, then the incoming DSCP value is maintained.

You can make the protocol packets avoid policing completely if you choose the pass-through mode. If the police mode is chosen, the committed information rate (CIR) specified is the rate that is used to police all the specified protocol's packets, both entering or leaving the Cisco 7600 series router.

To protect the system by ARP broadcast, you can enter the **mls qos protocol arp police bps** command.

### Examples

This example shows how to define the routing-protocol packet policing:

```
Router(config)# mls qos protocol arp police 43000
```

This example shows how to avoid policing completely:

```
Router(config)# mls qos protocol arp pass-through
```

This example shows how to define the IP-precedence value of the protocol packets to rewrite:

```
Router(config)# mls qos protocol bgp precedence 4
```

This example shows how to define the IP-precedence value of the protocol packets to rewrite and police the DSCP value:

```
Router(config)# mls qos protocol bgp precedence 4 police 32000 1200
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show mls qos protocol</b>	Displays protocol pass-through information.

# mls qos queueing-only

To enable port-queueing mode, use the **mls qos queueing-only** command in global configuration mode. To disable the port-queueing mode, use the **no** form of this command.

**mls qos queueing-only**

**no mls qos queueing-only**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Quality of service (QoS) is globally disabled.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** In port-queueing mode, Policy Feature Card (PFC) QoS (marking and policing) is disabled, and packet type of service (ToS) and class of service (CoS) are not changed by the PFC. All queueing on rcv and xmt is based on a QoS tag in the incoming packet, which is based on the incoming CoS.

For 802.1Q or Inter-Link Switch (ISL)-encapsulated port links, queueing is based on the packet 802.1Q or ISL CoS.

For router main interfaces or access ports, queueing is based on the configured per-port CoS (the default CoS is 0).

**Examples** This example shows how to enable the port-queueing mode globally:

```
Router(config)# mls qos queueing-only
```

This example shows how to disable the port-queueing mode globally:

```
Router(config)# no mls qos queueing-only
```

Related Commands	Command	Description
	<b>mls qos (global configuration mode)</b>	Enables the QoS functionality globally.
	<b>show mls qos</b>	Displays MLS QoS information.

# mls qos queue-mode mode-dscp

To set the queuing mode to Differentiated Services Code Point (DSCP) on an interface, use the **mls qos queue-mode mode-dscp** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos queue-mode mode-dscp**

**no mls qos queue-mode mode-dscp**

## Syntax Description

This command has no arguments or keywords.

## Command Default

The queuing mode of an interfaces is class of service (CoS) mode.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
12.2(18)SXF5	This command was introduced.

## Usage Guidelines

This command is supported on 10-Gigabit Ethernet ports only.

You should configure ports to trust DSCP only if they receive traffic that carries valid Layer 3 DSCP.

In Release 12.2(18)SXF5 and later releases, you can enable DSCP-based ingress queues and thresholds on WS-X6708-10GE ports to provide congestion avoidance.

In releases earlier than Release 12.2(18)SXF5, the ingress port queues and thresholds use only Layer 2 Class of Service (CoS), and Policy Feature Card (PFC) QoS does not implement ingress port congestion avoidance on ports configured to trust DSCP.

For traffic from trust DSCP ports, Policy Feature Card (PFC) QoS uses the received DSCP value as the initial internal DSCP value. PFC QoS does not mark any traffic on ingress ports configured to trust received DSCP.

## Examples

This example shows how to set the queuing mode to DSCP on an interface:

```
mls qos queue-mode mode-dscp
```

## Related Commands

Command	Description
<b>priority-queue</b> <b>queue-limit</b>	Allocates the available buffer space to a queue.
<b>show mls qos</b>	Displays MLS QoS information.

# mls qos rewrite ip dscp

To enable type of service (ToS)-to-differentiated services code point (DSCP) rewrite, use the **mls qos rewrite ip dscp** command in global configuration mode. To disable ToS-to-DSCP rewrite, use the **no** form of this command.

**mls qos rewrite ip dscp**

**no mls qos rewrite ip dscp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Quality of service (QoS) is globally disabled.

**Command Modes** Global configuration

## Command History

Release	Modification
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

If you disable ToS-to-DSCP rewrite, and QoS is enabled globally, the following occurs:

- Final ToS-to-DSCP rewrite is disabled, and the ToS-to-DSCP packet is preserved.
- Policing and marking function according to the QoS configuration.
- Marked and marked-down class of service (CoS) is used for queueing.
- In QoS disabled mode, both ToS and CoS are preserved.

The **no mls qos rewrite ip dscp** command is incompatible with Multiprotocol Label Switching (MPLS). The default **mls qos rewrite ip dscp** command must remain enabled in order for the PFC3BXL or PFC3B to assign the correct MPLS Experimental (EXP) value for the labels that it imposes.

## Examples

This example shows how to disable ToS-to-DSCP rewrite:

```
Router(config)# mls qos rewrite ip dscp
```

This example shows how to disable port-queueing mode globally:

```
Router(config)# no mls qos rewrite ip dscp
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>mls qos (global configuration mode)</b>	Enables the QoS functionality globally.
<b>show mls qos</b>	Displays MLS QoS information.

# mls qos statistics-export (global configuration)

To enable quality of service (QoS)-statistics data export globally, use the **mls qos statistics-export** command in global configuration mode. To disable QoS-statistics data export globally, use the **no** form of this command.

**mls qos statistics-export**

**no mls qos statistics-export**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** You must enable data export globally to set up data export on your Cisco 7600 series router. QoS-statistics data export is not supported on OSM interfaces. For QoS-statistics data export to perform correctly, you should set the export-destination hostname or IP address and the User Datagram Port (UDP) number.

**Examples** This example shows how to enable data export globally:

```
Router(config)# mls qos statistics-export
```

This example shows how to disable data export globally:

```
Router(config)# no mls qos statistics-export
```

Related Commands	Command	Description
	<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export (interface configuration)

To enable per-port quality of service (QoS)-statistics data export, use the **mls qos statistics-export** command in interface configuration mode. To disable per-port QoS-statistics data export, use the **no** form of this command.

**mls qos statistics-export**

**no mls qos statistics-export**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

QoS-statistics data export is not supported on OSM interfaces.

You must enable data export on the port and globally to set up data export on your Cisco 7600 series router.

For QoS-statistics data export to perform correctly, you should set the export-destination hostname or IP address and the User Datagram Port (UDP) number.

QoS-statistics data is exported using delimiter-separated fields. You can set the delimiter by entering the **mls qos statistics-export delimiter** command.

Port statistics are exported; port QoS statistics are not exported. For each data export-enabled port, the following information is exported:

- Type (1 denotes the type of port)
- Module/port
- In packets (cumulated hardware-counter values)
- In bytes (cumulated hardware-counter values)
- Out packets (cumulated hardware-counter values)
- Out bytes (cumulated hardware-counter values)
- Time stamp (time in seconds since January 1, 1970 UTC relative)

For example, if you have QoS-statistics data export that is enabled on FastEthernet4/5, the exported records could be (in this example, the delimiter is a | [pipe]) as follows:

```
|1|4/5|123|80|12500|6800|982361894|
```

### Examples

This example shows how to enable QoS-statistics data export:

```
Router(config-if)# mls qos statistics-export
```

This example shows how to disable QoS-statistics data export:

```
Router(config-if)# no mls qos statistics-export
```

### Related Commands

Command	Description
<b>mls qos statistics-export delimiter</b>	Sets the QoS-statistics data-export field delimiter.
<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export aggregate-policer

To enable quality of service (QoS)-statistics data export on the named aggregate policer, use the **mls qos statistics-export aggregate-policer** command in global configuration mode. To disable QoS-statistics data export on the named aggregate policer, use the **no** form of this command.

**mls qos statistics-export aggregate-policer** *policer-name*

**no mls qos statistics-export aggregate-policer** *policer-name*

## Syntax Description

*policer-name* Name of the policer.

## Command Default

Disabled for all shared aggregate policers.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

QoS-statistics data export is not supported on Optical Services Modules (OSM) interfaces.

You must enable data export on the shared aggregate policer and globally to set up data export on your Cisco 7600 series router.

QoS-statistics data is exported using delimiter-separated fields. You can set the delimiter by entering the **mls qos statistics-export delimiter** command.

For each data export-enabled shared aggregate or named policer, statistics data per policer per EARL is exported. For each data export-enabled shared aggregate or named policer, the following information is exported:

- Type (3 denotes aggregate policer export type)
- Aggregate name
- Direction (in or out)
- Encoded Address Recognition Logic (EARL) identification
- Accepted packets (accumulated hardware-counter values)
- Exceeded normal-rate packets (accumulated hardware-counter values)
- Exceeded excess-rate packets (accumulated hardware-counter values)
- Time stamp (time in seconds since January 1, 1970 UTC relative)

If a shared aggregate policer is attached to policies in both directions, two records are exported (one in each direction). Each record will contain the same counter values for accepted packets, exceeded normal packet rates, and exceeded excess packet rates.

For example, if you have the following configuration:

- QoS-statistics data export that is enabled on the shared aggregate policer named “aggr\_1”
- An EARL in the supervisor engine that is installed in slot 1
- An EARL on the Distributed Forwarding Card (DFC) that is installed in slot 3

the exported records could be (note that in this example, the delimiter is a | [pipe]) as follows:

```
|3|aggr_1|in|1|45543|2345|982361894|
|3|aggr_1|in|3|45543|2345|982361894|
```

### Examples

This example shows how to enable per-shared aggregate or named-policer data export:

```
Router(config)# mls qos statistics-export aggregate-policer aggr1M
```

### Related Commands

Command	Description
<b>mls qos statistics-export delimiter</b>	Sets the QoS-statistics data-export field delimiter.
<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export class-map

To enable quality of service (QoS)-statistics data export for a class map, use the **mls qos statistics-export class-map** command in global configuration mode. To disable QoS-statistics data export for a class map, use the **no** form of this command.

**mls qos statistics-export class-map** *classmap-name*

**no mls qos statistics-export class-map** *classmap-name*

## Syntax Description

*classmap-name* Name of the class map.

## Command Default

Disabled

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

QoS-statistics data export is not supported on OSM interfaces.

You must enable data export on the class map and globally to set up data export on your Cisco 7600 series router.

QoS-statistics data is exported using delimiter-separated fields. You can set the delimiter by entering the **mls qos statistics-export delimiter** command.

For each data export-enabled class map, statistics data per policer per interface is exported. If the interface is a physical interface, the following information is exported:

- Type (4 denotes class map physical export)
- Class-map name
- Direction (in or out)
- Module/port
- Accepted packets (accumulated hardware-counter values)
- Exceeded normal-rate packets (accumulated hardware-counter values)
- Exceeded excess-rate packets (accumulated hardware-counter values)
- Time stamp (time in seconds since January 1, 1970 UTC relative)

If the interface is a Cisco 7600 series router VLAN, the following information is exported:

- Type (5 denotes class-map VLAN export)
- Class-map name
- Direction (in or out)
- Encoded Address Recognition Logic (EARL) identification (slot number in which the EARL is installed)
- VLAN number
- Accepted packets (cumulated hardware-counter values)
- Exceeded normal-rate packets (cumulated hardware-counter values)
- Exceeded excess-rate packets (cumulated hardware-counter values)
- Time stamp (time in seconds since January 1, 1970 UTC relative)

If the interface is a Cisco 7600 series router port channel, the following information is exported:

- Type (6 denotes class-map port-channel export)
- Class-map name
- Direction (in or out)
- EARL identification (slot number in which the EARL is installed)
- Port-channel number
- Accepted packets (cumulated hardware-counter values)
- Exceeded normal-rate packets (cumulated hardware-counter values)
- Exceeded excess-rate packets (cumulated hardware-counter values)
- Time stamp (time in seconds since January 1, 1970 UTC relative)

For example, if you have the following configuration:

- QoS-statistics data export enabled on the class map named “class\_1”
- An EARL in the supervisor engine that is installed in slot 1
- An EARL on the Distributed Forwarding Card (DFC) that is installed in slot 3
- The Cisco 7600 series router is in the policy map named “policy\_1”
- policy\_1 is attached to the following interfaces in the ingress direction:
  - FastEthernet4/5
  - VLAN 100
  - Port-channel 24

The exported records could be (in this example, the delimiter is a | [pipe]) as follows:

```
l4|class_1|in|4/5|45543|2345|2345|98236|1894|
l5|class_1|in|1|100|44000|3554|36678|98236|1894|
l5|class_1|in|3|100|30234|1575|1575|98236|1894|
```

## Examples

This example shows how to enable QoS-statistics data export for a class map:

```
Router(config)# mls qos statistics-export class-map class3
```

Related Commands	Command	Description
	<b>mls qos statistics-export delimiter</b>	Sets the QoS-statistics data-export field delimiter.
	<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export delimiter

To set the quality of service (QoS)-statistics data-export field delimiter, use the **mls qos statistics-export delimiter** command in global configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos statistics-export delimiter**

**no mls qos statistics-export delimiter**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The default delimiter is the pipe character (|).

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** QoS-statistics data export is not supported on Optical Service Module (OSM) interfaces. You must enable data export globally to set up data export on your Cisco 7600 series router.

**Examples** This example shows how to set the QoS-statistics data-export field delimiter (a comma) and verify the configuration:

```
Router(config)# mls qos statistics-export delimiter ,
```

Related Commands	Command	Description
	<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export destination

To configure the quality of service (QoS)-statistics data-export destination host and User Datagram Protocol (UDP) port number, use the **mls qos statistics-export destination** command in global configuration mode. To return to the default settings, use the **no** form of this command.

```
mls qos statistics-export destination {host-name | host-ip-address} {port port-number | syslog}
[facility facility-name] [severity severity-value]
```

## Syntax Description

<i>host-name</i>	Hostname.
<i>host-ip-address</i>	Host IP address.
<b>port</b> <i>port-number</i>	Specifies the UDP port number.
<b>syslog</b>	Specifies the syslog port.
<b>facility</b> <i>facility-name</i>	(Optional) Specifies the type of facility to export; see the “Usage Guidelines” section for a list of valid values.
<b>severity</b> <i>severity-value</i>	(Optional) Specifies the severity level to export; see the “Usage Guidelines” section for a list of valid values.

## Command Default

The default is none unless **syslog** is specified. If **syslog** is specified, the defaults are as follows:

- *port* is 514.
- *facility* is local6.
- *severity* is debug.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

QoS-statistics data export is not supported on Optical Service Module (OSM) interfaces.

Valid *facility* values are as follows:

- **authorization**—Security/authorization messages
- **cron**—Clock daemon
- **daemon**—System daemon
- **kernel**—Kernel messages
- **local0**—Local use 0

- **local1**—Local use 1
- **local2**—Local use 2
- **local3**—Local use 3
- **local4**—Local use 4
- **local5**—Local use 5
- **local6**—Local use 6
- **local7**—Local use 7
- **lpr**—Line printer subsystem
- **mail**—Mail system
- **news**—Network news subsystem
- **syslog**—Messages that are generated internally by syslogd
- **user**—User-level messages
- **uucp**—UNIX-to-UNIX Copy Program (UUCP) subsystem

Valid *severity* levels are as follows:

- **alert**—Action must be taken immediately
- **critical**—Critical conditions
- **debug**—Debug-level messages
- **emergency**—System is unusable
- **error**—Error conditions
- **informational**—Informational
- **notice**—Normal but significant conditions
- **warning**—Warning conditions

### Examples

This example shows how to specify the destination host address and syslog as the UDP port number:

```
Router(config)# mls qos statistics-export destination 172.20.52.3 syslog
```

### Related Commands

Command	Description
<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos statistics-export interval

To specify how often a port and/or aggregate-policer quality of service (QoS)-statistics data is read and exported, use the **mls qos statistics-export interval** command in global configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos statistics-export interval** *interval*

**no mls qos statistics-export interval**

## Syntax Description

*interval* Export time; valid values are from 30 to 65535 seconds.

## Command Default

300 seconds

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

QoS-statistics data export is not supported on Optical Services Module (OSM) interfaces.

The *interval* needs to be short enough to avoid counter wraparound with the activity in your configuration.



### Caution

Be careful when decreasing the interval because exporting QoS statistics imposes a noticeable load on the Cisco 7600 series router.

## Examples

This example shows how to set the QoS-statistics data-export interval:

```
Router(config)# mls qos statistics-export interval 250
```

## Related Commands

Command	Description
<b>show mls qos statistics-export info</b>	Displays information about the MLS-statistics data-export status and configuration.

# mls qos supervisor 10g-only

To configure the Cisco 7600 RSP720-10GE to run QoS only on the 10GE uplink ports, use the **mls qos supervisor 10g-only** command in global configuration mode. Use the **no** form of the command to reconfigure the RSP to run QoS on all the uplink ports (10GE and 1GE).

**mls qos supervisor 10g-only**

**no mls qos supervisor 10g-only**

**Syntax Description** This command has no arguments or keywords.

**Defaults** This command is disabled by default.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(33)SRC	This command was introduced on the Cisco 7600 series routers.

**Usage Guidelines** The RSP720-10GE has both 10GE and 1GE uplink ports. You can configure the RSP720-10GE to run QoS features on all uplink ports (mixed mode) or on 10GE ports only. The number of queues available for QoS depends on which mode is used:

- In mixed mode (10GE and 1GE ports), the default, only four queues are available for QoS.  
The QoS port architecture for fixed mode for 1GE ports is (Rx/Tx): **2q8t/1p3q8t**.
- In 10GE only mode, eight queues are available for QoS.  
The QoS port architecture for 10GE only mode is as follows (Rx/Tx):
  - **8q8t/1p7q8t** (CoS)
  - **16q8t/1p15q8t** (DSCP)
  - **16q1t/1p15q1t** (VLAN)

When you switch between mixed-mode QoS and 10GE only mode, service is temporarily lost on the RSP720-10GE uplinks. In addition, when you switch between modes, any existing QoS configuration on the uplinks is lost. You must reconfigure QoS.

When you switch from 10GE only to mixed-mode QoS, you must issue the **no shutdown** command on each of the three 1GE ports to resume QoS service on those ports.

In 10GE only mode, the 1GE ports are visible but they remain in an administratively down state.



**Note** To obtain more information on queues, use the **show queueing interface** command.

---

**Examples**

The following example shows how to configure the RSP720-10GE to run QoS on 10GE ports only:

```
Router(config)# mls qos supervisor 10g-only  
The following ports will be shut to enable 10g-only mode:  
Gi6/1 Gi6/2 Gi6/3
```

The following example shows how in a redundant setup (High Availability), the 1GE uplink ports on both supervisors are shut down even though the redundant links are not used:

```
Router(config)# mls qos supervisor 10g-only  
The following ports will be shut to enable 10g-only mode:  
Gi6/1 Gi6/2 Gi6/3 Gi5/1 Gi5/2 Gi5/3
```

---

**Related Commands**

Command	Description
<b>mls qos (interface configuration)</b>	Displays information about the traffic on an interface.

# mls qos trust

To configure the multilayer switching (MLS) port trust state and to classify traffic by examining the class of service (CoS) or differentiated services code point (DSCP) value, use the **mls qos trust** command in interface configuration mode. To return a port to its untrusted state, use the **no** form of this command.

**mls qos trust [cos | dscp | ip-precedence]**

**no mls qos trust**

## Syntax Description

<b>cos</b>	(Optional) Classifies incoming packets that have packet CoS values. The CoS bits in incoming frames are trusted. The internal DSCP value is derived from the CoS bits. The port default CoS value should be used for untagged packets.
<b>dscp</b>	(Optional) Classifies incoming packets that have packet DSCP values (the most significant 6 bits of the 8-bit service-type field). The ToS bits in the incoming packets contain the DSCP value. For non-IP packets, the packet CoS value is 0. If you do not enter a keyword, <b>mls qos trust dscp</b> is assumed.
<b>ip-precedence</b>	(Optional) Specifies that the ToS bits in the incoming packets contain an IP precedence value. The internal DSCP value is derived from the IP-precedence bits.

## Command Default

The defaults for LAN interfaces and WAN interfaces on the Optical Service Modules (OSMs) are as follows:

- If you enable global QoS, the port is not trusted.
- If no keyword is specified or the global QoS is disabled, the default is **dscp**.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.1(6)EA2	This command was introduced.
12.2(14)SX	Support for this command was introduced on Cisco 7600 series routers.
12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series routers, Cisco 3600 series routers, and Cisco 3700 series routers.
12.2(17d)SXB	This command was implemented on the Cisco 7600 series routers and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.

**Usage Guidelines**

Packets that enter a quality of service (QoS) domain are classified at its edge. Because the packets are classified at the edge, the switch port within the QoS domain can be configured to a trusted state. It is not necessary to classify the packets at every switch within the domain. Use the **mls qos trust** command to set the trusted state of an interface and to indicate which fields of the packet are used to classify traffic.

The following conditions apply to the **mls qos trust** command running on Cisco 7600 series routers:

- The **cos** keyword is not supported for **pos** or **atm** interface types.
- The trust state does not apply to FlexWAN modules.
- The trust state does not apply to 1q4t LAN ports except for Gigabit Ethernet ports.
- Incoming queue drop thresholds are not implemented when you enter the **mls qos trust cos** command on 4-port Gigabit Ethernet WAN modules.
- The **set qos-group** command is used to set the trust state on Layer 2 WAN interfaces.

**Note**

This command can be used only on Cisco 7600 Series Routers.

**Examples**

The following example shows how to set the trusted state of an interface to IP precedence:

```
Router(config-if)# mls qos trust ip-precedence
```

**Related Commands**

Command	Description
<b>mls qos cos</b>	Defines the default CoS value of a port or assigns the default CoS to all incoming packets on the port.
<b>mls qos map</b>	Defines the CoS-to-DSCP map or the DSCP-to-CoS map.
<b>show mls qos interface</b>	Displays QoS information.

# mls qos trust extend

To configure the trust mode of the phone, use the **mls qos trust extend** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

**mls qos trust extend** [*cos value*]

**no mls qos trust extend**

## Syntax Description

**cos value** (Optional) Specifies the class of service (CoS) value that is used to remark the packets from the PC; valid values are from 0 to 7.

## Command Default

The default settings are as follows:

- Mode is untrusted.
- **cos value** is 0.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on WAN modules.

If you set the phone to trusted mode, all the packets from the PC are sent untouched directly through the phone to the Cisco 7600 series router. If you set the phone to untrusted mode, all the traffic coming from the PC are remarked with the configured CoS value before being sent to the Cisco 7600 series router.

Each time that you enter the **mls qos trust extend** command, the mode is changed. For example, if the mode was previously set to trusted, if you enter the command, the mode changes to untrusted. Enter the **show queuing interface** command to display the current trust mode.

## Examples

This example shows how to set the phone that is attached to the switch port in trust mode:

```
Router(config-if)# interface fastethernet5/1
Router(config-if)# mls qos trust extend
```

This example shows how to change the mode to untrusted and set the remark CoS value to 3:

```
Router(config-if)# interface fastethernet5/1
Router(config-if)# mls qos trust extend cos 3
```

This example shows how to set the configuration to the default mode:

```
Router(config-if)# interface fastethernet5/1  
Router(config-if)# no mls qos trust extend
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show queueing</b>	Displays queueing information.
<b>interface</b>	

---

# mls qos vlan-based

To enable per-VLAN quality of service (QoS) for a Layer 2 interface, use the **mls qos vlan-based** command in interface configuration mode. To disable per-VLAN QoS for a Layer 2 interface, use the **no** form of this command.

**mls qos vlan-based**

**no mls qos vlan-based**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Disabled

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** This command is supported on switch-port and port-channel interfaces only.

In VLAN-based mode, the policy map that is attached to the Layer 2 interface is ignored, and QoS is driven by the policy map that is attached to the corresponding VLAN interface.

You can configure per-VLAN QoS only on Layer 2 interfaces.



**Note** Layer 3 interfaces are always in interface-based mode. Layer 3 VLAN interfaces are always in VLAN-based mode.

**Examples** This example shows how to enable per-VLAN QoS for a Layer 2 interface:

```
Router(config-if)# mls qos vlan-based
```

Related Commands	Command	Description
	<b>mls qos bridged</b>	Enables the microflow policing for bridged traffic on Layer 3 LAN interfaces.
	<b>mls qos cos</b>	Defines the default CoS value for an interface.
	<b>show queuing interface</b>	Displays queuing information.

# mpls experimental

To configure Multiprotocol Label Switching (MPLS) experimental (EXP) levels for a virtual circuit (VC) class that can be assigned to a VC bundle and thus applied to all VC members of that bundle, use the **mpls experimental** command in VC-class configuration mode. To remove the MPLS EXP levels from the VC class, use the **no** form of this command.

To configure the MPLS EXP levels for a VC member of a bundle, use the **mpls experimental** command in bundle-vc configuration mode. To remove the MPLS EXP levels from the VC, use the **no** form of this command.

**mpls experimental** [*other* | *range*]

**no mpls experimental**

## Syntax Description

<b>other</b>	(Optional) Specifies any MPLS EXP levels in the range from 0 to 7 that are not explicitly configured. This is the default.
<i>range</i>	(Optional) A single MPLS EXP level specified as a number from 0 to 7, or a range of levels, specified as a hyphenated range.

## Defaults

Defaults to **other**, that is, any MPLS EXP levels in the range from 0 to 7 that are not explicitly configured.

## Command Modes

VC-class configuration (for a VC class)  
Bundle-vc configuration (for ATM VC bundle members)

## Command History

Release	Modification
12.2(8)T	This command was introduced.
12.0(26)S	This command was implemented on the Cisco 10000 series router.
12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
12.2(16)BC	This command was implemented on the ESR-PRE2.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

## Usage Guidelines

Assignment of MPLS EXP levels to VC bundle members allows you to create differentiated service because you can distribute the MPLS EXP levels over the different VC bundle members. You can map a single level or a range of levels to each discrete VC in the bundle, thereby enabling VCs in the bundle to carry packets marked with different levels. Alternatively, you can configure a VC with the **mpls experimental other** command to indicate that it can carry traffic marked with levels not specifically configured for it. Only one VC in the bundle can be configured with the **mpls experimental other** command to carry all levels not specified. This VC is considered the default one.

To use this command in VC-class configuration mode, enter the **vc-class atm** global configuration command before you enter this command. This command has no effect if the VC class that contains the command is attached to a standalone VC, that is, if the VC is not a bundle member.

To use this command to configure an individual bundle member in bundle-VC configuration mode, first enter the **bundle** command to enact bundle configuration mode for the bundle to which you want to add or modify the VC member to be configured. Then use the **pvc-bundle** command to specify the VC to be created or modified and enter bundle-VC configuration mode.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next highest MPLS EXP level):

- VC configuration in bundle-VC mode
- Bundle configuration in bundle mode (with the effect of assigned VC class configuration)
- Subinterface configuration in subinterface mode

**Note**

If you are using an ATM interface, you must configure all MPLS EXP levels (ranging from 0 to 7) for the bundle. For this configuration, Cisco recommends configuring one member of the bundle with the **mpls experimental other** command. The **other** keyword defaults to any MPLS EXP level in a range from 0 to 7 that is not explicitly configured.

**Examples**

The following example configures a class named control-class that includes an **mpls experimental** command that, when applied to a bundle, configures all VC members of that bundle to carry MPLS EXP level 7 traffic. Note that VC members of that bundle can be individually configured with the **mpls experimental** command at the bundle-vc level, which would supersede.

```
vc-class atm control-class
 mpls experimental 7
```

The following example configures permanent virtual circuit (PVC) 401, named control-class, to carry traffic with MPLS EXP levels in the range of 4 to 2, overriding the level mapping set for the VC through VC-class configuration:

```
pvc-bundle control-class 401
 mpls experimental 4-2
```

**Related Commands**

Command	Description
<b>bump</b>	Configures the bumping rules for a VC class that can be assigned to a VC bundle.
<b>bundle</b>	Creates a bundle or modifies an existing bundle, and enters bundle configuration mode.
<b>class-vc</b>	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
<b>protect</b>	Configures a VC class with protected group or protected VC status for application to a VC bundle member.
<b>pvc-bundle</b>	Adds a VC to a bundle as a member and enters bundle-VC configuration mode to configure that VC bundle member.
<b>ubr</b>	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vbr-nrt</b>	Configures the VBR-nrt QoS and specifies the output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vc-class atm</b>	Creates a VC class for an ATM PVC, SVC, or ATM interface, and enters VC-class configuration mode.

# non-tcp

To enable non-Transmission-Control-Protocol (non-TCP) header compression within an IP Header Compression (IPHC) profile, use the **non-tcp** command in IPHC-profile configuration mode. To disable non-TCP header compression within an IPHC profile, use the **no** form of this command.

**non-tcp**

**no non-tcp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Non-TCP header compression is enabled.

**Command Modes** IPHC-profile configuration

Command History	Release	Modification
	12.4(9)T	This command was introduced.

**Usage Guidelines**

**Intended for Use with IPHC Profiles**

The **non-tcp** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on a network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples** The following example shows how to configure an IPHC profile called profile2. In this example, non-TCP header compression is configured.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp
Router(config-iphcp)# end
```

Related Commands	Command	Description
	<b>iphc-profile</b>	Creates an IPHC profile.

## non-tcp contexts

To set the number of contexts available for non-Transmission-Control-Protocol (TCP) header compression, use the **non-tcp contexts** command in IPHC-profile configuration mode. To remove the number of previously configured contexts, use the **no** form of this command.

```
non-tcp contexts { absolute number-of-connections | kbits-per-context kbits }
```

```
no non-tcp contexts
```

### Syntax Description

<b>absolute</b>	Indicates that the maximum number of compressed non-TCP contexts will be based on a fixed (absolute) number.
<i>number-of-connections</i>	Number of non-TCP connections. Range is from 1 to 1000.
<b>kbits-per-context</b>	Indicates that the maximum number of compressed non-TCP contexts will be based on available bandwidth.
<i>kbits</i>	Number of kbits to allow for each context. Range is from 1 to 100.

### Command Default

The **non-tcp contexts** command calculates the number of contexts on the basis of bandwidth and allocates 4 kbits per context.

### Command Modes

IPHC-profile configuration

### Command History

Release	Modification
12.4(9)T	This command was introduced.

### Usage Guidelines

Use the **non-tcp contexts** command to set the number of contexts available for non-TCP header compression. A context is the state that the compressor uses to compress a header and that the decompressor uses to decompress a header. The context is the uncompressed version of the last header sent and includes information used to compress and decompress the packet.

#### Intended for Use with IPHC Profiles

The **non-tcp contexts** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

#### Setting the Number of Contexts as an Absolute Number

The **non-tcp contexts** command allows you to set the number of contexts as an absolute number. To set the number of contexts as an absolute number, enter a number between 1 and 1000.

### Calculating the Number of Contexts on the Basis of Bandwidth

The **non-tcp contexts** command can calculate the number of contexts on the basis of the bandwidth available on the network link to which the IPHC profile is applied.

To have the number of contexts calculated on the basis of the available bandwidth, enter the **kbits-per-context** keyword followed by a value for the *kbits* argument. The command divides the available bandwidth by the kbits specified. For example, if the bandwidth of the network link is 3000 kbps, and you enter 5 for the *kbits* argument, the command calculates 600 contexts.

### Examples

The following is an example of an IPHC profile called profile2. In this example, the number of non-TCP contexts has been set to 75.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp contexts absolute 75
Router(config-iphcp)# end
```

### Related Commands

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.

# oam-bundle

To enable end-to-end F5 Operation, Administration, and Maintenance (OAM) loopback cell generation and OAM management for all virtual circuit (VC) members of a bundle or a VC class that can be applied to a VC bundle, use the **oam-bundle** command in SVC-bundle configuration mode or VC-class configuration mode. To remove OAM management from the bundle or class configuration, use the **no** form of this command.

To enable end-to-end F5 OAM loopback cell generation and OAM management for all VC members of a bundle, use the **oam-bundle** command in bundle configuration mode. To remove OAM management from the bundle, use the **no** form of this command.

**oam-bundle** [**manage**] [*frequency*]

**no oam-bundle** [**manage**] [*frequency*]

## Syntax Description

<b>manage</b>	(Optional) Enables OAM management. If this keyword is omitted, loopback cells are sent, but the bundle is not managed.
<i>frequency</i>	(Optional) Number of seconds between transmitted OAM loopback cells. Values range from 0 to 600 seconds. The default value for the <i>frequency</i> argument is 10 seconds.

## Command Default

End-to-end F5 OAM loopback cell generation and OAM management are disabled, but if OAM cells are received, they are looped back.

## Command Modes

SVC-bundle configuration (for an SVC bundle)  
 VC-class configuration (for a VC class)  
 Bundle configuration (for an ATM VC bundle)

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.0(26)S	This command was introduced on the Cisco 10000 series router.
12.2(16)BX	This command was implemented on the ESR-PRE2.
12.2(4)T	This command was made available in SVC-bundle configuration mode.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

This command defines whether a VC bundle is OAM managed. If this command is configured for a bundle, every VC member of the bundle is OAM managed. If OAM management is enabled, further control of OAM management is configured using the **oam retry** command.

This command has no effect if the VC class that contains the command is attached to a standalone VC; that is, if the VC is not a bundle member. In this case, the attributes are ignored by the VC.

To use this command in VC-class configuration mode, first enter the **vc-class atm** global configuration command.

To use this command in bundle configuration mode, first enter the **bundle** subinterface configuration command to create the bundle or to specify an existing bundle.

VCs in a VC bundle are subject to the following configuration inheritance rules (listed in order of next-highest precedence):

- VC configuration in bundle-VC mode
- Bundle configuration in bundle mode (with the effect of assigned VC-class configuration)

**Examples**

The following example enables OAM management for a bundle called “bundle 1”:

```
bundle bundle1
 oam-bundle manage
```

**Related Commands**

Command	Description
<b>broadcast</b>	Configures broadcast packet duplication and transmission for an ATM VC class, PVC, SVC, or VC bundle.
<b>bundle</b>	Enters bundle configuration mode to create a bundle or modify an existing bundle.
<b>class-bundle</b>	Configures a VC bundle with the bundle-level commands contained in the specified VC class.
<b>encapsulation</b>	Sets the encapsulation method used by the interface.
<b>inarp</b>	Configures the Inverse ARP time period for an ATM PVC, VC class, or VC bundle.
<b>oam retry</b>	Configures parameters related to OAM management for an ATM PVC, SVC, VC class, or VC bundle.
<b>protocol (ATM)</b>	Configures a static map for an ATM PVC, SVC, VC class, or VC bundle, and enables Inverse ARP or Inverse ARP broadcasts on an ATM PVC by configuring Inverse ARP either directly on the PVC, on the VC bundle, or in a VC class (applies to IP and IPX protocols only).
<b>vc-class atm</b>	Creates a virtual circuit (VC) class for an ATM permanent virtual circuit (PVC), switched virtual circuit (SVC), or ATM interface.

# platform vfi dot1q-transparency

To enable 802.1Q transparency mode, use the **platform vfi dot1q-transparency** command in global configuration mode. To disable 802.1Q transparency, use the **no** form of this command.

**platform vfi dot1q-transparency**

**no platform vfi dot1q-transparency**

**Syntax Description** This command has no arguments or keywords.

**Command Default** 802.1Q transparency mode is disabled.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(18)SXF2	This command was introduced on the Supervisor Engine 720.

**Usage Guidelines** This command is supported on Optical Services Modules (OSMs) only.

802.1Q transparency allows a service provider to modify the Multiprotocol Label Switching Experimental bits (MPLS EXP) bits for core-based QoS policies while leaving any Virtual Private LAN Service (VPLS) customer 802.1p bits unchanged.

With releases before Cisco IOS Release 12.2(18)SXF1, application of a service policy to a VLAN interface that matches all and sets the MPLS EXP bits had an effect on both the Interior Gateway Protocol (IGP) label and the VC label. Because the 802.1p bits were rewritten on the egress Provider Edge (PE) based on the received Virtual Circuit (VC) MPLS EXP bits, the VPLS customer's 802.1p bits were changed.

The Dot1q Transparency for EoMPLS feature causes the VLAN-applied policy to affect only the IGP label (for core QoS) and leaves the VC label EXP bits equal to the 802.1p bits. On the egress PE, the 802.1p bits are still rewritten based on the received VC EXP bits; however, because the EXP bits now match the ingress 802.1p bits, a VPLS customer's 802.1p bits do not change.

Global configuration applies to all virtual forwarding instance (VFI) and switched virtual interface (SVI) EoMPLS VCs configured on the Cisco 7600 series routers.

To ensure interoperability, apply the Dot1q Transparency for EoMPLS feature to all participating PE routers.

**Examples** This example shows how to enable 802.1Q transparency:

```
platform vfi dot1q-transparency
```

This example shows how to disable 802.1Q transparency:

```
no platform vfi dot1q-transparency
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show cwan vfi dot1q-transparency</b>	Displays 802.1Q transparency mode.

---

# police

To configure traffic policing, use the **police** command in policy-map class configuration mode or policy-map class police configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

```
police bps [burst-normal] [burst-max] conform-action action exceed-action action
[violate-action action]
```

```
no police bps [burst-normal] [burst-max] conform-action action exceed-action action
[violate-action action]
```

## Syntax Description

<i>bps</i>	Average rate, in bits per second. Valid values are 8000 to 200000000.
<i>burst-normal</i>	(Optional) Normal burst size in bytes. Valid values are 1000 to 51200000. Default normal burst size is 1500.
<i>burst-max</i>	(Optional) Maximum burst size, in bytes. Valid values are 1000 to 51200000. Default varies by platform.
<b>conform-action</b>	Specifies action to take on packets that conform to the rate limit.
<b>exceed-action</b>	Specifies action to take on packets that exceed the rate limit.
<b>violate-action</b>	(Optional) Specifies action to take on packets that violate the normal and maximum burst sizes.

---

*action*

Action to take on packets. Specify one of the following keywords:

- **drop**—Drops the packet.
  - **set-clp-transmit** *value*—Sets the ATM Cell Loss Priority (CLP) bit from 0 to 1 on the ATM cell and transmits the packet with the ATM CLP bit set to 1.
  - **set-cos-inner-transmit** *value*—Sets the inner class of service field as a policing action for a bridged frame on the Enhanced FlexWAN module when using bridging features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
  - **set-cos-transmit** *value*—Sets the COS packet value and sends it.
  - **set-discard-class-transmit**—Sets the discard class attribute of a packet and transmits the packet with the new discard class setting.
  - **set-dscp-transmit** *value*—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value.
  - **set-dscp-tunnel-transmit** *value*—Sets the DSCP value (0 to 63) in the tunnel header of a Layer 2 Tunnel Protocol Version 3 (L2TPv3) or Generic Routing Encapsulation (GRE) tunneled packet for tunnel marking and transmits the packet with the new value.
  - **set-frde-transmit** *value*—Sets the Frame Relay Discard Eligibility (DE) bit from 0 to 1 on the Frame Relay frame and transmits the packet with the DE bit set to 1.
  - **set-mpls-experimental-imposition-transmit** *value*—Sets the Multiprotocol Label Switching (MPLS) experimental (EXP) bits (0 to 7) in the imposed label headers and transmits the packet with the new MPLS EXP bit value.
  - **set-mpls-experimental-topmost-transmit** *value*—Sets the MPLS EXP field value in the topmost MPLS label header at the input and/or output interfaces.
  - **set-prec-transmit** *value*—Sets the IP precedence and transmits the packet with the new IP precedence value.
  - **set-prec-tunnel-transmit** *value*—Sets the precedence value (0 to 7) in the tunnel header of an L2TPv3 or GRE tunneled packet for tunnel marking and transmits the packet with the new value.
  - **set-qos-transmit** *value*—Sets the qos-group value and transmits the packet with the new qos-group value.
  - **transmit**—Transmits the packet. The packet is not altered.
- 

---

**Command Default**

Traffic policing is not configured.

---

**Command Modes**

Policy-map class configuration (config-pmap-c) when specifying a single action to be applied to a marked packet

Policy-map class police configuration (config-pmap-c-police) when specifying multiple actions to be applied to a marked packet

Command History	Release	Modification
	12.0(5)XE	This <b>police</b> command was introduced.
	12.1(1)E	This command was integrated in Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated in Cisco IOS Release 12.1(5)T. The <b>violate-action</b> keyword was added.
	12.2(2)T	The following modifications were made to the command: <ul style="list-style-type: none"> <li>The <b>set-clp-transmit</b> keyword for the <i>action</i> argument was added.</li> <li>The <b>set-frde-transmit</b> keyword for the <i>action</i> argument was added.</li> </ul> <p><b>Note</b> However, the <b>set-frde-transmit</b> keyword is not supported for AToM traffic in this release. Also, the <b>set-frde-transmit</b> keyword is supported only when Frame Relay is implemented on a physical interface without encapsulation.</p> <ul style="list-style-type: none"> <li>The <b>set-mpls-experimental-transmit</b> keyword for the <i>action</i> argument was added.</li> </ul>
	12.2(8)T	The command was modified for the Policer Enhancement—Multiple Actions feature. This command can now accommodate multiple actions for packets marked as conforming to, exceeding, or violating a specific rate.
	12.2(13)T	In the <i>action</i> argument, the <b>set-mpls-experimental-transmit</b> keyword was renamed to <b>set-mpls-experimental-imposition-transmit</b> .
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB, and the <b>set-dscp-tunnel-transmit</b> and <b>set-prec-tunnel-transmit</b> keywords for the <i>action</i> argument were added. These keywords are intended for marking Layer 2 Tunnel Protocol Version 3 (L2TPv3) tunneled packets.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA. The <b>set-cos-inner-transmit</b> keyword for the <i>action</i> argument was added when using multipoint bridging (MPB) features on the Enhanced FlexWAN module and when using MPB on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
	12.2(31)SB2	Support for the <b>set-frde-transmit</b> <i>action</i> argument was added on the Cisco 10000 series router.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
	12.2(33)SRC	Support for the Cisco 7600 series router was added.
	12.4(15)T2	This command was modified to include support for marking Generic Routing Encapsulation (GRE) tunneled packets. <p><b>Note</b> For this release, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco MGX Route Processor Module (RPM-XF).</p>
	12.2(33)SB	This command was modified to include support for marking GRE-tunneled packets, and support for the Cisco 7300 series router was added.

**Usage Guidelines**

Use the **police** command to mark a packet with different quality of service (QoS) values based on conformance to the service-level agreement.

Traffic policing will not be executed for traffic that passes through an interface.

**Specifying Multiple Actions**

The **police** command allows you to specify multiple policing actions. When specifying multiple policing actions when configuring the **police** command, note the following points:

- You can specify a maximum of four actions at one time.
- You cannot specify contradictory actions such as **conform-action transmit** and **conform-action drop**.

**Using the Police Command with the Traffic Policing Feature**

The **police** command can be used with the Traffic Policing feature. The Traffic Policing feature works with a token bucket algorithm. Two types of token bucket algorithms are in Cisco IOS Release 12.1(5)T: a single-token bucket algorithm and a two-token bucket algorithm. A single-token bucket system is used when the **violate-action** option is not specified, and a two-token bucket system is used when the **violate-action** option is specified.

The token bucket algorithm for the **police** command that was introduced in Cisco IOS Release 12.0(5)XE is different from the token bucket algorithm for the **police** command that was introduced in Cisco IOS Release 12.1(5)T. For information on the token bucket algorithm introduced in Release 12.0(5)XE, see the *Traffic Policing* document for Release 12.0(5)XE. This document is available on the New Features for 12.0(5)XE documentation index (under Modular QoS CLI-related feature modules) at [www.cisco.com](http://www.cisco.com).

The following are explanations of how the token bucket algorithms introduced in Cisco IOS Release 12.1(5)T work.

**Token Bucket Algorithm with One Token Bucket**

The one-token bucket algorithm is used when the **violate-action** option is not specified in the **police** command CLI.

The conform bucket is initially set to the full size (the full size is the number of bytes specified as the normal burst size).

When a packet of a given size (for example, “B” bytes) arrives at specific time (time “T”), the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current time is T, the bucket is updated with (T - T1) worth of bits based on the token arrival rate. The token arrival rate is calculated as follows:  
(time between packets (which is equal to T - T1) \* policer rate)/8 bytes
- If the number of bytes in the conform bucket B is greater than or equal to the packet size, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is completed for the packet.
- If the number of bytes in the conform bucket B (minus the packet size to be limited) is fewer than 0, the exceed action is taken.

### Token Bucket Algorithm with Two Token Buckets

The two-token bucket algorithm is used when the **violate-action** option is specified in the **police** command.

The conform bucket is initially full (the full size is the number of bytes specified as the normal burst size).

The exceed bucket is initially full (the full exceed bucket size is the number of bytes specified in the maximum burst size).

The tokens for both the conform and exceed token buckets are updated based on the token arrival rate, or committed information rate (CIR).

When a packet of given size (for example, “B” bytes) arrives at specific time (time “T”) the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current arrival of the packet is at T, the bucket is updated with T -T1 worth of bits based on the token arrival rate. The refill tokens are placed in the conform bucket. If the tokens overflow the conform bucket, the overflow tokens are placed in the exceed bucket.

The token arrival rate is calculated as follows:

$(\text{time between packets (which is equal to } T-T1) * \text{policer rate})/8 \text{ bytes}$

- If the number of bytes in the conform bucket B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is taken. The exceed bucket is unaffected in this scenario.
- If the number of bytes in the conform bucket B is less than 0, the excess token bucket is checked for bytes by the packet. If the number of bytes in the exceed bucket B is greater than or equal to 0, the exceed action is taken and B bytes are removed from the exceed token bucket. No bytes are removed from the conform bucket.
- If the number bytes in the exceed bucket B is fewer than 0, the packet violates the rate and the violate action is taken. The action is complete for the packet.

### Using the set-cos-inner-transmit Action for SIPs and SPAs on the Cisco 7600 Series Router

The **set-cos-inner-transmit** keyword action was introduced in Cisco IOS Release 12.2(33)SRA to support marking of the inner CoS value as a policing action when using MPB features on the Enhanced FlexWAN module and when using MPB features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.

This command is not supported on the Cisco 7600 SIP-600.

For more information about QoS and the forms of **police** commands supported by the SIPs on the Cisco 7600 series router, see the *Cisco 7600 Series SIP, SSC, and SPA Software Configuration Guide*.

## Examples

### Token Bucket Algorithm with One Token Bucket: Example

The following example shows how to define a traffic class (using the **class-map** command) and associate the match criteria from the traffic class with the traffic policing configuration, which is configured in the service policy (using the **policy-map** command). The **service-policy** command is then used to attach this service policy to the interface.

In this particular example, traffic policing is configured with the average rate at 8000 bits per second and the normal burst size at 1000 bytes for all packets leaving Fast Ethernet interface 0/0:

```
Router(config)# class-map access-match
Router(config-cmap)# match access-group 1
Router(config-cmap)# exit
```

```

Router(config)# policy-map police-setting
Router(config-pmap)# class access-match
Router(config-pmap-c)# police 8000 1000 conform-action transmit exceed-action drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface fastethernet 0/0
Router(config-if)# service-policy output police-setting

```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the token bucket ( $(0.25 * 8000)/8$ ), leaving 800 bytes in the token bucket. If the next packet is 900 bytes, the packet exceeds and the exceed action (drop) is taken. No bytes are taken from the token bucket.

### Token Bucket Algorithm with Two Token Buckets: Example

In this example, traffic policing is configured with the average rate at 8000 bits per second, the normal burst size at 1000 bytes, and the excess burst size at 1000 bytes for all packets leaving Fast Ethernet interface 0/0.

```

Router(config)# class-map access-match
Router(config-cmap)# match access-group 1
Router(config-cmap)# exit
Router(config)# policy-map police-setting
Router(config-pmap)# class access-match
Router(config-pmap-c)# police 8000 1000 1000 conform-action transmit exceed-action
set-qos-transmit 1 violate-action drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface fastethernet 0/0
Router(config-if)# service-policy output police-setting

```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet, and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the conform token bucket ( $(0.25 * 8000)/8$ ), leaving 800 bytes in the conform token bucket. If the next packet is 900 bytes, the packet does not conform because only 800 bytes are available in the conform token bucket.

The exceed token bucket, which starts full at 1000 bytes (as specified by the excess burst size), is then checked for available bytes. Because enough bytes are available in the exceed token bucket, the exceed action (set the QoS transmit value of 1) is taken and 900 bytes are taken from the exceed bucket (leaving 100 bytes in the exceed token bucket).

If the next packet arrives 0.40 seconds later, 400 bytes are added to the token buckets ( $(.40 * 8000)/8$ ). Therefore, the conform token bucket now has 1000 bytes (the maximum number of tokens available in the conform bucket) and 200 bytes overflow the conform token bucket (because only 200 bytes were needed to fill the conform token bucket to capacity). These overflow bytes are placed in the exceed token bucket, giving the exceed token bucket 300 bytes.

If the arriving packet is 1000 bytes, the packet conforms because enough bytes are available in the conform token bucket. The conform action (transmit) is taken by the packet, and 1000 bytes are removed from the conform token bucket (leaving 0 bytes).

If the next packet arrives 0.20 seconds later, 200 bytes are added to the token bucket  $((.20 * 8000)/8)$ . Therefore, the conform bucket now has 200 bytes. If the arriving packet is 400 bytes, the packet does not conform because only 200 bytes are available in the conform bucket. Similarly, the packet does not exceed because only 300 bytes are available in the exceed bucket. Therefore, the packet violates and the violate action (drop) is taken.

### Conforming to the MPLS EXP Value: Example

The following example shows that if packets conform to the rate limit, the MPLS EXP field is set to 5. If packets exceed the rate limit, the MPLS EXP field is set to 3.

```
Router(config)# policy-map input-IP-dscp
Router(config-pmap)# class dscp24
Router(config-pmap-c)# police 8000 1500 1000 conform-action
set-mpls-experimental-imposition-transmit 5 exceed-action
set-mpls-experimental-imposition-transmit 3
Router(config-pmap-c)# violate-action drop
```

### Setting the Inner CoS Value as an Action for SIPs and SPAs on the Cisco 7600 Series Router: Example

The following example shows configuration of a QoS class that filters all traffic for virtual LAN (VLAN) 100 into a class named “vlan-inner-100” and establishes a traffic shaping policy for the vlan-inner-100 class. The service policy limits traffic to an average rate of 500 kbps, with a normal burst of 1000 bytes and a maximum burst of 1500 bytes, and sets the inner CoS value to 3. Since setting of the inner CoS value is supported only with bridging features, the configuration also shows the service policy being applied as an output policy for an ATM SPA interface permanent virtual circuit (PVC) that bridges traffic into VLAN 100 using the **bridge-domain** command.

```
Router(config)# class-map match-all vlan-inner-100
Router(config-cmap)# match vlan inner 100
Router(config-cmap)# exit
Router(config)# policy-map vlan-inner-100
Router(config-pmap)# class vlan-inner-100
Router(config-pmap-c)# police 500000 1000 1500 conform-action set-cos-inner-transmit 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm3/0/0
Router(config-if)# pvc 100/100
Router(config-if-atm-vc)# bridge-domain 100 dot1q
Router(config-if-atm-vc)# service-policy output vlan-inner-100
Router(config-if-atm-vc)# end
```

## Related Commands

Command	Description
<b>bridge-domain</b>	Enables RFC 1483 ATM bridging or RFC 1490 Frame Relay bridging to map a bridged VLAN to an ATM PVC or Frame Relay data-link connection identifier (DLCI).
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Specifies the name of the service policy to be attached to the interface.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

## police (EtherSwitch)

To define a policer for classified traffic, use the **police** command in policy-map class configuration mode. To remove an existing policer, use the **no** form of this command.

```
police {bps | cir bps} [burst-byte | bc burst-byte] conform-action transmit [exceed-action {drop | dscp dscp-value}]
```

```
no police {bps | cir bps} [burst-byte | bc burst-byte] conform-action transmit [exceed-action {drop | dscp dscp-value}]
```

Syntax Description	
<i>bps</i>   <b>cir</b> <i>bps</i>	Average traffic rate or committed information rate (CIR) in bits per second (bps).  For 10/100 ports, the range is 1000000 to 100000000, and the granularity is 1 Mbps.  For Gigabit-capable Ethernet ports, the range is 8000000 to 1016000000, and the granularity is 8 Mbps.
<i>burst-byte</i>   <b>bc</b> <i>burst-byte</i>	(Optional) Normal burst size or burst count in bytes.
<b>conform-action transmit</b>	Sends packets that conform to the rate limit.
<b>exceed-action drop</b>	(Optional) When the specified rate is exceeded, specifies that the switch drops the packet.
<b>exceed-action dscp</b> <i>dscp-value</i>	(Optional) When the specified rate is exceeded, specifies that the switch changes the differentiated services code point (DSCP) of the packet to the specified <i>dscp-value</i> and then sends the packet.

**Command Default** No policers are defined.

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.1(6)EA2	This command was introduced.
	12.2(15)ZJ	This command was implemented on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
	12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T on the following platforms: Cisco 2600 series, Cisco 3600 series, and Cisco 3700 series routers.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

You can configure up to six policers on ingress Fast Ethernet ports.

You can configure up to 60 policers on ingress Gigabit-capable Ethernet ports.

Policers cannot be configured on egress Fast Ethernet and Gigabit-capable Ethernet ports.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

Use the **show policy-map** command to verify your settings.

**Examples**

The following example shows how to configure a policer that sets the DSCP value to 46 if traffic does not exceed a 1-Mbps average rate with a burst size of 65536 bytes and drops packets if traffic exceeds these conditions:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip dscp 46
Router(config-pmap-c)# police 1000000 65536 conform-action transmit exceed-action drop
Router(config-pmap-c)# end
```

**Related Commands**

Command	Description
<b>policy-map</b>	Creates or modifies a policy map that can be attached to multiple interfaces and enters policy-map configuration mode.
<b>show policy-map</b>	Displays QoS policy maps.

# police (percent)

To configure traffic policing on the basis of a percentage of bandwidth available on an interface, use the **police** command in QoS policy-map class configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

## Supported Platforms Except the Cisco 10000 Series Router

```
police cir percent percentage [burst-in-msec] [bc conform-burst-in-msec ms]
[be peak-burst-in-msec ms] [pir percent percentage] [conform-action action] [exceed-action
action] [violate-action action]]]
```

```
no police cir percent percentage [burst-in-msec] [bc conform-burst-in-msec ms]
[be peak-burst-in-msec ms] [pir percent percentage] [conform-action action] [exceed-action
action] [violate-action action]]]
```

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```
police cir percent percent [burst-in-msec] [bc conform-burst-in-msec ms] [pir percent] [be
peak-burst-in-msec ms] [conform-action action] [exceed-action action]
[violate-action action]
```

```
no police cir percent percent [burst-in-msec] [bc conform-burst-in-msec ms] [pir percent] [be
peak-burst-in-msec ms] [conform-action action] [exceed-action action]
[violate-action action]
```

## Syntax Description

<b>cir</b>	Committed information rate. Indicates that the CIR will be used for policing traffic.
<b>percent</b>	Specifies that a percentage of bandwidth will be used for calculating the CIR.
<i>percentage</i>	Specifies the bandwidth percentage. Valid range is a number from 1 to 100.
<i>burst-in-msec</i>	(Optional) Burst in milliseconds. Valid range is a number from 1 to 2000.
<b>bc</b>	(Optional) Conform burst (bc) size used by the first token bucket for policing traffic.
<i>conform-burst-in-msec</i>	(Optional) Specifies the bc value in milliseconds. Valid range is a number from 1 to 2000.
<b>ms</b>	(Optional) Indicates that the burst value is specified in milliseconds.
<b>be</b>	(Optional) Peak burst (be) size used by the second token bucket for policing traffic.
<i>peak-burst-in-msec</i>	(Optional) Specifies the be size in milliseconds. Valid range is a number from 1 to 2000.
<b>pir</b>	(Optional) Peak information rate. Indicates that the PIR will be used for policing traffic.
<i>percent</i>	(Optional) Specifies that a percentage of bandwidth will be used for calculating the PIR.
<b>conform-action</b>	(Optional) Action to take on packets whose rate is less than the conform burst. You must specify a value for peak-burst-in-msec before you specify the <b>conform-action</b> .

<b>exceed-action</b>	(Optional) Action to take on packets whose rate is within the conform and conform plus exceed burst.
<b>violate-action</b>	(Optional) Action to take on packets whose rate exceeds the conform plus exceed burst. You must specify the <b>exceed-action</b> before you specify the <b>violate-action</b> .
<i>action</i>	(Optional) Action to take on packets. Specify one of the following keywords:

#### All Supported Platforms

- **drop**—Drops the packet.
- **set-clp-transmit**—Sets the ATM Cell Loss Priority (CLP) bit from 0 to 1 on the ATM cell and sends the packet with the ATM CLP bit set to 1.
- **set-dscp-transmit** *new-dscp*—Sets the IP differentiated services code point (DSCP) value and sends the packet with the new IP DSCP value setting.
- **set-frde-transmit**—Sets the Frame Relay discard eligible (DE) bit from 0 to 1 on the Frame Relay frame and sends the packet with the DE bit set to 1.
- **set-prec-transmit** *new-prec*—Sets the IP precedence and sends the packet with the new IP precedence value setting.
- **transmit**—Sends the packet with no alteration.

#### Supported Platforms Except the Cisco 10000 Series Router

- **policed-dscp-transmit**—(Exceed and violate action only). Changes the DSCP value per the policed DSCP map and sends the packet.
- **set-cos-inner-transmit** *value*—Sets the inner class of service field as a policing action for a bridged frame on the Enhanced FlexWAN module, and when using bridging features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
- **set-cos-transmit** *value*—Sets the packet cost of service (CoS) value and sends the packet.
- **set-mpls-exposition-transmit**—Sets the Multiprotocol Label Switching (MPLS) experimental bits from 0 to 7 and sends the packet with the new MPLS experimental bit value setting.
- **set-mpls-topmost-transmit**—Sets the MPLS experimental bits on the topmost label and sends the packet.

*action (continued)***Cisco 10000 Series Routers**

- **drop**—Drops the packet.
- **set-clp-transmit *value***—Sets the ATM Cell Loss Priority (CLP) bit from 0 to 1 on the ATM cell and transmits the packet with the ATM CLP bit set to 1.
- **set-cos-inner-transmit *value***—Sets the inner class of service field as a policing action for a bridged frame on the Enhanced FlexWAN module, and when using bridging features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
- **set-cos-transmit *value***—Sets the packet COS value and sends it.
- **set-discard-class-transmit**—Sets the discard class attribute of a packet and transmits the packet with the new discard class setting.
- **set-dscp-transmit *value***—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting.
- **set-frde-transmit *value***—Sets the Frame Relay Discard Eligibility (DE) bit from 0 to 1 on the Frame Relay frame and transmits the packet with the DE bit set to 1.
- **set-mpls-experimental-imposition-transmit *value***—Sets the Multiprotocol Label Switching (MPLS) experimental (EXP) bits (0 to 7) in the imposed label headers and transmits the packet with the new MPLS EXP bit value setting.
- **set-mpls-experimental-topmost-transmit *value***—Sets the MPLS EXP field value in the topmost MPLS label header at the input and/or output interfaces.
- **set-prec-transmit *value***—Sets the IP precedence and transmits the packet with the new IP precedence value setting.
- **set-qos-transmit *value***—Sets the quality of service (QoS) group value and transmits the packet with the new QoS group value setting. Valid values are from 0 to 99.
- **transmit**—Transmits the packet. The packet is not altered.

**Command Default****All Supported Platforms**

The default bc and be values are 4 ms.

**Cisco 10000 Series Routers**

The default action for **conform-action** is transmit.

The default action for **exceed-action** and **violate-action** is drop.

**Command Modes**

QoS policy-map class configuration

**Command History**

Release	Modification
12.0(5)XE	This command was introduced.
12.0(25)SX	The Percent-based Policing feature was introduced on the Cisco 10000 series router.
12.1(1)E	This command was integrated into Cisco IOS Release 12.2(1)E.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(13)T	This command was modified for the Percentage-Based Policing and Shaping feature.
12.0(28)S	The command was integrated into Cisco IOS Release 12.0(28)S.
12.2(18)SXE	The command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(28)SB	The command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	The <b>set-cos-inner-transmit</b> keyword for the <i>action</i> argument was added when using multipoint bridging (MPB) features on the Enhanced FlexWAN module, and when using MPB on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
12.2(31)SB2	Support was added on the PRE3 for the <b>set-frde-transmit</b> <i>action</i> argument for the Cisco 10000 series router.

**Usage Guidelines**

This command calculates the cir and pir on the basis of a percentage of the maximum amount of bandwidth available on the interface. When a policy map is attached to the interface, the equivalent cir and pir values in bits per second (bps) are calculated on the basis of the interface bandwidth and the percent value entered with this command. The **show policy-map interface** command can then be used to verify the bps rate calculated.

The calculated cir and pir bps rates must be in the range of 8000 and 2000000000 bps. If the rates are outside this range, the associated policy map cannot be attached to the interface. If the interface bandwidth changes (for example, more is added), the bps values of the cir and the pir are recalculated on the basis of the revised amount of bandwidth. If the cir and pir percentages are changed after the policy map is attached to the interface, the bps values of the cir and pir are recalculated.

**Conform Burst and Peak Burst Sizes in Milliseconds**

This command also allows you to specify the values for the conform burst size and the peak burst size in milliseconds. If you want bandwidth to be calculated as a percentage, the conform burst size and the peak burst size must be specified in milliseconds (ms).

**Hierarchical Policy Maps**

Policy maps can be configured in two-level (nested) hierarchies; a top (or “parent”) level and a secondary (or “child”) level. The **police** (percent) command can be configured for use in either a parent or child policy map.

**Bandwidth and Hierarchical Policy Maps**

The **police** (percent) command uses the maximum rate of bandwidth available as the reference point for calculating the bandwidth percentage. When the **police** (percent) command is configured in a child policy map, the **police** (percent) command uses the bandwidth amount specified in the next higher-level policy (in this case, the parent policy map). If the parent policy map does not specify the maximum bandwidth rate available, the **police** (percent) command uses the maximum bandwidth rate available on

the next higher level (in this case, the physical interface, the highest point in the hierarchy) as the reference point. The **police** (percent) command always looks to the next higher level for the bandwidth reference point. The following sample configuration illustrates this point:

```

Policymap parent_policy
  class parent
    shape average 512000
    service-policy child_policy

Policymap child_policy
  class normal_type
    police cir percent 30

```

In this sample configuration, there are two hierarchical policies: one called `parent_policy` and one called `child_policy`. In the policy map called `child_policy`, the `police` command has been configured in the class called `normal_type`. In this class, the percentage specified by for the **police** (percent) command is 30 percent. The command will use 512 kbps, the peak rate, as the bandwidth reference point for class `parent` in the `parent_policy`. The **police** (percent) command will use 512 kbps as the basis for calculating the cir rate (512 kbps \* 30 percent).

```

interface serial 4/0
  service-policy output parent_policy

Policymap parent_policy
  class parent
    bandwidth 512
    service-policy child_policy

```

In the above example, there is one policy map called `parent_policy`. In this policy map, a peak rate has not been specified. The **bandwidth** command has been used, but this command does not represent the maximum rate of bandwidth available. Therefore, the **police** (percent) command will look to the next higher level (in this case serial interface 4/0) to get the bandwidth reference point. Assuming the bandwidth of serial interface 4/0 is 1.5 Mbps, the **police** (percent) command will use 1.5 Mbps as the basis for calculating the cir rate (1500000 \* 30 percent).

### How Bandwidth Is Calculated

The **police** (percent) command is often used in conjunction with the **bandwidth** and **priority** commands. The **bandwidth** and **priority** commands can be used to calculate the total amount of bandwidth available on an entity (for example, a physical interface). When the **bandwidth** and **priority** commands calculate the total amount of bandwidth available on an entity, the following guidelines are invoked:

- If the entity is a physical interface, the total bandwidth is the bandwidth on the physical interface.
- If the entity is a shaped ATM permanent virtual circuit (PVC), the total bandwidth is calculated as follows:
  - For a variable bit rate (VBR) virtual circuit (VC), the sustained cell rate (SCR) is used in the calculation.
  - For an available bit rate (ABR) VC, the minimum cell rate (MCR) is used in the calculation.

For more information on bandwidth allocation, refer to the “Congestion Management Overview” chapter in the Cisco IOS Quality of Service Solutions Configuration Guide.

### Using the `set-cos-inner-transmit` Action for SIPs and SPAs on the Cisco 7600 Series Router

The `set-cos-inner-transmit` keyword action was introduced in Cisco IOS Release 12.2(33)SRA to support marking of the inner CoS value as a policing action when using MPB features on the Enhanced FlexWAN module, and when using MPB features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.

This command is not supported on the Cisco 7600 SIP-600.

For more information about QoS and the forms of **police** commands supported by the SIPs on the Cisco 7600 series router, refer to the *Cisco 7600 Series SIP, SSC, and SPA Software Configuration Guide*.

## Examples

The following example shows how to configure traffic policing using a CIR and a PIR on the basis of a percentage of bandwidth. In this example, a CIR of 20 percent and a PIR of 40 percent have been specified. Additionally, an optional bc value and be value (300 ms and 400 ms, respectively) have been specified.

```
Router> enable
Router# configure terminal
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# police cir percent 20 bc 300 ms be 400 ms pir percent 40
Router(config-pmap-c-police)# exit
```

After the policy map and class maps are configured, the policy map is attached to an interface as shown in the following example:

```
Router> enable
Router# configure terminal
Router(config)# interface serial4/0
Router(config-if)# service-policy input policy1
Router(config-if)# exit
```

### Setting the Inner CoS Value as an Action for SIPs and SPAs on the Cisco 7600 Series Router

The following example shows configuration of a QoS class that filters all traffic for virtual LAN (VLAN) 100 into a class named vlan-inner-100 and establishes a traffic shaping policy for the vlan-inner-100 class. The service policy limits traffic to a CIR of 20 percent and a PIR of 40 percent, with a conform burst (bc) of 300 ms, and peak burst (be) of 400 ms, and sets the inner CoS value to 3. Because setting of the inner CoS value is only supported with bridging features, the configuration also shows the service policy being applied as an output policy for an ATM shared port adapter (SPA) interface permanent virtual circuit (PVC) that bridges traffic into VLAN 100 using the **bridge-domain** command.

```
Router(config)# class-map match-all vlan-inner-100
Router(config-cmap)# match vlan inner 100
Router(config-cmap)# exit
Router(config)# policy-map vlan-inner-100
Router(config-pmap-c)# police cir percent 20 bc 300 ms be 400 ms pir percent 40
conform-action set-cos-inner-transmit 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm3/0/0
Router(config-if)# pvc 100/100
Router(config-if-atm-vc)# bridge-domain 100 dot1q
Router(config-if-atm-vc)# service-policy output vlan-inner-100
Router(config-if)# end
```

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The following example shows how to configure the police (percent) command for a priority service. In the example, the priority class named Voice is configured in the policy map named New-Traffic. The router allocates 25 percent of the committed rate to Voice traffic and allows committed bursts of 4 ms

and excess bursts of 1 ms. The router transmits Voice traffic that conforms to the committed rate, sets the QoS transmit value to 4 for Voice traffic that exceeds the burst sizes, and drops Voice traffic that violates the committed rate.

```
Router(config)# policy-map New-Traffic
Router(config-pmap)# class Voice
Router(config-pmap-c)# priority
Router(config-pmap-c)# queue-limit 32
Router(config-pmap-c)# police percent 25 4 ms 1 ms conform-action transmit exceed-action
set-qos-transmit 4 violate-action drop
```

### Related Commands

Command	Description
<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>bridge-domain</b>	Enables RFC 1483 ATM bridging or RFC 1490 Frame Relay bridging to map a bridged VLAN to an ATM PVC or Frame Relay DLCI.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>priority</b>	Gives priority to a traffic class in a policy map.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>shape (percent)</b>	Specifies average or peak rate traffic shaping on the basis of a percentage of bandwidth available on an interface.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# police (policy map)

To create a per-interface policer and configure the policy-map class to use it, use the **police** command in policy-map class configuration mode. To delete the per-interface policer from the policy-map class, use the **no** form of this command.

The **police** command can be used three ways in a new policy map: **police**, **police aggregate**, and **police flow**. These commands are discussed below.

## police

The **police** command syntax is described in the *Cisco IOS Quality of Service Solutions Command Reference*.

## police aggregate

**police aggregate** *name*

**no police aggregate** *name*

## Creating a policy map

**policy-map** *name*

**no policy-map** *name*

## police flow

**police flow** *bps* [*burst-normal* [**conform-action** *action*] | **conform-action** *action*]

**police flow mask** {**dest-only** | **full-flow** | **src-only**} *bps* [*burst-normal* | **conform-action** *action*]

**no police flow** *bps* [*burst-normal* | **conform-action** *action*]

**no police flow mask** {**dest-only** | **full-flow** | **src-only**} *bps* [*burst-normal* | **conform-action** *action*]

Syntax	Description
<b>aggregate</b> <i>name</i>	Specifies a previously defined aggregate policer name and configures the policy-map class to use the specified aggregate policer.
<b>policy-map</b> <i>name</i>	Creates the named Quality of Service (QoS) policy map.
<b>flow</b>	Specifies a microflow policer that will police each flow.
<i>bps</i>	Average rate, in bits per second. Valid values are from 8000 to 10000000000.
<i>burst-normal</i>	(Optional) Committed information rate (CIR) token-bucket size, in bytes. Valid range is from 1000 to 31250000.
<b>conform-action</b> <i>action</i>	(Optional) Action to take on packets that conform to the rate limit. See the “Usage Guidelines” section for valid values.
<b>mask</b>	Specifies the flow mask to be used for policing.
<b>dest-only</b>	Specifies the destination-only flow mask.
<b>full-flow</b>	Specifies the full-flow mask.
<b>src-only</b>	Specifies the source-only flow mask.

**Command Default**

The defaults are as follows:

- **conform-action** is **transmit**.
- **exceed-action** is **drop**.

**Command Modes**

Policy-map class configuration

**Command History**

Release	Modification
12.2(14)SX	This command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(17d)SXB3	This command was changed to lower the <b>police bps</b> minimum from 32000 to 8000 on FlexWAN interfaces only.
12.2(18)SXD	This command was changed as follows: <ul style="list-style-type: none"> <li>• Added <b>set-mpls-exp-topmost-transmit</b> to the valid values for <b>conform-action</b>.</li> <li>• Changed the <b>set-mpls-exp-transmit</b> keyword to <b>set-mpls-exp-imposition-transmit</b>.</li> </ul>
12.2(18)SXF	This command was changed to increase the CIR maximum to 10,000,000,000 bits per second.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines**

The valid values for the *bps* argument are from 8000 to 10000000000. The exception is that in Release 12.2(17d)SXB3, valid values for the FlexWAN interfaces only are from 8000 to 4000000000 bps.

Use the **mls qos aggregate-policer** *policer-name* command to create a named aggregate policer.

You can create two types of aggregate policers: named and per-interface. Both types can be attached to more than one port as follows:

- You create named aggregate policers using the **mls qos aggregate-policer** command. If you attach a named aggregate policer to multiple ingress ports, it polices the matched traffic from all the ingress ports to which it is attached.
- You define per-interface aggregate policers in a policy-map class using the **police** command. If you attach a per-interface aggregate policer to multiple ingress ports, it polices the matched traffic on each ingress port separately.

The *burst-normal* argument sets the CIR token bucket size.

Use the **no police aggregate** *aggregate-name* command to clear the use of the named aggregate policer.

You can enter the **police flow** command to define a microflow policer (you cannot apply microflow policing to ARP traffic).

You can enter the **police** command to define per-interface aggregate policers.

If the traffic is both aggregate and microflow policed, the aggregate and the microflow policers must both be in the same policy-map class and each must use the same **conform-action** and **exceed-action** keyword.

**Additional Values**

The valid values for the *action* argument are:

- **drop**—Drops packets that do not exceed the *bps* rate.
- **set-clp-transmit**—Sets and sends the ATM cell loss priority (CLP).
- **set-dscp-transmit** {*dscp-bit-pattern* | *dscp-value* | **default** | **ef**}—Marks the matched traffic with a new DSCP value.
  - *dscp-bit-pattern*—Specifies a DSCP bit pattern. Valid values are listed in [Table 25](#).
  - *dscp-value*—Specifies a DSCP value. Valid values are from 0 to 63.
  - **default**—Matches packets with default DSCP value (000000).
  - **ef**—Matches packets with the EF DSCP value (101110).

**Table 25** Valid *dscp-bit-pattern* Values

Keyword	Definition
<b>af11</b>	Matches packets with AF11 DSCP (001010).
<b>af12</b>	Matches packets with AF12 DSCP (001100).
<b>af13</b>	Matches packets with AF13 DSCP (001110).
<b>af21</b>	Matches packets with AF21 DSCP (010010).
<b>af22</b>	Matches packets with AF22 DSCP (010100).
<b>af23</b>	Matches packets with AF23 DSCP (010110).
<b>af31</b>	Matches packets with AF31 DSCP (011010).
<b>af32</b>	Matches packets with AF32 DSCP (011100).
<b>af33</b>	Matches packets with AF33 DSCP (011110).
<b>af41</b>	Matches packets with AF41 DSCP (100010).
<b>af42</b>	Matches packets with AF42 DSCP (100100).
<b>af43</b>	Matches packets with AF43 DSCP (100110).
<b>cs1</b>	Matches packets with CS1 (precedence 1) DSCP (001000).
<b>cs2</b>	Matches packets with CS2 (precedence 2) DSCP (010000).
<b>cs3</b>	Matches packets with CS3 (precedence 3) DSCP (011000).
<b>cs4</b>	Matches packets with CS4 (precedence 4) DSCP (100000).
<b>cs5</b>	Matches packets with CS5 (precedence 5) DSCP (101000).
<b>cs6</b>	Matches packets with CS6 (precedence 6) DSCP (110000).
<b>cs7</b>	Matches packets with CS7 (precedence 7) DSCP (111000).

- **set-frde-transmit**—Sets and sends the Frame Relay discard eligible (FR DE). Valid value is **exceed-action**.
- **set-mpls-exp-imposition-transmit** *new-mpls-exp*—Rewrites the MPLS experimental bits on imposed label entries and transmits the bits. The *new-mpls-exp* argument specifies the value used to set the MPLS EXP bits that are defined by the policy map. Valid values for *new-mpls-exp* are from 0 to 7.

- **set-mpls-exp-topmost-transmit**—Sets experimental (exp) bits on the topmost label and sends the packet. Valid range is 0 to 7.
- **set-prec-transmit** *new-precedence* [**exceed-action**]—Marks the matched traffic with a new IP-precedence value and transmits it. Valid values for *new-precedence* are from 0 to 7. Optionally, you may also enter **exceed-action**.
- **set-qos-transmit**—Rewrites qos-group and sends the packet.
- **transmit**—Transmits the packets that do not exceed the *bps* rate. The optional keyword for **transmit** is **exceed-action** *action*.
- **exceed-action** *action* and **violate-action** *action*—Two additional actions, **exceed-action** and **violate-action**, appear as subcommands under **police (policy map)**. The former specifies the action to be taken when the *bps* rate has been exceeded. The latter specifies action to be taken when the *bps* rate is greater than the *burst-max* rate. Both have the following valid values:
  - **drop**—Drops packets that do not exceed the *bps* rate.
  - **policed-dscp-transmit**—Causes all the out-of-profile traffic to be marked down as specified in the markdown map.
  - **transmit**—Transmits the packets that do not exceed the *bps* rate. The optional keyword for **transmit** is **exceed-action** *action*.

## Examples

This example shows how to specify a previously defined aggregate-policer name and configures the policy-map class to use the specified aggregate policer:

```
Router(config-pmap-c)# police aggregate agg1
```

This example shows how to create a policy map named police-setting that uses the class map access-match, which is configured to trust received IP-precedence values and is configured with a maximum-capacity aggregate policer and a microflow policer:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# policy-map police-setting
Router(config-pmap)# class access-match
Router(config-pmap-c)# trust ip-precedence
Router(config-pmap-c)# police 100000000 20000 conform-action set-prec-transmit 6
exceed-action policed-dscp-transmit
Router(config-pmap-c)# police flow 1000000 10000 conform-action set-prec-transmit 6
exceed-action policed-dscp-transmit
Router(config-pmap-c)# exit
```

## Related Commands

Command	Description
<b>class-map</b>	Accesses the QoS class map configuration mode to configure QoS class maps.
<b>mls qos aggregate-policer</b>	Defines a named aggregate policer for use in policy maps.
<b>police</b>	Configures traffic policing in the policy-map class configuration mode or policy-map class police configuration mode.
<b>service-policy</b>	Attaches a policy map to an interface.
<b>show class-map</b>	Displays class-map information.

<b>Command</b>	<b>Description</b>
<b>show policy-map</b>	Displays information about the policy map.
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

## police (two rates)

To configure traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR), use the **police** command in policy-map class configuration mode. To remove two-rate traffic policing from the configuration, use the **no** form of this command.

```
police cir cir [bc conform-burst] pir pir [be peak-burst] [conform-action action [exceed-action action [violate-action action]]]
```

```
no police cir cir [bc conform-burst] pir pir [be peak-burst] [conform-action action [exceed-action action [violate-action action]]]
```

### Syntax Description

<b>cir</b>	Committed information rate (CIR) at which the first token bucket is updated.
<i>cir</i>	Specifies the CIR value in bits per second. The value is a number from 8000 to 200000000.
<b>bc</b>	(Optional) Conform burst (bc) size used by the first token bucket for policing.
<i>conform-burst</i>	(Optional) Specifies the bc value in bytes. The value is a number from 1000 to 51200000.
<b>pir</b>	Peak information rate (PIR) at which the second token bucket is updated.
<i>pir</i>	Specifies the PIR value in bits per second. The value is a number from 8000 to 200000000.
<b>be</b>	(Optional) Peak burst (be) size used by the second token bucket for policing.
<i>peak-burst</i>	(Optional) Specifies the peak burst (be) size in bytes. The size varies according to the interface and platform in use.
<b>conform-action</b>	(Optional) Action to take on packets that conform to the CIR and PIR.
<b>exceed-action</b>	(Optional) Action to take on packets that conform to the PIR but not the CIR.

<b>violate-action</b>	(Optional) Action to take on packets exceed the PIR.
<i>action</i>	(Optional) Action to take on packets. Specify one of the following keywords: <ul style="list-style-type: none"> <li>• <b>drop</b>—Drops the packet.</li> <li>• <b>set-clp-transmit</b>—Sets the ATM Cell Loss Priority (CLP) bit from 0 to 1 on the ATM cell and sends the packet with the ATM CLP bit set to 1.</li> <li>• <b>set-cos-inner-transmit</b> <i>value</i>—Sets the inner class of service field as a policing action for a bridged frame on the Enhanced FlexWAN module, and when using bridging features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.</li> <li>• <b>set-dscp-transmit</b> <i>new-dscp</i>—Sets the IP differentiated services code point (DSCP) value and sends the packet with the new IP DSCP value setting.</li> <li>• <b>set-dscp-tunnel-transmit</b> <i>value</i>—Sets the DSCP value (0 to 63) in the tunnel header of a Layer 2 Tunnel Protocol Version 3 (L2TPv3) or Generic Routing Encapsulation (GRE) tunneled packet for tunnel marking and transmits the packet with the new value.</li> <li>• <b>set-frde-transmit</b>—Sets the Frame Relay discard eligible (DE) bit from 0 to 1 on the Frame Relay frame and sends the packet with the DE bit set to 1.</li> <li>• <b>set-mpls-exp-transmit</b>—Sets the Multiprotocol Label Switching (MPLS) experimental bits from 0 to 7 and sends the packet with the new MPLS experimental bit value setting.</li> <li>• <b>set-prec-transmit</b> <i>new-prec</i>—Sets the IP precedence and sends the packet with the new IP precedence value setting.</li> <li>• <b>set-prec-tunnel-transmit</b> <i>value</i>—Sets the precedence value (0 to 7) in the tunnel header of an L2TPv3 or GRE tunneled packet for tunnel marking and transmits the packet with the new value.</li> <li>• <b>set-qos-transmit</b> <i>new-qos</i>—Sets the quality of service (QoS) group value and sends the packet with the new QoS group value setting.</li> <li>• <b>transmit</b>—Sends the packet with no alteration.</li> </ul>

**Command Default** Traffic policing using two rates is disabled.

**Command Modes** Policy-map class configuration (config-pmap-c)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)XE	The <b>police</b> command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T. The <b>violate-action</b> keyword was added.

Release	Modification
12.2(2)T	The following keywords for the <i>action</i> argument were added: <ul style="list-style-type: none"> <li>• <b>set-clp-transmit</b></li> <li>• <b>set-frde-transmit</b></li> <li>• <b>set-mpls-exp-transmit</b></li> </ul>
12.2(4)T	This command expanded for the Two-Rate Policing feature. The <b>cir</b> and <b>pir</b> keywords were added to accommodate two-rate traffic policing.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB, and the <b>set-dscp-tunnel-transmit</b> and <b>set-prec-tunnel-transmit</b> keywords for the <i>action</i> argument were added. These keywords are intended for marking Layer 2 Tunnel Protocol Version 3 (L2TPv3) tunneled packets.
12.2(33)SRA	The <b>set-cos-inner-transmit</b> keyword for the <i>action</i> argument was added when using multipoint bridging (MPB) features on the Enhanced FlexWAN module, and when using MPB on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	This command was modified to support the Cisco 7600 series router equipped with a Cisco Multilayer Switch Feature Card 3 (MSFC3).
12.4(15)T2	This command was modified to include support for marking Generic Routing Encapsulation (GRE) tunneled packets. <p><b>Note</b> For this release, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco MGX Route Processor Module (RPM-XF).</p>
12.2(33)SB	This command was modified to include support for marking GRE-tunneled packets, and support for the Cisco 7300 series router was added.

### Usage Guidelines

Two-rate traffic policing uses two token buckets—Tc and Tp—for policing traffic at two independent rates. Note the following points about the two token buckets:

- The Tc token bucket is updated at the CIR value each time a packet arrives at the two-rate policer. The Tc token bucket can contain up to the conform burst (Bc) value.
- The Tp token bucket is updated at the PIR value each time a packet arrives at the two-rate policer. The Tp token bucket can contain up to the peak burst (Be) value.

### Updating Token Buckets

The following scenario illustrates how the token buckets are updated:

A packet of B bytes arrives at time t. The last packet arrived at time t1. The CIR and the PIR token buckets at time t are represented by Tc(t) and Tp(t), respectively. Using these values and in this scenario, the token buckets are updated as follows:

$$Tc(t) = \min(CIR * (t-t1) + Tc(t1), Bc)$$

$$Tp(t) = \min(PIR * (t-t1) + Tp(t1), Be)$$

### Marking Traffic

The two-rate policer marks packets as either conforming, exceeding, or violating a specified rate. The following points (using a packet of  $B$  bytes) illustrate how a packet is marked:

- If  $B > T_p(t)$ , the packet is marked as violating the specified rate.
- If  $B > T_c(t)$ , the packet is marked as exceeding the specified rate, and the  $T_p(t)$  token bucket is updated as  $T_p(t) = T_p(t) - B$ .

Otherwise, the packet is marked as conforming to the specified rate, and both token buckets— $T_c(t)$  and  $T_p(t)$ —are updated as follows:

$$T_p(t) = T_p(t) - B$$

$$T_c(t) = T_c(t) - B$$

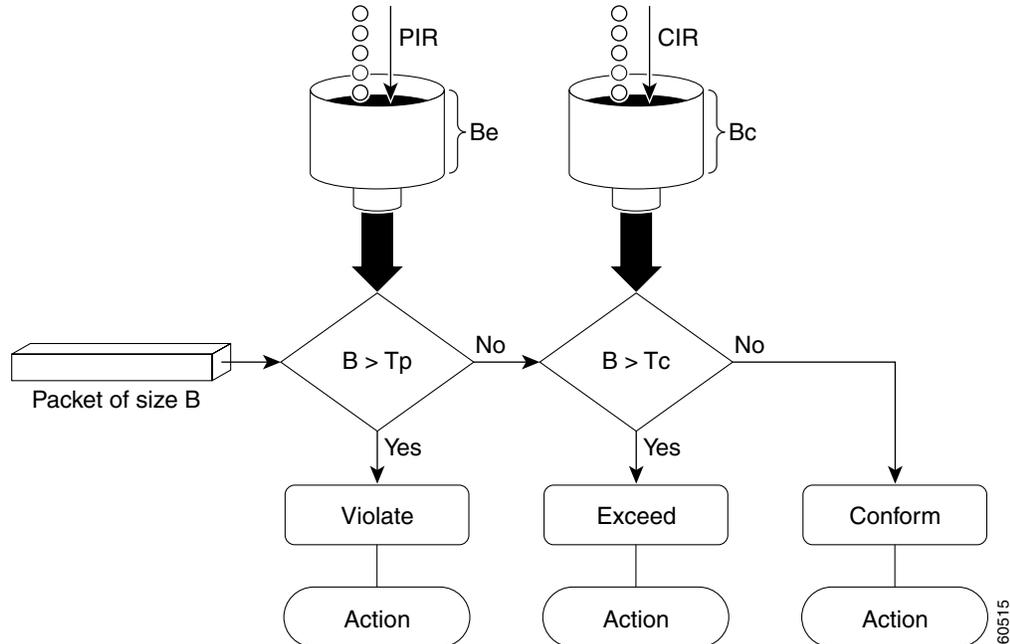
For example, if the CIR is 100 kbps, the PIR is 200 kbps, and a data stream with a rate of 250 kbps arrives at the two-rate policer, the packet would be marked as follows:

- 100 kbps would be marked as conforming to the rate.
- 100 kbps would be marked as exceeding the rate.
- 50 kbps would be marked as violating the rate.

### Marking Packets and Assigning Actions Flowchart

The flowchart in [Figure 4](#) illustrates how the two-rate policer marks packets and assigns a corresponding action (that is, violate, exceed, or conform) to the packet.

**Figure 4** Marking Packets and Assigning Actions with the Two-Rate Policer



### Using the set-cos-inner-transmit Action for SIPs and SPAs on the Cisco 7600 Series Router

The **set-cos-inner-transmit** keyword action was introduced in Cisco IOS Release 12.2(33)SRA to support marking of the inner CoS value as a policing action when using MPB features on the Enhanced FlexWAN module, and when using MPB features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.

This command is not supported on the Cisco 7600 SIP-600.

For more information about QoS and the forms of **police** commands supported by the SIPs on the Cisco 7600 series router, see the *Cisco 7600 Series SIP, SSC, and SPA Software Configuration Guide*.

### Examples

In the following example, two-rate traffic policing is configured on a class to limit traffic to an average committed rate of 500 kbps and a peak rate of 1 Mbps:

```
Router(config)# class-map police
Router(config-cmap)# match access-group 101
Router(config-cmap)# policy-map policy1
Router(config-pmap)# class police
Router(config-pmap-c)# police cir 500000 bc 10000 pir 1000000 be 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface serial3/0
Router(config-if)# service-policy output policy1
Router(config-if)# end
Router# show policy-map policy1
```

```
Policy Map policy1
Class police
  police cir 500000 conform-burst 10000 pir 1000000 peak-burst 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
```

Traffic marked as conforming to the average committed rate (500 kbps) will be sent as is. Traffic marked as exceeding 500 kbps, but not exceeding 1 Mbps, will be marked with IP Precedence 2 and then sent. All traffic marked as exceeding 1 Mbps will be dropped. The burst parameters are set to 10000 bytes.

In the following example, 1.25 Mbps of traffic is sent (“offered”) to a policer class:

```
Router# show policy-map interface serial3/0

Serial3/0

Service-policy output: policy1

Class-map: police (match all)
  148803 packets, 36605538 bytes
  30 second offered rate 1249000 bps, drop rate 249000 bps
  Match: access-group 101
  police:
    cir 500000 bps, conform-burst 10000, pir 1000000, peak-burst 10000
    conformed 59538 packets, 14646348 bytes; action: transmit
    exceeded 59538 packets, 14646348 bytes; action: set-prec-transmit 2
    violated 29731 packets, 7313826 bytes; action: drop
    conformed 499000 bps, exceed 500000 bps violate 249000 bps

Class-map: class-default (match-any)
  19 packets, 1990 bytes
  30 seconds offered rate 0 bps, drop rate 0 bps
  Match: any
```

The two-rate policer marks 500 kbps of traffic as conforming, 500 kbps of traffic as exceeding, and 250 kbps of traffic as violating the specified rate. Packets marked as conforming to the rate will be sent as is, and packets marked as exceeding the rate will be marked with IP Precedence 2 and then sent. Packets marked as violating the rate are dropped.

#### Setting the Inner CoS Value as an Action for SIPs and SPAs on the Cisco 7600 Series Router: Example

The following example shows configuration of a QoS class that filters all traffic for virtual LAN (VLAN) 100 into a class named “vlan-inner-100,” and establishes a traffic shaping policy for the vlan-inner-100 class. The service policy limits traffic to an average committed rate of 500 kbps and a peak rate of 1 Mbps and sets the inner CoS value to 3. Since setting of the inner CoS value is only supported with bridging features, the configuration also shows the service policy being applied as an output policy for an ATM SPA interface permanent virtual circuit (PVC) that bridges traffic into VLAN 100 using the **bridge-domain** command.

```
Router(config)# class-map match-all vlan-inner-100
Router(config-cmap)# match vlan inner 100
Router(config-cmap)# exit
Router(config)# policy-map vlan-inner-100
Router(config-pmap-c)# police cir 500000 bc 10000 pir 1000000 be 10000 conform-action
set-cos-inner-transmit 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm3/0/0
Router(config-if)# pvc 100/100
Router(config-if-atm-vc)# bridge-domain 100 dot1q
Router(config-if-atm-vc)# service-policy output vlan-inner-100
Router(config-if-atm-vc)# end
```

#### Related Commands

Command	Description
<b>bridge-domain</b>	Enables RFC 1483 ATM bridging or RFC 1490 Frame Relay bridging to map a bridged VLAN to an ATM PVC or Frame Relay DLCI.
<b>police</b>	Configures traffic policing.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or an output interface to be used as the service policy for that interface.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# police rate (control-plane)

To configure traffic policing for traffic that is destined for the control plane, use the **police rate** command in QoS policy-map class configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

```
police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps]
  [peak-burst peak-burst-in-packets packets] [conform-action action]
```

```
no police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps] [peak-burst
  peak-burst-in-packets packets] [conform-action action]
```

## Syntax for Packets per Seconds (pps)

```
police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps]
  [peak-burst peak-burst-in-packets packets]
```

```
no police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps] [peak-burst
  peak-burst-in-packets packets]
```

## Syntax for Bytes per Seconds (bps)

```
police rate units bps [burst burst-in-bytes bytes] [peak-rate peak-rate-in-bps bps] [peak-burst
  peak-burst-in-bytes bytes]
```

```
no police rate units bps [burst burst-in-bytes bytes] [peak-rate peak-rate-in-bps bps] [peak-burst
  peak-burst-in-bytes bytes]
```

## Syntax for Percent

```
police rate percent percentage [burst ms ms] [peak-rate percent percentage] [peak-burst ms ms]
```

```
no police rate percent percentage [burst ms ms] [peak-rate percent percentage] [peak-burst
  ms ms]
```

## Syntax for Cisco 10000 Series Router

```
police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps]
  [peak-burst peak-burst-in-packets packets] [conform-action action] [exceed-action action]
  [violate-action action]
```

```
no police rate units pps [burst burst-in-packets packets] [peak-rate peak-rate-in-pps pps] [peak-burst
  peak-burst-in-packets packets] [conform-action action] [exceed-action action] [violate-action
  action]
```

Syntax	Description
<i>units</i>	Specifies the police rate. If the police rate is specified in pps, the valid range of values is: <ul style="list-style-type: none"> <li>• Cisco 10000 series router—Valid range is 1 to 500000</li> <li>• Other platforms—Valid range is 1 to 2000000</li> </ul> If the police rate is specified in bps, the valid range of values is 8000 to 10000000000.
<b>pps</b>	Specifies that packets per seconds (pps) will be used to determine the rate at which traffic is policed.
<b>burst</b> <i>burst-in-packets</i> <b>packets</b>	(Optional) Specifies the burst rate, in packets, will be used for policing traffic. Valid range of values are: <ul style="list-style-type: none"> <li>• Cisco 10000 series router—Valid range is 1 to 25000</li> <li>• Other platforms—Valid range is 1 to 512000</li> </ul>
<b>peak-rate</b> <i>peak-rate-in-pps</i> <b>pps</b>	(Optional) Specifies the peak information rate (PIR) will be used for policing traffic and calculating the PIR. Valid range of values are: <ul style="list-style-type: none"> <li>• Cisco 10000 series router—Valid range is 1 to 500000</li> <li>• Other platforms—Valid range is 1 to 512000</li> </ul>
<b>peak-burst</b> <i>peak-burst-in-packets</i> <b>packets</b>	(Optional) Specifies the peak burst value, in packets, will be used for policing traffic. Valid range of values are: <ul style="list-style-type: none"> <li>• Cisco 10000 series router—Valid range is 1 to 25000</li> <li>• Other platforms—Valid range is 1 to 512000</li> </ul>
<b>bps</b>	(Optional) Specifies that bits per second (bps) will be used to determine the rate at which traffic is policed.
<b>burst</b> <i>burst-in-bytes</i> <b>bytes</b>	(Optional) Specifies the burst rate, in bytes, will be used for policing traffic. Valid range is from 1000 to 512000000.
<b>peak-rate</b> <i>peak-rate-in-bps</i> <b>bps</b>	(Optional) Specifies the peak burst value, in bytes, for the peak rate. Valid range is from 1000 to 512000000.
<b>peak-burst</b> <i>peak-burst-in-bytes</i> <b>bytes</b>	(Optional) Specifies the peak burst value, in bytes, will be used for policing traffic. Valid range is from 1000 to 512000000.
<b>percent</b>	A percentage of interface bandwidth will be used to determine the rate at which traffic is policed.
<i>percentage</i>	Specifies the bandwidth percentage. Valid range is from 1 to 100.
<b>burst</b> <i>ms</i> <b>ms</b>	(Optional) Specifies the burst rate, in milliseconds, will be used for policing traffic. Valid range is from 1 to 2000.
<b>peak-rate</b> <b>percent</b> <i>percentage</i>	(Optional) Specifies a percentage of interface bandwidth will be used to determine the PIR. Valid range is from 1 to 100.
<b>peak-burst</b> <i>ms</i> <b>ms</b>	(Optional) Specifies the peak burst rate, in milliseconds, will be used for policing traffic. Valid range is from 1 to 2000.
<b>conform-action</b> <i>action</i>	(Optional) Specifies the action to take on packets that conform to the police rate limit. See the “Usage Guidelines” section for the actions you can specify.

<b>exceed-action</b> <i>action</i>	(Optional) Specifies the action to take on packets that exceed the rate limit. See the “Usage Guidelines” section for the actions you can specify.
<b>violate-action</b> <i>action</i>	(Optional) Specifies the action to take on packets that continuously exceed the police rate limit. See the “Usage Guidelines” section for the actions you can specify.

**Command Default** Disabled

**Command Modes** QoS policy-map class configuration

### Command History

Release	Modification
12.3(7)T	This command was introduced.
12.2(18)SXD1	Support for this command was introduced on the Supervisor Engine 720.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2 and implemented on the Cisco 10000 series router.

### Usage Guidelines

Use the **police rate** command to limit traffic that is destined for the control plane on the basis of packets per second (pps), bytes per seconds (bps), or a percentage of interface bandwidth.

If the **police rate** command is issued, but the a rate is not specified, traffic that is destined for the control plane will be policed on the basis of bps.

[Table 26](#) lists the actions you can specify for the *action* argument.

**Table 26** *action Argument Values*

Action	Description
<b>drop</b>	Drops the packet. This is the default action for traffic that exceeds or violates the committed police rate.
<b>set-clp-transmit</b> <i>value</i>	Sets the ATM Cell Loss Priority (CLP) bit on the ATM cell. Valid values are 0 or 1.
<b>set-discard-class-transmit</b> <i>value</i>	Sets the discard class attribute of a packet and transmits the packet with the new discard class setting. Valid values are from 0 to 7.
<b>set-dscp-transmit</b> <i>value</i>	Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting. Valid values are from 0 to 63.
<b>set-dscp-tunnel-transmit</b> <i>value</i>	Rewrites the tunnel packet DSCP and transmits the packet with the new tunnel DSCP value. Valid values are from 0 to 63.

**Table 26** *action Argument Values (continued)*

Action	Description
<b>set-frde-transmit</b> <i>value</i>	Sets the Frame Relay Discard Eligibility (DE) bit from 0 to 1 on the Frame Relay frame and transmits the packet with the DE bit set to 1.
<b>set-mpls-exp-imposition-transmit</b> <i>value</i>	Sets the Multiprotocol Label Switching (MPLS) experimental (EXP) bits in the imposed label headers and transmits the packet with the new MPLS EXP bit value setting. Valid values are from 0 to 7.
<b>set-mpls-exp-transmit</b> <i>value</i>	Sets the MPLS EXP field value in the MPLS label header at the input interface, output interface, or both. Valid values are from 0 to 7.
<b>set-prec-transmit</b> <i>value</i>	Sets the IP precedence and transmits the packet with the new IP precedence value. Valid values are from 0 to 7.
<b>set-prec-tunnel-transmit</b> <i>value</i>	Sets the tunnel packet IP precedence and transmits the packet with the new IP precedence value. Valid values are from 0 to 7.
<b>set-qos-transmit</b> <i>value</i>	Sets the QoS group and transmits the packet with the new QoS group value. Valid values are from 0 to 63.
<b>transmit</b>	Transmits the packet. The packet is not altered.

**Examples**

The following example shows how to configure the action to take on packets that conform to the police rate limit:

```
Router(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
Router(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
Router(config)# access-list 140 permit tcp any any eq telnet
Router(config)# class-map match-any pps-1
Router(config-cmap)# match access-group 140
Router(config-cmap)# exit
Router(config)# policy-map copp-pps
Router(config-pmap)# class pps-1
Router(config-pmap)# police rate 10000 pps burst 100 packets peak-rate 10100 pps
peak-burst 150 packets conform-action transmit
Router(config-cmap)# exit
Router(config)# control-plane
Router(config-cp)# service-policy input copp-pps
Router(config-cp)# exit
```

**Related Commands**

Command	Description
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.

# police rate pdp

To configure Packet Data Protocol (PDP) traffic policing using the police rate, use the **police rate pdp** command in policy-map class configuration mode or policy-map class police configuration mode. To remove PDP traffic policing from the configuration, use the **no** form of this command.

**police rate pdp** [*burst bytes*] [**peak-rate pdp** [**peak-burst bytes**]] **conform-action** *action*  
**exceed-action** *action* [**violate-action** *action*]

**no police rate pdp** [*burst bytes*] [**peak-rate pdp** [**peak-burst bytes**]] **conform-action** *action*  
**exceed-action** *action* [**violate-action** *action*]

## Syntax Description

<b>burst</b> <i>bytes</i>	(Optional) Committed burst size, in bytes. The size varies according to the interface and platform in use. Valid range is 1000 to 512000000. Default is 1500.
<b>peak-rate pdp</b>	(Optional) Specifies that the peak rate of sessions be considered when PDP traffic is policed.
<b>peak-burst</b> <i>bytes</i>	(Optional) Peak burst size, in bytes. The size varies according to the interface and platform in use. Valid range is 1000 to 512000000. Default is 2500.
<b>conform-action</b>	Action to take on packets when the rate is less than the conform burst.
<b>exceed-action</b>	Action to take on packets when the rate exceeds the conform burst.
<b>violate-action</b>	(Optional) Action to take on packets when the rate violates the conform burst.
<i>action</i>	Action to take on packets. Specify one of the following keywords: <ul style="list-style-type: none"> <li><b>drop</b>—Drops the packet.</li> <li><b>set-dscp-transmit</b> <i>new-dscp-value</i>—Sets the IP differentiated services code point (DSCP) value and sends the packet with the new IP DSCP value.</li> <li><b>set-prec-transmit</b> <i>new-prec-value</i>—Sets the IP precedence and sends the packet with the new IP precedence value.</li> <li><b>transmit</b>—Sends the packet with no alteration.</li> </ul>

## Command Default

PDP traffic policing is disabled.

## Command Modes

Policy-map class configuration  
Policy-map class police configuration

## Command History

Release	Modification
12.3(8)XU	This command was introduced.
12.3(11)YJ	This command was integrated into Cisco IOS Release 12.3(11)YJ.
12.3(14)YQ	This command was integrated into Cisco IOS Release 12.3(14)YQ.
12.4(9)T	This command was integrated into Cisco IOS Release 12.4(9)T.

## Usage Guidelines

The **police rate pdp** command is included with the Flow-Based QoS for GGSN feature available with Cisco IOS Release 12.4(9)T.

The Flow-Based QoS for GGSN feature is designed specifically for the Gateway General Packet Radio Service (GPRS) Support Node (GGSN).

### Per-PDP Policing

The Flow-Based QoS for GGSN feature includes per-PDP policing (session-based policing).

Per-PDP policing is a gateway GPRS support node traffic conditioner (3G TS 23.107) function that can be used to limit the maximum rate of traffic received on the Gi interface for a particular PDP context.

The policing function enforces the call admission control (CAC)-negotiated data rates for a PDP context. The GGSN can be configured to either drop nonconforming traffic or mark nonconforming traffic for preferential dropping if congestion should occur.

The policing parameters used depend on the PDP context, such as the following:

- For GTPv1 PDPs with R99 quality of service (QoS) profiles, the maximum bit rate (MBR) and guaranteed bit rate (GBR) parameters from the CAC-negotiated QoS profile are used. For nonreal time traffic, only the MBR parameter is used.
- For GTPv1 PDPs with R98 QoS profiles and GTPv0 PDPs, the peak throughput parameter from the CAC-negotiated QoS policy is used.

Before configuring per-PDP policing, note the following points:

- Universal Mobile Telecommunications System (UMTS) QoS mapping must be enabled on the GGSN.
- Cisco Express Forwarding (CEF) must be enabled on the Gi interface.
- Per-PDP policing is supported for downlink traffic at the Gi interface only.
- The initial packets of a PDP context are not policed.
- Hierarchical policing is not supported.
- If flow-based policing is configured in a policy map that is attached to an Access Point Network (APN), the **show policy-map apn** command displays the total number of packets received before policing and does not display the policing counters.



**Note** To clear policing counters displayed by the **show policy-map apn** command, use the **clear gprs access-point statistics access-point-index** command.

- A service policy that has been applied to an APN cannot be modified. To modify a service policy, remove the service policy from the APN, modify it, and then reapply the service policy.
- Multiple class maps, each with **match flow pdp** configured and a different differentiated services code point (DSCP) value specified, are supported in a policy map only if the DSCP is trusted (the **gprs umts-qos dscp unmodified** global configuration command has not been configured on the GGSN).

### For More Information

For more information about the GGSN, along with the instructions for configuring the Flow-Based QoS for GGSN feature, see the *Cisco GGSN Release 6.0 Configuration Guide*, Cisco IOS Release 12.4(2)XB.



**Note** To configure the Flow-Based QoS for GGSN feature, follow the instructions in the section called “*Configuring Per-PDP Policing*.”

For more information about the **show policy-map apn** command, the **gprs umts-qos dscp unmodified** command, the **clear gprs access-point statistics** command, and other GGSN-specific commands, see the *Cisco GGSN Release 6.0 Command Reference*, Cisco IOS Release 12.4(2)XB.

## Examples

The following is an example of a per-PDP policing policy map applied to an APN:

```
class-map match-all class-pdp
  match flow pdp
!
! Configures a policy map and attaches this class map to it.

policy-map policy-gprs
  class class-pdp
    police rate pdp
      conform-action set-dscp-transmit 15
      exceed-action set-dscp-transmit 15
      violate-action drop

! Attaches the policy map to the APN.

gprs access-point-list gprs
  access-point 1
  access-point-name static
  service-policy input policy-gprs
```

## Related Commands

Command	Description
<b>clear gprs access-point statistics</b>	Clears statistics counters for a specific access point or for all access points on the GGSN.
<b>gprs umts-qos dscp unmodified</b>	Specifies that the subscriber datagram be forwarded through the GTP path without modifying its DSCP.
<b>match flow pdp</b>	Specifies PDP flows as the match criterion in a class map.
<b>show policy-map apn</b>	Displays statistical and configuration information for all input and output policies attached to an APN.

# policy-map

To create or modify a policy map that can be attached to one or more interfaces to specify a service policy, use the **policy-map** command in global configuration mode. To delete a policy map, use the **no** form of this command. The **policy-map** command enters policy-map configuration mode in which you can configure or modify the class policies for that policy map.

## Supported Platforms Other Than Cisco 10000 Series Routers

```
policy-map [type {stack | access-control | port-filter | queue-threshold | logging log-policy}]
policy-map-name
```

```
no policy-map [type {stack | access-control | port-filter | queue-threshold | logging log-policy}]
policy-map-name
```

## Cisco 10000 Series Router

```
policy-map [type {control | service}] policy-map-name
```

```
no policy-map [type {control | service}] policy-map-name
```

Syntax Description		
<b>type stack</b>	(Optional) Determines the exact pattern to look for in the protocol stack of interest.	
<b>type access-control</b>	(Optional) Enables the policy map for the flexible packet matching feature.	
<b>type port-filter</b>	(Optional) Enables the policy map for the port-filter feature.	
<b>type queue-threshold</b>	(Optional) Enables the policy map for the queue-threshold feature.	
<b>type logging</b>	(Optional) Enables the policy map for the control-plane packet logging feature.	
<i>log-policy</i>	Type of log policy for control-plane logging.	
<i>policy-map-name</i>	Name of the policy map. The name can be a maximum of 40 alphanumeric characters.	
<b>type control</b>	(Optional) Creates a control policy map.	
<b>type service</b>	(Optional) Creates a service policy map.	

**Command Default** The policy map is not configured.

**Command Modes** Global configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.4(4)T	The <b>type access-control</b> keywords were added to support flexible packet matching. The <b>type port-filter</b> and <b>type queue-threshold</b> keywords were added to support control-plane protection.

Release	Modification
12.4(6)T	The <b>type logging</b> keywords were added to support control-plane packet logging.
12.2(31)SB	The <b>type control</b> and <b>type service</b> keywords were added to support the Cisco 10000 series router.
12.2(18)ZY	The following modifications were made to the <b>policy-map</b> command: <ul style="list-style-type: none"> <li>The <b>type access-control</b> keywords were integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series switch that is equipped with the Supervisor 32/programmable intelligent services accelerator (PISA) engine.</li> <li>The command was modified to enhance Network-Based Application Recognition (NBAR) functionality on the Catalyst 6500 series switch that is equipped with the Supervisor 32/PISA engine.</li> </ul>
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Use the **policy-map** command to specify the name of the policy map to be created, added to, or modified before you configure policies for classes whose match criteria are defined in a class map. The **policy-map** command enters policy-map configuration mode in which you can configure or modify the class policies for that policy map.

You can configure class policies in a policy map only if the classes have match criteria defined for them. You use the **class-map** and **match** commands to configure the match criteria for a class. Because you can configure a maximum of 64 class maps, no policy map can contain more than 64 class policies.

A single policy map can be attached to multiple interfaces concurrently. When you attempt to attach a policy map to an interface, the attempt is denied if the available bandwidth on the interface cannot accommodate the total bandwidth requested by class policies comprising the policy map. In this case, if the policy map is already attached to other interfaces, it is removed from them.

Whenever you modify class policy in an attached policy map, class-based weighted fair queueing (CBWFQ) is notified and the new classes are installed as part of the policy map in the CBWFQ system.

#### Class Queues (Cisco 10000 Series Routers Only)

The PRE2 allows you to configure 31 class queues in a policy map.

In a policy map, the PRE3 allows you to configure one priority level 1 queue, plus one priority level 2 queue, plus 12 class queues, plus one default queue.

#### Control Policies (Cisco 10000 Series Routers Only)

Control policies define the actions that your system will take in response to specified events and conditions.

A control policy is made of one or more control policy rules. A control policy rule is an association of a control class and one or more actions. The control class defines the conditions that must be met before the actions will be executed.

There are three steps involved in defining a control policy:

1. Create one or more control class maps, by using the **class-map type control** command.
2. Create a control policy map, using the **policy-map type control** command.

A control policy map contains one or more control policy rules. A control policy rule associates a control class map with one or more actions. Actions are numbered and executed sequentially.

3. Apply the control policy map to a context, using the **service-policy type control** command.

### Service Policies (Cisco 10000 Series Routers Only)

Service policy maps and service profiles contain a collection of traffic policies and other functionality. Traffic policies determine which functionality will be applied to which session traffic. A service policy map or service profile may also contain a network-forwarding policy, which is a specific type of traffic policy that determines how session data packets will be forwarded to the network.

### Policy Map Restrictions (Catalyst 6500 Series Switches Only)

Cisco IOS Release 12.2(18)ZY includes software intended for use on the Catalyst 6500 series switch that is equipped with a Supervisor 32/PISA engine. For this release and platform, note the following restrictions for using policy maps and **match** commands:

- You cannot modify an existing policy map if the policy map is attached to an interface. To modify the policy map, remove the policy map from the interface by using the **no** form of the **service-policy** command.
- Policy maps contain traffic classes. Traffic classes contain one or more **match** commands that can be used to match packets (and organize them into groups) on the basis of a protocol type or application. You can create as many traffic classes as needed. However, the following restrictions apply:
  - A single traffic class can be configured to match a maximum of 8 protocols or applications.
  - Multiple traffic classes can be configured to match a cumulative maximum of 95 protocols or applications.

## Examples

The following example creates a policy map called `policy1` and configures two class policies included in that policy map. The class policy called `class1` specifies policy for traffic that matches access control list (ACL) 136. The second class is the default class to which packets that do not satisfy configured match criteria are directed.

```
! The following commands create class-map class1 and define its match criteria:
```

```
class-map class1
  match access-group 136
```

```
! The following commands create the policy map, which is defined to contain policy
! specification for class1 and the default class:
```

```
policy-map policy1
```

```
  class class1
    bandwidth 2000
    queue-limit 40
```

```
  class class-default
    fair-queue 16
    queue-limit 20
```

The following example creates a policy map called policy9 and configures three class policies to belong to that map. Of these classes, two specify policy for classes with class maps that specify match criteria based on either a numbered ACL or an interface name, and one specifies policy for the default class called class-default to which packets that do not satisfy configured match criteria are directed.

```
policy-map policy9

class acl136
  bandwidth 2000
  queue-limit 40

class ethernet101
  bandwidth 3000
  random-detect exponential-weighting-constant 10

class class-default
  fair-queue 10
  queue-limit 20
```

#### Examples for Cisco 10000 Series Routers Only

The following example shows the configuration of a control policy map named rule4. Control policy map rule4 contains one policy rule, which is the association of the control class named class3 with the action to authorize subscribers using the network access server (NAS) port ID. The **service-policy type control** command is used to apply the control policy map globally.

```
class-map type control match-all class3
  match access-type pppoe
  match domain cisco.com
  available nas-port-id
!
policy-map type control rule4
  class type control class3
  authorize nas-port-id
!
service-policy type control rule4
```

The following example shows the configuration of a service policy map named redirect-profile:

```
policy-map type service redirect-profile
  class type traffic CLASS-ALL
  redirect to group redirect-sg
```

# policy-map copp-peruser

To create a policy map that defines a Control Plane Policing and Protection (CoPP) per-user policy, use the **policy-map copp-peruser** command in global configuration mode. To disable, use the **no** form of the command.

**policy-map copp-peruser**

**no policy-map copp-peruser**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No policy map is configured.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(33)SRB	This command was introduced.

## Usage Guidelines

Use this command to create a CoPP per-user policy map when configuring CoPP.

## Examples

The following example creates a CoPP per-user policy map:

```
Router(config)# policy-map copp-peruser
Router(config-pmap)# class arp-peruser
Router(config-pmap-c)# police rate 5 pps burst 50 packets
Router(config-pmap-c)# class dhcp-peruser
Router(config-pmap-c)# police rate 10 pps burst 100 packets
```

## Related Commands

Command	Description
<b>class-map arp-peruser</b>	Creates a class map to be used for matching ARP per-user packets.
<b>match subscriber access</b>	Matches subscriber access traffic to a policy map.

# precedence

To configure precedence levels for a virtual circuit (VC) class that can be assigned to a VC bundle and thus applied to all VC members of that bundle, use the **precedence** command in `vc-class` configuration mode. To remove the precedence levels from the VC class, use the **no** form of this command.

To configure the precedence levels for a VC or permanent virtual circuit (PVC) member of a bundle, use the **precedence** command in `bundle-vc` configuration mode for ATM VC bundle members, or in switched virtual circuit (SVC)-`bundle-member` configuration mode for an ATM SVC. To remove the precedence levels from the VC or PVC, use the **no** form of this command.

**precedence** [**other** | *range*]

**no precedence**

## Syntax Description

<b>other</b>	(Optional) Any precedence levels in the range from 0 to 7 that are not explicitly configured.
<i>range</i>	(Optional) A single precedence level specified either as a number from 0 to 7 or a range of precedence levels, specified as a hyphenated range.

## Command Default

Defaults to **other**—that is, any precedence levels in the range from 0 to 7 that are not explicitly configured.

## Command Modes

VC-class configuration (for a VC class)  
 Bundle-vc configuration (for ATM VC bundle members)  
 SVC-bundle-member configuration (for an ATM SVC)

## Command History

Release	Modification
11.1(22)CC	This command was introduced.
12.0(3)T	This command was integrated into Cisco IOS Release 12.0(3)T. This command was extended to configure precedence levels for a VC member of a bundle.
12.2(4)T	This command was made available in SVC-bundle-member configuration mode.
12.0(23)S	This command was made available in <code>vc-class</code> and <code>bundle-vc</code> configuration modes on the 8-port OC-3 STM-1 ATM line card for Cisco 12000 series Internet routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Assignment of precedence levels to VC or PVC bundle members allows you to create differentiated service because you can distribute the IP precedence levels over the various VC/PVC bundle members. You can map a single precedence level or a range of levels to each discrete VC/PVC in the bundle, thereby enabling VCs/PVCs in the bundle to carry packets marked with different precedence levels. Alternatively, you can use the **precedence other** command to indicate that a VC/PVC can carry traffic marked with precedence levels not specifically configured for other VCs/PVCs. Only one VC/PVC in the bundle can be configured using the **precedence other** command. This VC/PVC is considered the default one.

To use this command in vc-class configuration mode, first enter the **vc-class atm** command in global configuration mode. The **precedence** command has no effect if the VC class that contains the command is attached to a standalone VC; that is, if the VC is not a bundle member.

To use the **precedence** command to configure an individual bundle member in bundle-VC configuration mode, first enter the **bundle** command to enact bundle configuration mode for the bundle to which you want to add or modify the VC member to be configured. Then use the **pvc-bundle** command to specify the VC to be created or modified and enter bundle-VC configuration mode.

VCs in a VC bundle are subject to the following configuration inheritance guidelines (listed in order of next-highest precedence):

- VC configuration in bundle-vc mode
- Bundle configuration in bundle mode (with effect of assigned vc-class configuration)
- Subinterface configuration in subinterface mode

**Examples**

The following example configures a class called “control-class” that includes a **precedence** command that, when applied to a bundle, configures all VC members of that bundle to carry IP precedence level 7 traffic. Note, however, that VC members of that bundle can be individually configured with the **precedence** command at the bundle-vc level, which would supervene.

```
vc-class atm control-class
  precedence 7
```

The following example configures PVC 401 (with the name of “control-class”) to carry traffic with IP precedence levels in the range of 4–2, overriding the precedence level mapping set for the VC through vc-class configuration:

```
pvc-bundle control-class 401
  precedence 4-2
```

**Related Commands**

Command	Description
<b>bump</b>	Configures the bumping rules for a VC class that can be assigned to a VC bundle.
<b>bundle</b>	Creates a bundle or modifies an existing bundle to enter bundle configuration mode.
<b>class-vc</b>	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
<b>dscp (frame-relay vc-bundle-member)</b>	Specifies the DSCP value or values for a specific Frame Relay PVC bundle member.
<b>match precedence</b>	Identifies IP precedence values as match criteria.
<b>mpls experimental</b>	Configures the MPLS experimental bit values for a VC class that can be mapped to a VC bundle and thus applied to all VC members of that bundle.

<b>Command</b>	<b>Description</b>
<b>protect</b>	Configures a VC class with protected group or protected VC status for application to a VC bundle member.
<b>pvc-bundle</b>	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.
<b>pvc</b>	Creates or assigns a name to an ATM PVC, specifies the encapsulation type on an ATM PVC, and enters interface-ATM-VC configuration mode.
<b>ubr</b>	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>ubr+</b>	Configures UBR QoS and specifies the output peak cell rate and output minimum guaranteed cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vbr-nrt</b>	Configures the VBR-NRT QoS and specifies output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vc-class atm</b>	Configures a VC class for an ATM VC or interface.

## precedence (WRED group)

To configure a Weighted Random Early Detection (WRED) or VIP-distributed WRED (DWRED) group for a particular IP Precedence, use the **precedence** command in random-detect-group configuration mode. To return the values for each IP Precedence for the group to the default values, use the **no** form of this command.

**precedence** *precedence min-threshold max-threshold mark-probability-denominator*

**no precedence** *precedence min-threshold max-threshold mark-probability-denominator*

Syntax Description	
<i>precedence</i>	IP Precedence number. Values range from 0 to 7.
<i>min-threshold</i>	Minimum threshold in number of packets. Value range from 1 to 4096. When the average queue length reaches this number, WRED or DWRED begins to drop packets with the specified IP Precedence.
<i>max-threshold</i>	Maximum threshold in number of packets. The value range is <i>min-threshold</i> to 4096. When the average queue length exceeds this number, WRED or DWRED drops all packets with the specified IP Precedence.
<i>mark-probability-denominator</i>	Denominator for the fraction of packets dropped when the average queue depth is <i>max-threshold</i> . For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the <i>max-threshold</i> . The value is 1 to 65536. The default is 10; 1 out of every 10 packets is dropped at the <i>max-threshold</i> .

Command Default	
	For all IP Precedences, the <i>mark-probability-denominator</i> argument is 10, and the <i>max-threshold</i> argument is based on the output buffering capacity and the transmission speed for the interface.
	The default <i>min-threshold</i> argument depends on the IP Precedence. The <i>min-threshold</i> argument for IP Precedence 0 corresponds to half of the <i>max-threshold</i> argument. The values for the remaining IP Precedences fall between half the <i>max-threshold</i> argument and the <i>max-threshold</i> argument at evenly spaced intervals. See <a href="#">Table 27</a> in the “Usage Guidelines” section for a list of the default minimum value for each IP Precedence.

Command Modes	
	Random-detect-group configuration

Command History	Release	Modification
	11.1(22)CC	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. DWRED is similar to WRED but uses the Versatile Interface Processor (VIP) instead of the Route Switch Processor (RSP).

If used, this command is issued after the **random-detect-group** command.

When you configure the **random-detect group** command on an interface, packets are given preferential treatment based on the IP Precedence of the packet. Use the **precedence** command to adjust the treatment for different IP Precedences.

If you want WRED or DWRED to ignore the IP Precedence when determining which packets to drop, enter this command with the same parameters for each IP Precedence. Remember to use reasonable values for the minimum and maximum thresholds.

**Note**

The default WRED or DWRED parameter values are based on the best available data. We recommend that you do not change the parameters from their default values unless you have determined that your applications would benefit from the changed values.

Table 27 lists the default minimum value for each IP Precedence.

**Table 27**      *Default WRED Minimum Threshold Values*

IP Precedence	Minimum Threshold Value (Fraction of Maximum Threshold Value)
0	8/16
1	9/16
2	10/16
3	11/16
4	12/16
5	13/16
6	14/16
7	15/16

**Examples**

The following example specifies parameters for the WRED parameter group called sanjose for the different IP Precedences:

```
random-detect-group sanjose
precedence 0 32 256 100
precedence 1 64 256 100
precedence 2 96 256 100
precedence 3 128 256 100
precedence 4 160 256 100
precedence 5 192 256 100
precedence 6 224 256 100
precedence 7 256 256 100
```

Related Commands	Command	Description
	<b>exponential-weighting-constant</b>	Configures the exponential weight factor for the average queue size calculation for a WRED parameter group.
	<b>random-detect (per VC)</b>	Enables per-VC WRED or per-VC DWRED.
	<b>random-detect-group</b>	Defines the WRED or DWRED parameter group.
	<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
	<b>show queueing</b>	Lists all or selected configured queueing strategies.
	<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

# preempt-priority

To specify the Resource Reservation Protocol (RSVP) quality of service (QoS) priorities to be inserted into PATH and RESV messages if they were not signaled from an upstream or downstream neighbor or local client application, use the **preempt-priority** command in local policy configuration mode. To delete the priorities, use the **no** form of this command.

**preempt-priority** [**traffic-eng** *x*] *setup-priority* [*hold-priority*]

**no preempt-priority** [**traffic-eng** *x*] *setup-priority* [*hold-priority*]

Syntax Description		
<b>traffic-eng</b> <i>x</i>	(Optional) Indicates the upper limit of the priority for Traffic Engineering (TE) reservations. The range of <i>x</i> values is 0 to 7 in which the smaller the number, the higher the reservation's priority. For non-TE reservations, the range of <i>x</i> values is 0 to 65535 in which the higher the number, the higher the reservation's priority.	
<i>setup-priority</i>	Indicates the priority of a reservation when it is initially installed. Values range from 0 to 7 where 0 is considered the highest priority. For TE reservations, the default value is 7; for non-TE reservations, the default is 0.	
<i>hold-priority</i>	(Optional) Indicates the priority of a reservation after it has been installed. If omitted, this argument defaults to the <i>setup-priority</i> . Values range from 0 to 7 where 0 is considered the highest priority. For TE reservations, the default value is 7; for non-TE reservations, the default is 0.	

**Command Default** No RSVP QoS priorities are specified until you configure them.

**Command Modes** Local policy configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **preempt-priority** command to specify the maximum setup or hold priority that RSVP QoS or MPLS/ TE sessions can signal. A PATHERROR, RESVERROR, or local application error is returned if these limits are exceeded.

If an incoming message has a preemption priority that requests a priority higher than the policy allows, the message is rejected. Use the **tunnel mpls traffic-eng priority** command to configure preemption priority for TE tunnels.

A single policy can contain a **preempt-priority traffic-eng** and a **preempt-priority** command, which may be useful if the policy is bound to an access control list (ACL) that identifies a subnet containing a mix of TE and non-TE endpoints or midpoints.

When selecting reservations for preemption, RSVP preempts lower-priority reservations before those with higher priority. If there are multiple nonTE reservations with the same preemption priority, RSVP selects the oldest reservations first.

**Examples**

The following example has a setup priority of 0 and a hold priority of 5:

```
Router(config-rsvp-local-policy)# preempt-priority 0 5
```

**Related Commands**

Command	Description
<b>ip rsvp policy local</b>	Determines how to perform authorization on RSVP requests.
<b>ip rsvp policy preempt</b>	Enables RSVP to take bandwidth from lower-priority reservations and give it to new, higher-priority reservations.
<b>tunnel mpls traffic-eng priority</b>	Configures the setup and reservation priorities for an MPLS TE tunnel.

# priority

To give priority to a class of traffic belonging to a policy map, use the **priority** command in policy-map class configuration mode. To remove a previously specified priority for a class, use the **no** form of this command.

**priority** { *bandwidth-kbps* | **percent** *percentage* } [*burst*]

**no priority** { *bandwidth-kbps* | **percent** *percentage* } [*burst*]

## Syntax Description

<i>bandwidth-kbps</i>	Guaranteed allowed bandwidth, in kbps, for the priority traffic. The amount of guaranteed bandwidth varies according to the interface and platform in use. Beyond the guaranteed bandwidth, the priority traffic will be dropped in the event of congestion to ensure that the nonpriority traffic is not starved.
<b>percent</b>	Specifies that the amount of guaranteed bandwidth will be specified by the percent of available bandwidth.
<i>percentage</i>	Used in conjunction with the <b>percent</b> keyword, specifies the percentage of the total available bandwidth to be set aside for the priority class. The percentage can be a number from 1 to 100.
<i>burst</i>	(Optional) Specifies the burst size in bytes. The burst size configures the network to accommodate temporary bursts of traffic. The default burst value, which is computed as 200 milliseconds of traffic at the configured bandwidth rate, is used when the burst argument is not specified. The range of the burst is from 32 to 2000000 bytes.

## Command Default

No default behavior or values

## Command Modes

Policy-map class configuration

## Command History

Release	Modification
12.0(7)T	This command was introduced.
12.0(5)XE5	This command was introduced for the Versatile Interface Processor (VIP) as part of the Distributed Low Latency Queueing (Low Latency Queueing for the VIP) feature.
12.0(9)S	This command was introduced for the VIP as part of the Distributed Low Latency Queueing (Low Latency Queueing for the VIP) feature.
12.1(2)E	The <i>burst</i> argument was added.
12.1(3)T	The <i>burst</i> argument was integrated in Release 12.1(3)T.
12.1(5)T	This command was introduced for the VIP as part of the Distributed Low Latency Queueing (Low Latency Queueing for the VIP) feature.
12.2(2)T	The <b>percent</b> keyword and the <i>percentage</i> argument were added.

Release	Modification
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

This command configures low latency queuing (LLQ), providing strict priority queuing (PQ) for class-based weighted fair queuing (CBWFQ). Strict PQ allows delay-sensitive data such as voice to be dequeued and sent before packets in other queues are dequeued.

The **priority** command allows you to set up classes based on a variety of criteria (not just User Datagram Ports (UDP) ports) and assign priority to them, and is available for use on serial interfaces and ATM permanent virtual circuits (PVCs). A similar command, the **ip rtp priority** command, allows you to stipulate priority flows based only on UDP port numbers and is not available for ATM PVCs.

When the device is not congested, the priority class traffic is allowed to exceed its allocated bandwidth. When the device is congested, the priority class traffic above the allocated bandwidth is discarded.

The **bandwidth** and **priority** commands cannot be used in the same class, within the same policy map. These commands can be used together in the same policy map, however.

Within a policy map, you can give one or more classes priority status. When multiple classes within a single policy map are configured as priority classes, all traffic from these classes is queued to the same, single, priority queue.

When the policy map containing class policy configurations is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed. If a policy map cannot be attached to a particular interface because of insufficient interface bandwidth, the policy is removed from all interfaces to which it was successfully attached.

For more information on bandwidth allocation, refer to the chapter “Congestion Management Overview” in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

### Examples

The following example configures PQ with a guaranteed bandwidth of 50 kbps and a one-time allowable burst size of 60 bytes for the policy map called policy1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 50 60
```

In the following example, 10 percent of the available bandwidth is reserved for the class called voice on interfaces to which the policy map called policy1 has been attached:

```
Router(config)# policy-map policy1
Router(config-pmap)# class voice
Router(config-pmap-c)# priority percent 10
```

Related Commands	Command	Description
	<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
	<b>ip rtp priority</b>	Reserves a strict priority queue for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>ip rtp reserve</b>	Reserves a special queue for a set of RTP packet flows belonging to a range of UDP destination ports.
	<b>max-reserved-bandwidth</b>	Changes the percent of interface bandwidth allocated for CBWFQ, LLQ, and IP RTP Priority.
	<b>show interfaces fair-queue</b>	Displays information and statistics about WFQ for a VIP-based interface.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.

# priority level

To configure multiple priority queues, use the **priority level** command in policy-map class configuration mode. To remove a previously specified priority level for a class, use the **no** form of this command.

**priority level** *level*

**no priority level** *level*

## Syntax Description

<b>level</b>	Defines multiple levels of a strict priority service model. When you enable a traffic class with a specific level of priority service, the implication is a single priority queue associated with all traffic enabled with the specified level of priority service.
<i>level</i>	A range of priority levels. Valid values are from 1 (high priority) to 4 (low priority). Default: 1

## Defaults

The priority level has a default level of 1.

## Command Modes

Policy-map class configuration

## Command History

Release	Modification
12.2(31)SB2	This command was introduced to provide multiple levels of strict priority queuing and implemented on the Cisco 10000 series router for the PRE3.

## Usage Guidelines

The **bandwidth** and **priority level** commands cannot be used in the same class, within the same policy map. These commands can be used in the same policy map, however.

The **shape** and **priority level** commands cannot be used in the same class, within the same policy map. These commands can be used in the same policy map, however.

Within a policy map, you can give one or more classes priority status. The router associates a single priority queue with all of the traffic enabled with the same priority level and services the high level priority queues until empty before servicing the next level priority queues and non-priority queues.

You cannot specify the same priority level for two different classes in the same policy map.

You cannot specify the **priority** command and the **priority level** command for two different classes in the same policy map. For example, you cannot specify the **priority bandwidth-kbps** or **priority percent percentage** command and the **priority level** command for different classes.

When the **priority level** command is configured with a specific level of priority service, the **queue-limit** and **random-detect** commands can be used if only a single class at that level of priority is configured.

You cannot configure the default queue as a priority queue at any priority level.

### Cisco 10000 Series Router Usage Guidelines

The Cisco 10000 series router supports two levels of priority service: level 1 (high) and level 2 (low). If you do not specify a priority level, the router uses the default level of 1. Level 1 specifies that low latency behavior must be given to the traffic class. The high-level queues are serviced until empty before the next level queues and non-priority queues.

### Examples

The following example shows how to configure multi-level priority queues. In the example, the traffic class named Customer1 is given high priority (level 1) and the class named Customer2 is given level 2 priority. To prevent Customer2 traffic from becoming starved of bandwidth, Customer1 traffic is policed at 30 percent of the available bandwidth.

```
Router> enable
Router# config terminal
Router(config)# policy-map Business
Router(config-pmap)# class Customer1
Router(config-pmap-c)# priority level 1
Router(config-pmap-c)# police 30
Router(config-pmap-c)# exit
Router(config-pmap)# class Customer2
Router(config-pmap-c)# priority level 2
```

### Related Commands

Command	Description
<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>priority</b>	Assigns priority to a class of traffic.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface. Displays statistical information for all priority levels configured.

# priority-group

To assign the specified priority list to an interface, use the **priority-group** command in interface configuration mode. To remove the specified priority group assignment, use the **no** form of this command.

**priority-group** *list-number*

**no priority-group** *list-number*

<b>Syntax Description</b>	<i>list-number</i>	Priority list number assigned to the interface. Any number from 1 to 16.
<b>Command Default</b>	Disabled	
<b>Command Modes</b>	Interface configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	10.0	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

Only one list can be assigned per interface. Priority output queueing provides a mechanism to prioritize packets sent on an interface.

Use the **show queueing** and **show interfaces** commands to display the current status of the output queues.

**Examples**

The following example causes packets for transmission on serial interface 0 to be classified by priority list 1:

```
interface serial 0
 priority-group 1
```

The following example shows how to establish queueing priorities based on the address of the serial link on a serial tunnel (STUN) connection. Note that you must use the **priority-group** interface configuration command to assign a priority group to an output interface.

```
stun peer-name 172.16.0.0
stun protocol-group 1 sdlc
!
interface serial 0
! Disable the ip address for interface serial 0:
no ip address
! Enable the interface for STUN:
```

```

encapsulation stun
!
stun group 2
stun route address 10 tcp 172.16.0.1 local-ack priority
!
! Assign priority group 1 to the input side of interface serial 0:
priority-group 1
! Assign a low priority to priority list 1 on serial link identified
! by group 2 and address A7:
priority-list 1 stun low address 2 A7

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>locaddr-priority-list</b>	Maps LUs to queueing priorities as one of the steps to establishing queueing priorities based on LU addresses.
<b>priority-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the priority list.
<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.
<b>priority-list protocol</b>	Establishes queueing priorities based on the protocol type.
<b>priority-list protocol ip tcp</b>	Establishes BSTUN or STUN queueing priorities based on the TCP port.
<b>priority-list protocol stun address</b>	Establishes STUN queueing priorities based on the address of the serial link.
<b>priority-list queue-limit</b>	Specifies the maximum number of packets that can be waiting in each of the priority queues.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# priority-list default

To assign a priority queue for those packets that do not match any other rule in the priority list, use the **priority-list default** command in global configuration mode. To return to the default or assign **normal** as the default, use the **no** form of this command.

```
priority-list list-number default { high | medium | normal | low }
```

```
no priority-list list-number default
```

## Syntax Description

<i>list-number</i>	Any number from 1 to 16 that identifies the priority list.
<b>high</b>   <b>medium</b>   <b>normal</b>   <b>low</b>	Priority queue level. The <b>normal</b> queue is used if you use the <b>no</b> form of this command.

## Command Default

This command is not enabled by default.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When you use multiple rules, remember that the system reads the priority settings in order of appearance. When classifying a packet, the system searches the list of rules specified by **priority-list** commands for a matching protocol or interface type. When a match is found, the system assigns the packet to the appropriate queue. The system searches the list in the order specified, and the first matching rule terminates the search.

## Examples

The following example sets the priority queue for those packets that do not match any other rule in the priority list to a low priority:

```
priority-list 1 default low
```

## Related Commands

Command	Description
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.

<b>Command</b>	<b>Description</b>
<b>priority-list protocol</b>	Establishes queueing priorities based on the protocol type.
<b>priority-list queue-limit</b>	Specifies the maximum number of packets that can be waiting in each of the priority queues.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# priority-list interface

To establish queueing priorities on packets entering from a given interface, use the **priority-list interface** command in global configuration mode. To remove an entry from the list, use the **no** form of this command with the appropriate arguments.

**priority-list** *list-number* **interface** *interface-type* *interface-number* { **high** | **medium** | **normal** | **low** }

**no priority-list** *list-number* **interface** *interface-type* *interface-number* { **high** | **medium** | **normal** | **low** }

Syntax Description		
<i>list-number</i>		Any number from 1 to 16 that identifies the priority list.
<i>interface-type</i>		The type of the interface.
<i>interface-number</i>		The number of the interface.
<b>high</b>   <b>medium</b>   <b>normal</b>   <b>low</b>		Priority queue level.

**Command Default** No queueing priorities are established by default.

**Command Modes** Global configuration

Command History	Release	Modification
	10.0	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** When you use multiple rules, remember that the system reads the priority settings in order of appearance. When classifying a packet, the system searches the list of rules specified by **priority-list** commands for a matching protocol or interface type. When a match is found, the system assigns the packet to the appropriate queue. The system searches the list in the order specified, and the first matching rule terminates the search.

**Examples** The following example assigns a list entering on serial interface 0 to a medium priority queue level:

```
priority-list 3 interface serial 0 medium
```



**Note**

This command defines a rule that determines how packets are attached to an interface. Once the rule is defined, the packet is actually attached to the interface using the **priority-group** command.

Related Commands	Command	Description
	<b>priority-group</b>	Assigns the specified priority list to an interface.
	<b>priority-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the priority list.
	<b>priority-list protocol</b>	Establishes queueing priorities based on the protocol type.
	<b>priority-list queue-limit</b>	Specifies the maximum number of packets that can be waiting in each of the priority queues.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
	<b>show queueing</b>	Lists all or selected configured queueing strategies.

# priority-list protocol

To establish queueing priorities based upon the protocol type, use the **priority-list protocol** command in global configuration mode. To remove a priority list entry assigned by protocol type, use the **no** form of this command with the appropriate arguments.

```
priority-list list-number protocol protocol-name {high | medium | normal | low} queue-keyword
keyword-value
```

```
no priority-list list-number protocol [protocol-name {high | medium | normal | low}
queue-keyword keyword-value]
```

## Syntax Description

<i>list-number</i>	Any number from 1 to 16 that identifies the priority list.
<i>protocol-name</i>	Protocol type: <b>aarp</b> , <b>appletalk</b> , <b>arp</b> , <b>bridge</b> (transparent), <b>clns</b> , <b>clns_es</b> , <b>clns_is</b> , <b>compressedtcp</b> , <b>cmns</b> , <b>decnet</b> , <b>decnet_node</b> , <b>decnet_router-11</b> , <b>decnet_router-12</b> , <b>dls</b> , <b>ip</b> , <b>ipx</b> , <b>pad</b> , <b>rsrb</b> , <b>stun</b> and <b>x25</b> .
<b>high</b>   <b>medium</b>   <b>normal</b>   <b>low</b>	Priority queue level.
<i>queue-keyword</i> <i>keyword-value</i>	Possible keywords are <b>fragments</b> , <b>gt</b> , <b>list</b> , <b>lt</b> , <b>tcp</b> , and <b>udp</b> . For more information about keywords and values, see <a href="#">Table 28</a> in the “Usage Guidelines” section.

## Command Default

No queueing priorities are established.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(13)T	This command was modified to remove <b>apollo</b> , <b>vines</b> , and <b>xns</b> from the list of protocol types. These protocols were removed because Apollo Domain, Banyan VINES, and Xerox Network Systems (XNS) were removed in Release 12.2(13)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When you use multiple rules for a single protocol, remember that the system reads the priority settings in order of appearance. When classifying a packet, the system searches the list of rules specified by **priority-list** commands for a matching protocol type. When a match is found, the system assigns the packet to the appropriate queue. The system searches the list in the order specified, and the first matching rule terminates the search.

The **decnet\_router-l1** keyword refers to the multicast address for all level 1 routers, which are intra-area routers, and the **decnet\_router-l2** keyword refers to all level 2 routers, which are interarea routers.

The **dls**, **rsrb**, and **stun** keywords refer only to direct encapsulation.

Use [Table 28](#), [Table 29](#), and [Table 30](#) to configure the queueing priorities for your system.

**Table 28** Protocol Priority Queue Keywords and Values

Option	Description
<b>fragments</b>	Assigns the priority level defined to fragmented IP packets (for use with IP only). More specifically, this command matches IP packets whose fragment offset field is nonzero. The initial fragment of a fragmented IP packet has a fragment offset of zero, so such packets are not matched by this command.  <b>Note</b> Packets with a nonzero fragment offset do not contain TCP or User Datagram Protocol (UDP) headers, so other instances of this command that use the <b>tcp</b> or <b>udp</b> keyword will always fail to match such packets.
<b>gt</b> <i>byte-count</i>	Specifies a greater-than count. The priority level assigned goes into effect when a packet size exceeds the value entered for the <i>byte-count</i> argument.  <b>Note</b> The size of the packet must also include additional bytes because of MAC encapsulation on the outgoing interface.
<b>list</b> <i>list-number</i>	Assigns traffic priorities according to a specified list when used with AppleTalk, bridging, IP, IPX, VINES, or XNS. The <i>list-number</i> argument is the access list number as specified by the <b>access-list</b> global configuration command for the specified <i>protocol-name</i> . For example, if the protocol is AppleTalk, <i>list-number</i> should be a valid AppleTalk access list number.
<b>lt</b> <i>byte-count</i>	Specifies a less-than count. The priority level assigned goes into effect when a packet size is less than the value entered for the <i>byte-count</i> argument.  <b>Note</b> The size of the packet must also include additional bytes because of MAC encapsulation on the outgoing interface.
<b>tcp</b> <i>port</i>	Assigns the priority level defined to TCP segments originating from or destined to a specified port (for use with IP only). <a href="#">Table 29</a> lists common TCP services and their port numbers.
<b>udp</b> <i>port</i>	Assigns the priority level defined to UDP packets originating from or destined to a specified port (for use with IP only). <a href="#">Table 30</a> lists common UDP services and their port numbers.

**Table 29** Common TCP Services and Their Port Numbers

Service	Port
FTP data	20
FTP	21
Simple Mail Transfer Protocol (SMTP)	25
Telnet	23

**Note**

To display a complete list of TCP services and their port numbers, enter a help string, such as the following example:

```
Router(config)# priority list 4 protocol ip medium tcp ?
```

**Table 30** Common UDP Services and Their Port Numbers

Service	Port
Domain Name System (DNS)	53
Network File System (NFS)	2049
remote-procedure call (RPC)	111
SNMP	161
TFTP	69

**Note**

To display a complete list of UDP services and their port numbers, enter a help string, such as the following example:

```
Router(config)# priority list 4 protocol ip medium udp ?
```

**Note**

[Table 29](#) and [Table 30](#) include some of the more common TCP and UDP port numbers. However, you can specify any port number to be prioritized; you are not limited to those listed.

For some protocols, such as TFTP and FTP, only the initial request uses port 69. Subsequent packets use a randomly chosen port number. For these types of protocols, the use of port numbers fails to be an effective method to manage queued traffic.

**Examples**

The following example assigns 1 as the arbitrary priority list number, specifies DECnet as the protocol type, and assigns a high-priority level to the DECnet packets sent on this interface:

```
priority-list 1 protocol decnet high
```

The following example assigns a medium-priority level to every DECnet packet with a size greater than 200 bytes:

```
priority-list 2 protocol decnet medium gt 200
```

The following example assigns a medium-priority level to every DECnet packet with a size less than 200 bytes:

```
priority-list 4 protocol decnet medium lt 200
```

The following example assigns a high-priority level to traffic that matches IP access list 10:

```
priority-list 1 protocol ip high list 10
```

The following example assigns a medium-priority level to Telnet packets:

```
priority-list 4 protocol ip medium tcp 23
```

The following example assigns a medium-priority level to UDP DNS packets:

```
priority-list 4 protocol ip medium udp 53
```

The following example assigns a high-priority level to traffic that matches Ethernet type code access list 201:

```
priority-list 1 protocol bridge high list 201
```

The following example assigns a high-priority level to data-link switching plus (DLSw+) traffic with TCP encapsulation:

```
priority-list 1 protocol ip high tcp 2065
```

The following example assigns a high-priority level to DLSw+ traffic with direct encapsulation:

```
priority-list 1 protocol dlsw high
```


**Note**

This command defines a rule that determines how packets are attached to an interface. Once the rule is defined, the packet is actually attached to the interface using the **priority-group** command.

**Related Commands**

Command	Description
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>priority-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the priority list.
<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.
<b>priority-list queue-limit</b>	Specifies the maximum number of packets that can be waiting in each of the priority queues.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# priority-list queue-limit

To specify the maximum number of packets that can be waiting in each of the priority queues, use the **priority-list queue-limit** command in global configuration mode. To select the normal queue, use the **no** form of this command.

**priority-list** *list-number* **queue-limit** [*high-limit* [*medium-limit* [*normal-limit* [*low-limit*]]]]

**no priority-list** *list-number* **queue-limit**

## Syntax Description

<i>list-number</i>	Any number from 1 to 16 that identifies the priority list.
<i>high-limit</i>	(Optional) Priority queue maximum length. A value of 0 for any of the four arguments means that the queue can be of unlimited size for that particular queue.
<i>medium-limit</i>	
<i>normal-limit</i>	For default values for these arguments, see <a href="#">Table 31</a> .
<i>low-limit</i>	

## Command Default

None.  
See [Table 31](#) in the “Usage Guidelines” section of this command for a list of the default queue limit arguments.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

If a priority queue overflows, excess packets are discarded and messages can be sent, if appropriate, for the protocol.

The default queue limit arguments are listed in [Table 31](#).

**Table 31** Default Priority Queue Packet Limits

Priority Queue Argument	Packet Limits
<i>high-limit</i>	20
<i>medium-limit</i>	40
<i>normal-limit</i>	60
<i>low-limit</i>	80

**Note**

If priority queueing is enabled and there is an active ISDN (Integrated Services Digital Network) call in the queue, changing the configuration of the **priority-list queue-limit** command drops the call from the queue. For more information about priority queueing, refer to the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Examples**

The following example sets the maximum packets in the priority queue to 10:

```
priority-list 2 queue-limit 10 40 60 80
```

**Related Commands**

Command	Description
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>priority-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the priority list.
<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.
<b>priority-list protocol</b>	Establishes queueing priorities based on the protocol type.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# priority-queue cos-map

To map CoS values to the receive and transmit strict-priority queues in interface configuration command mode, use the **priority-queue cos-map** command. To return to the default mapping, use the **no** form of this command.

```
priority-queue cos-map queue-id cos1 [cos2 [cos3 [cos4 [cos5 [cos6 [cos7 [cos8]]]]]]]
```

```
no priority-queue cos-map
```

## Syntax Description

<i>queue-id</i>	Queue number; the valid value is <b>1</b> .
<i>cos1</i>	CoS value; valid values are from 0 to 7.
<i>... cos8</i>	(Optional) CoS values; valid values are from 0 to 7.

## Command Default

The default mapping is queue 1 is mapped to CoS 5 for the following receive and transmit strict-priority queues:

- 1p1q4t receive queues
- 1p1q0t receive queues
- 1p1q8t receive queues
- 1p2q2t transmit queues
- 1p3q8t transmit queues
- 1p7q8t transmit queues
- 1p3q1t transmit queues
- 1p2q1t transmit queues

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

When mapping CoS values to the strict-priority queues, note the following information:

- The queue number is always **1**.
- You can enter up to 8 CoS values to map to the queue.

## Examples

This example shows how to map CoS value 7 to the strict-priority queues on Gigabit Ethernet port 1/1:

■ **priority-queue cos-map**

```
Router(config-if)# priority-queue cos-map 1 7  
Router(config-if)#
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show queueing interfaces</b>	Displays queueing information.

# priority-queue queue-limit

To set the priority-queue size on an interface, use the **priority-queue queue-limit** command in interface configuration mode. To return to the default priority-queue size, use the **no** form of this command.

**priority-queue queue-limit** *percent*

**no priority-queue queue-limit** *percent*

## Syntax Description

*percent* Priority-queue size in percent; valid values are from 1 to 100.

## Command Default

When global quality of service (QoS) is enabled, the priority-queue size is 15. When global QoS is disabled, the priority-queue size is 0.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(18)SXF2	This command was introduced.

## Usage Guidelines

This command is supported on the following modules:

- WS-X6501-10GE—1p2q1t<sup>1</sup>
- WS-X6148A-GE—1p3q8t<sup>2</sup>
- WS-X6148-45—1p3q8t
- WS-X6148-FE-SFP—1p3q8t
- WS-X6748-SFP—1p3q8t
- WS-X6724-SFP—1p7q8t<sup>3</sup>
- WS-X6704-10GE—1p7q4t<sup>4</sup>
- WS-SUP32-10GB-3B—1p7q4t
- WS-SUP32-GB-3B—1p3q8t
- WS-X6708-10GE—1p7q4t

## Examples

The following example shows how to set the priority-queue size on an interface:

```
priority-queue queue-limit 15
```

1. 1p2q1t—One strict-priority queue, two standard queues with one WRED drop threshold and one non-configurable (100%) tail-drop threshold per queue.
2. 1p3q8t—One strict-priority queue, three standard queues with eight WRED drop thresholds per queue.
3. 1p7q8t—One strict-priority queue, seven standard queues with eight WRED drop thresholds per queue.
4. 1p7q4t—One strict-priority queue, seven standard queues with four WRED drop thresholds per queue.

Related Commands	Command	Description
	show queueing interface	Displays queueing information.

# pvc-bundle

To add a virtual circuit (VC) to a bundle as a member of the bundle and enter bundle-vc configuration mode in order to configure that VC bundle member, use the **pvc-bundle** command in bundle configuration mode. To remove the VC from the bundle, use the **no** form of this command.

```
pvc-bundle pvc-name [vpi/] [vci]
```

```
no pvc-bundle pvc-name [vpi/] [vci]
```

## Syntax Description

<i>pvc-name</i>	The name of the permanent virtual circuit (PVC) bundle.
<i>vpi/</i>	(Optional) ATM network virtual path identifier (VPI) for this PVC. The absence of the / and a <i>vpi</i> value defaults the <i>vpi</i> value to 0.  On the Cisco 7200 and 7500 series routers, the value range is from 0 to 255; on the Cisco 4500 and 4700 routers, the value range is from 0 to 1 less than the quotient of 8192 divided by the value set by the <b>atm vc-per-vp</b> command.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.
<i>vci</i>	(Optional) ATM network virtual channel identifier (VCI) for this PVC. The value range is from 0 to 1 less than the maximum value set for this interface by the <b>atm vc-per-vp</b> command. Typically, lower values 0 to 31 are reserved for specific traffic (F4 Operation, Administration, and Maintenance (OAM), switched virtual circuit (SVC) signaling Integrated Local Management Interface (ILMI), and so on) and should not be used.  The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.

## Command Default

None

## Command Modes

Bundle configuration

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.0(26)S	This command was implemented on the Cisco 10000 series router.
12.2(16)BX	This command was implemented on the ESR-PRE2.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Each bundle can contain multiple VCs having different quality of service (QoS) attributes. This command associates a VC with a bundle, making it a member of that bundle. Before you can add a VC to a bundle, the bundle must exist. Use the **bundle** command to create a bundle. You can also use this command to configure a VC that already belongs to a bundle. You enter the command in the same way, giving the name of the VC bundle member.

The **pvc-bundle** command enters bundle-vc configuration mode, in which you can specify VC-specific and VC class attributes for the VC.

### Examples

The following example specifies an existing bundle called bundle1 and enters bundle configuration mode. Then it adds two VCs to the bundle. For each added VC, bundle-vc mode is entered and a VC class is attached to the VC to configure it.

```
bundle bundle1
pvc-bundle bundle1-control 207
class control-class
pvc-bundle bundle1-premium 206
class premium-class
```

The following example configures the PVC called bundle1-control, an existing member of the bundle called bundle1, to use class-based weighted fair queueing (CBWFQ). The example configuration attaches the policy map called policy1 to the PVC. Once the policy map is attached, the classes comprising policy1 determine the service policy for the PVC bundle1-control.

```
bundle bundle1
pvc-bundle bundle1-control 207
class control-class
service-policy output policy1
```

### Related Commands

Command	Description
<b>atm vc-per-vp</b>	Sets the maximum number of VCI to support per VPI.
<b>bump</b>	Configures the bumping rules for a VC class that can be assigned to a VC bundle.
<b>class-bundle</b>	Configures a VC bundle with the bundle-level commands contained in the specified VC class.
<b>class-vc</b>	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
<b>precedence</b>	Configures precedence levels for a VC member of a bundle, or for a VC class that can be assigned to a VC bundle.
<b>protect</b>	Configures a VC class with protected group or protected VC status for application to a VC bundle member.
<b>pvc</b>	Creates or assigns a name to an ATM PVC, specifies the encapsulation type on an ATM PVC, and enters interface-ATM-VC configuration mode.

Command	Description
<b>ubr</b>	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>ubr+</b>	Configures UBR QoS and specifies the output peak cell rate and output minimum guaranteed cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
<b>vbr-nrt</b>	Configures the VBR-NRT QoS and specifies output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.

# qos pre-classify

To enable quality of service (QoS) preclassification, use the **qos pre-classify** command in interface configuration mode. To disable the QoS preclassification feature, use the **no** form of this command.

**qos pre-classify**

**no qos pre-classify**

**Syntax Description** This command has no arguments or keywords.

**Command Default** QoS preclassification is disabled.

**Command Modes** Interface configuration

## Command History

Release	Modification
12.0(5)XE3	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(2)T	This command was implemented on the Cisco 2600 and Cisco 3600 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command is restricted to tunnel interfaces, virtual templates, and crypto maps. The **qos pre-classify** command is unavailable on all other interface types.

You can enable the **qos pre-classify** command for IP packets only.



### Note

QoS preclassification is not supported for all fragmented packets. If a packet is fragmented, each fragment might receive different preclassifications.

## Examples

The following example enables the QoS for Virtual Private Networks (VPNs) feature on tunnel interfaces and virtual templates:

```
Router(config-if)# qos pre-classify
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show interfaces</b>	Displays statistics for the interfaces configured on a router or access server.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.

# queue-limit

To specify or modify the maximum number of packets the queue can hold for a class policy configured in a policy map, use the **queue-limit** command in QoS policy-map class configuration mode. To remove the queue packet limit from a class, use the **no** form of this command.

**queue-limit** *number-of-packets*

**no queue-limit** *number-of-packets*

## Syntax Description

<i>number-of-packets</i>	A number in the range from 1 to 64 specifying the maximum number of packets that the queue for this class can accumulate.
<i>number-of-packets</i>	For ESR-PRE1, <i>number-of-packets</i> is a number from 32 to 16384; the number must be a power of 2. If the number you specify is not a power of 2, the router converts the number to the nearest power of 2 value.  For Cisco IOS Release 12.2(16)BX, <i>number-of-packets</i> is a number from 32 to 16384. The number does not need to be a power of 2.  For Cisco IOS Release 12.3(7)XI and later releases, if the interface speed is less than 500 MB, <i>number-of-packets</i> is a number from 8 to 4096; the number must be a power of 2. If the interface speed is greater than 500 MB, <i>number-of-packets</i> is a number from 128 to 64000 and must be a power of 2. If it is not, the router converts the number to the nearest power of 2 value.

## Command Default

The default behavior of the **queue-limit** command for class queues with and without weighted random early detection (WRED) is:

- Class queues with WRED—The router uses the default queue limit of two times the largest WRED maximum threshold value, rounded to the nearest power of 2.



**Note** For Cisco IOS Release 12.2(16)BX, the router does not round the value to the nearest power of 2.

- Priority queues and class queues without WRED—The router has buffers for up to 50 ms of 256-byte packets at line rate, but not fewer than 32 packets.

## Command Modes

QoS policy-map class configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE. Support for VIP-enabled Cisco 7500 series routers was added.
12.0(17)SL	This command was implemented on the Cisco 10000 series router.
12.1(5)T	This command was implemented on the VIP-enabled Cisco 7500 series routers.

Release	Modification
12.2(16)BX	This command was introduced on the ESR-PRE2.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.
12.3(7)XI	This command was integrated into Cisco IOS Release 12.3(7)XI.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Weighted fair queuing (WFQ) creates a queue for every class for which a class map is defined. Packets satisfying the match criterion for a class accumulate in the queue reserved for the class until they are sent, which occurs when the queue is serviced by the fair queuing process. When the maximum packet threshold you defined for the class is reached, enqueueing of any further packets to the class queue causes tail drop or, if Weighted Random Early Detection (WRED) is configured for the class policy, packet drop to take effect.

#### Overriding Queue Limits Set by the bandwidth Command

The **bandwidth** command can be used with the modular quality of service command-line interface (modular QoS) specify the bandwidth for a particular class. When used with the MQC, the **bandwidth** command uses a default queue limit for the class. This queue limit can be modified using the **queue-limit** command, thereby overriding the default set by the **bandwidth** command.



#### Note

Using the **queue-limit** command to modify the default queue limit is especially important for higher-speed interfaces, in order to meet the minimum bandwidth guarantees required by the interface.

### Examples

The following example configures a policy map called policy11 to contain policy for a class called ac1203. Policy for this class is set so that the queue reserved for it has a maximum packet limit of 40.

```
Router(config)# policy-map policy11
Router(config-pmap)# class ac1203
Router(config-pmap-c)# bandwidth 2000
Router(config-pmap-c)# queue-limit 40
```

### Related Commands

Command	Description
<b>bandwidth</b>	Specifies the maximum aggregate bandwidth for H.323 traffic and verify the available bandwidth of the destination gatekeeper.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>class class-default</b>	Specifies the default traffic class whose bandwidth is to be configured or modified.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

# queue-list default

To assign a priority queue for those packets that do not match any other rule in the queue list, use the **queue-list default** command in global configuration mode. To restore the default value, use the **no** form of this command.

**queue-list** *list-number* **default** *queue-number*

**no queue-list** *list-number* **default** *queue-number*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16 that identifies the queue list.
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.

## Command Default

Disabled

The default number of the queue list is queue number 1.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When you use multiple rules, remember that the system reads the **queue-list** commands in order of appearance. When classifying a packet, the system searches the list of rules specified by **queue-list** commands for a matching protocol or interface type. When a match is found, the system assigns the packet to the appropriate queue. The system searches the list in the order specified, and the first matching rule terminates the search.

Queue number 0 is a system queue. It is emptied before any of the other queues are processed. The system enqueues high-priority packets, such as keepalives, to this queue.

Use the **show interfaces** command to display the current status of the output queues.

## Examples

In the following example, the default queue for list 10 is set to queue number 2:

```
queue-list 10 default 2
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list interface</b>	Establishes queueing priorities on packets entering on an interface.
<b>queue-list protocol</b>	Establishes queueing priority based on the protocol type.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>queue-list queue limit</b>	Designates the queue length limit for a queue.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# queue-list interface

To establish queueing priorities on packets entering on an interface, use the **queue-list interface** command in global configuration mode. To remove an entry from the list, use the **no** form of this command.

**queue-list** *list-number* **interface** *interface-type* *interface-number* *queue-number*

**no queue-list** *list-number* **interface** *interface-type* *interface-number* *queue-number*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16 that identifies the queue list.
<i>interface-type</i>	Type of the interface.
<i>interface-number</i>	Number of the interface.
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.

## Command Default

No queueing priorities are established.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When you use multiple rules, remember that the system reads the **queue-list** commands in order of appearance. When classifying a packet, the system searches the list of rules specified by **queue-list** commands for a matching protocol or interface type. When a match is found, the system assigns the packet to the appropriate queue. The list is searched in the order specified, and the first matching rule terminates the search.

## Examples

In the following example, queue list 4 establishes queueing priorities for packets entering on interface tunnel 3. The queue number assigned is 10.

```
queue-list 4 interface tunnel 3 10
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the queue list.
<b>queue-list protocol</b>	Establishes queueing priority based on the protocol type.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>queue-list queue limit</b>	Designates the queue length limit for a queue.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# queue-list lowest-custom

To set the lowest number for a queue to be treated as a custom queue, use the **queue-list lowest-custom** command in global configuration mode. To restore the default value, use the **no** form of this command.

**queue-list** *list-number* **lowest-custom** *queue-number*

**no queue-list** *list-number* **lowest-custom** *queue-number*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16 that identifies the queue list.
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.

## Command Default

The default number of the lowest custom queue is 1.

## Command Modes

Global configuration

## Command History

Release	Modification
11.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

All queues from queue 0 to the queue prior to the one specified in the **queue-list lowest-custom** command use the priority queue. (Queue 0 has the highest priority.)

All queues from the one specified in the **queue-list lowest-custom** command to queue 16 use a round-robin scheduler.

Use the **show queuing custom** command to display the current custom queue configuration.

## Examples

In the following example, the lowest custom value is set to 2 for queue list 4:

```
queue-list 4 lowest-custom 2
```

## Related Commands

Command	Description
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list interface</b>	Establishes queuing priorities on packets entering on an interface.
<b>queue-list protocol</b>	Establishes queuing priority based on the protocol type.

<b>Command</b>	<b>Description</b>
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>queue-list queue limit</b>	Designates the queue length limit for a queue.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# queue-list protocol

To establish queueing priority based upon the protocol type, use the **queue-list protocol** command in global configuration mode. To remove an entry from the list, use the **no** form of this command.

**queue-list** *list-number protocol protocol-name queue-number queue-keyword keyword-value*

**no queue-list** *list-number protocol protocol-name queue-number queue-keyword keyword-value*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16.
<i>protocol-name</i>	Protocol type: <b>aarp</b> , <b>appletalk</b> , <b>arp</b> , <b>bridge</b> (transparent), <b>clns</b> , <b>clns_es</b> , <b>clns_is</b> , <b>cmns</b> , <b>compressedtcp</b> , <b>decnet</b> , <b>decnet_node</b> , <b>decnet_routerl1</b> , <b>decnet_routerl2</b> , <b>dls</b> , <b>ip</b> , <b>ipx</b> , <b>pad</b> , <b>rsrb</b> , <b>stun</b> and <b>x25</b> .
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.
<i>queue-keyword keyword-value</i>	Possible keywords are <b>fragments</b> , <b>gt</b> , <b>list</b> , <b>lt</b> , <b>tcp</b> , and <b>udp</b> . See the <b>priority-list protocol</b> command for more information about this keyword.

## Command Default

No queueing priorities are established.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(13)T	This command was modified to remove <b>apollo</b> , <b>vines</b> , and <b>xns</b> from the list of protocol types. These protocols were removed because Apollo Domain, Banyan VINES, and Xerox Network Systems (XNS) were removed in Release 12.2(13)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When you use multiple rules for a single protocol, remember that the system reads the **queue-list** commands in order of appearance. When classifying a packet, the system searches the list of rules specified by **queue-list** commands for a matching protocol. When a match is found, the system assigns the packet to the appropriate queue. The system searches the list in the order specified, and the first matching rule terminates the search.

The **decnet\_router-l1** keyword refers to the multicast address for all level 1 routers, which are intra-area routers, and the **decnet\_router-l2** keyword refers to all level 2 routers, which are interarea routers.

The **dls**, **rsrb**, and **stun** keywords refer only to direct encapsulation.

Use the tables listed in the **priority-list protocol** command documentation to configure the queueing priorities for your system.

### Examples

The following example assigns 1 as the custom queue list, specifies DECnet as the protocol type, and assigns 3 as a queue number to the packets sent on this interface:

```
queue-list 1 protocol decnet 3
```

The following example assigns DECnet packets with a size greater than 200 bytes to queue number 2:

```
queue-list 2 protocol decnet 2 gt 200
```

The following example assigns DECnet packets with a size less than 200 bytes to queue number 2:

```
queue-list 4 protocol decnet 2 lt 200
```

The following example assigns traffic that matches IP access list 10 to queue number 1:

```
queue-list 1 protocol ip 1 list 10
```

The following example assigns Telnet packets to queue number 2:

```
queue-list 4 protocol ip 2 tcp 23
```

The following example assigns User Datagram Protocol (UDP) Domain Name Service packets to queue number 2:

```
queue-list 4 protocol ip 2 udp 53
```

The following example assigns traffic that matches Ethernet type code access list 201 to queue number 1:

```
queue-list 1 protocol bridge 1 list 201
```

### Related Commands

Command	Description
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the queue list.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>queue-list queue limit</b>	Designates the queue length limit for a queue.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# queue-list queue byte-count

To specify how many bytes the system allows to be delivered from a given queue during a particular cycle, use the **queue-list queue byte-count** command in global configuration mode. To return the byte count to the default value, use the **no** form of this command.

**queue-list** *list-number* **queue** *queue-number* **byte-count** *byte-count-number*

**no queue-list** *list-number* **queue** *queue-number* **byte-count** *byte-count-number*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16.
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.
<i>byte-count-number</i>	The average number of bytes the system allows to be delivered from a given queue during a particular cycle.

## Command Default

This command is disabled by default. The default byte count is 1500 bytes.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

In the following example, queue list 9 establishes the byte count as 1400 for queue number 10:

```
queue-list 9 queue 10 byte-count 1400
```

## Related Commands

Command	Description
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the queue list.
<b>queue-list interface</b>	Establishes queueing priorities on packets entering on an interface.
<b>queue-list protocol</b>	Establishes queueing priority based on the protocol type.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>queue-list queue limit</b>	Designates the queue length limit for a queue.

<b>Command</b>	<b>Description</b>
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# queue-list queue limit

To designate the queue length limit for a queue, use the **queue-list queue limit** command in global configuration mode. To return the queue length to the default value, use the **no** form of this command.

**queue-list** *list-number* **queue** *queue-number* **limit** *limit-number*

**no queue-list** *list-number* **queue** *queue-number* **limit** *limit-number*

## Syntax Description

<i>list-number</i>	Number of the queue list. Any number from 1 to 16.
<i>queue-number</i>	Number of the queue. Any number from 1 to 16.
<i>limit-number</i>	Maximum number of packets that can be enqueued at any time. The range is from 0 to 32767 queue entries. A value of 0 means that the queue can be of unlimited size.

## Command Default

The default queue length limit is 20 entries.

## Command Modes

Global configuration

## Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

In the following example, the queue length of queue 10 is increased to 40:

```
queue-list 5 queue 10 limit 40
```

## Related Commands

Command	Description
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>queue-list default</b>	Assigns a priority queue for those packets that do not match any other rule in the queue list.
<b>queue-list interface</b>	Establishes queuing priorities on packets entering on an interface.
<b>queue-list protocol</b>	Establishes queuing priority based on the protocol type.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queuing strategies.

# random-detect

To enable Weighted Random Early Detection (WRED) or distributed WRED (DWRED) on an interface, use the **random-detect** command in interface configuration mode. To configure WRED for a class in a policy map, use the **random-detect** command in policy-map class configuration mode. To disable WRED or DWRED, use the **no** form of this command.

**random-detect** [**dscp-based** | **prec-based**]

**no random-detect** [**dscp-based** | **prec-based**]

Syntax Description	Keyword	Description
	<b>dscp-based</b>	(Optional) Specifies that WRED is to use the differentiated services code point (DSCP) value when it calculates the drop probability for a packet.
	<b>prec-based</b>	(Optional) Specifies that WRED is to use the IP Precedence value when it calculates the drop probability for a packet.

**Command Default** WRED and DWRED are disabled by default.

**Command Modes** Interface configuration when used on an interface  
Policy-map class configuration when used in a policy map

Command History	Release	Modification
	11.1CC	This command was introduced.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T. Arguments were added to support Differentiated Services (DiffServ) and Assured Forwarding (AF) Per Hop Behavior (PHB).
	12.1(5a)E	This command was integrated into Release 12.1(5a)E in policy map class configuration mode only.  This command was implemented on Versatile Interface Processor (VIP)-enabled Cisco 7500 series routers and Catalyst 6000 family switches with a FlexWAN module.
	12.0(15)S	This command was integrated into Release 12.0(15)S in policy-map class configuration mode only.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** If you choose not to use either the **dscp-based** or the **prec-based** keywords, WRED uses the IP Precedence value (the default method) to calculate the drop probability for the packet.

The **random-detect** command is not available at the interface level for Cisco IOS Release 12.1E or Release 12.0S. The **random-detect** command is available in policy-map class configuration mode only for Cisco IOS Release 12.1E, Release 12.0S, and later.

### WRED Functionality

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. DWRED is similar to WRED but uses the Versatile Interface Processor (VIP) instead of the Route Switch Processor (RSP). WRED and DWRED are most useful with protocols like Transport Control Protocol (TCP) that respond to dropped packets by decreasing the transmission rate.

The router automatically determines parameters to use in the WRED calculations. To change these parameters, use the **random-detect precedence** command.

### Platform Support for DWRED

The DWRED feature is supported only on Cisco 7000 series routers with an RSP7000 card and Cisco 7500 series routers with a VIP2-40 or greater interface processor. A VIP2-50 interface processor is strongly recommended when the aggregate line rate of the port adapters on the VIP is greater than DS3. A VIP2-50 interface processor is required for OC-3 rates.

To use DWRED, distributed Cisco Express Forwarding (dCEF) switching must first be enabled on the interface. For more information on dCEF, refer to the *Cisco IOS Switching Services Configuration Guide* and the *Cisco IOS Switching Services Command Reference*.

### WRED in a Policy Map

You can configure WRED as part of the policy map for a standard class or the default class. The WRED **random-detect** command and the weighted fair queueing (WFQ) **queue-limit** command are mutually exclusive. If you configure WRED, its packet drop capability is used to manage the queue when packets exceeding the configured maximum count are enqueued. If you configure the WFQ **queue-limit** command, tail drop is used.

To configure a policy map and create class policies, use the **policy-map** and **class** (policy-map) commands. When creating a class within a policy map, you can use the **random-detect** command with either of the following commands:

- **bandwidth** (policy-map class)
- **fair-queue** (class-default)—for the default class only



**Note** If you use WRED packet drop instead of tail drop for one or more classes in a policy map, you must ensure that WRED is not configured on the interface to which you attach that policy map.



**Note** DWRED is not supported for classes in a policy map.

### Two Methods for Calculating the Drop Probability of a Packet

This command includes two optional keywords, **dscp-based** and **prec-based**, that determine the method WRED uses to calculate the drop probability of a packet.

Note the following points when deciding which method to instruct WRED to use:

- With the **dscp-based** keyword, WRED uses the DSCP value (that is, the first six bits of the IP type of service (ToS) byte) to calculate the drop probability.
- With the **prec-based** keyword, WRED will use the IP Precedence value to calculate the drop probability.

- The **dscp-based** and **prec-based** keywords are mutually exclusive.
- If neither argument is specified, WRED uses the IP Precedence value to calculate the drop probability (the default method).

## Examples

The following example configures WRED on the High-Speed Serial Interface (HSSI) 0/0/0 interface:

```
interface Hssi0/0/0
 random-detect
```

The following example configures the policy map called policy1 to contain policy specification for the class called class1. During times of congestion, WRED packet drop is used instead of tail drop.

```
! The following commands create the class map called class1:
class-map class1
 match input-interface fastethernet0/1
```

```
! The following commands define policy1 to contain policy specification for class1:
policy-map policy1
 class class1
  bandwidth 1000
  random-detect
```

The following example enables WRED to use the DSCP value 8. The minimum threshold for the DSCP value 8 is 24 and the maximum threshold is 40. This configuration was performed at the interface level.

```
Router(config)# interface serial10/0
Router(config-if)# random-detect dscp-based
Router(config-if)# random-detect dscp 8 24 40
```

The following example enables WRED to use the DSCP value 8 for class c1. The minimum threshold for DSCP value 8 is 24 and the maximum threshold is 40. The last line attaches the service policy to the output interface or virtual circuit (VC) p1.

```
Router(config-if)# class-map c1
Router(config-cmap)# match access-group 101
Router(config-if)# policy-map p1
Router(config-pmap)# class c1
Router(config-pmap-c)# bandwidth 48
Router(config-pmap-c)# random-detect dscp-based
Router(config-pmap-c)# random-detect dscp 8 24 40
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface serial10/0
Router(config-if)# service-policy output p1
```

## Related Commands

Command	Description
<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect flow</b>	Enables flow-based WRED.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.

<b>Command</b>	<b>Description</b>
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>show tech-support rsvp</b>	Generates a report of all RSVP-related information.

# random-detect (per VC)

To enable per-virtual circuit (VC) Weighted Random Early Detection (WRED) or per-VC VIP-distributed WRED (DWRED), use the **random-detect** command in VC submode mode. To disable per-VC WRED and per-VC DWRED, use the **no** form of this command.

**random-detect** [**attach** *group-name*]

**no random-detect** [**attach** *group-name*]

## Syntax Description

**attach** *group-name* (Optional) Name of the WRED or DWRED group.

## Command Default

WRED and DWRED are disabled by default.

## Command Modes

VC submode

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. DWRED is similar to WRED but uses the Versatile Interface Processor (VIP) instead of the Route Switch Processor (RSP). WRED and DWRED are most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.

WRED and DWRED are configurable at the interface and per-VC levels. The VC-level WRED or DWRED configuration will override the interface-level configuration if WRED or DWRED is also configured at the interface level.

Use this command to configure a single ATM VC or a VC that is a member of a bundle.

Note the following points when using the **random-detect** (per VC) command:

- If you use this command without the optional **attach** keyword, default WRED or DWRED parameters (such as minimum and maximum thresholds) are used.
- If you use this command with the optional **attach** keyword, the parameters defined by the specified WRED or DWRED parameter group are used. (WRED or DWRED parameter groups are defined through the **random-detect-group** command.) If the specified WRED or DWRED group does not exist, the VC is configured with default WRED or DWRED parameters.

When this command is used to configure an interface-level WRED or DWRED group to include per-VC WRED or DWRED as a drop policy, the configured WRED or DWRED group parameters are inherited under the following conditions:

- All existing VCs—including Resource Reservation Protocol (RSVP) switched virtual circuits (SVCs) that are not specifically configured with a VC-level WRED or DWRED group—will inherit the interface-level WRED or DWRED group parameters.
- Except for the VC used for signalling and the Interim Local Management Interface (ILMI) VC, any VCs created after the configuration of an interface-level DWRED group will inherit the parameters.

When an interface-level WRED or DWRED group configuration is removed, per-VC WRED or DWRED parameters are removed from any VC that inherited them from the configured interface-level WRED or DWRED group.

When an interface-level WRED or DWRED group configuration is modified, per-VC WRED or DWRED parameters are modified accordingly if the WRED or DWRED parameters were inherited from the configured interface-level WRED or DWRED group configuration.

This command is only supported on interfaces that are capable of VC-level queuing. The only currently supported interface is the Enhanced ATM port adapter (PA-A3).

The DWRED feature is only supported on Cisco 7000 series routers with an RSP7000 card and Cisco 7500 series routers with a VIP2-40 or greater interface processor. A VIP2-50 interface processor is strongly recommended when the aggregate line rate of the port adapters on the VIP is greater than DS3. A VIP2-50 interface processor is required for OC-3 rates.

To use DWRED, distributed Cisco Express Forwarding (dCEF) switching must first be enabled on the interface. For more information on dCEF, refer to the *Cisco IOS Switching Services Configuration Guide* and the *Cisco IOS Switching Services Command Reference*.

## Examples

The following example configures per-VC WRED for the permanent virtual circuit (PVC) called cisco. Because the **attach** keyword was not used, WRED uses default parameters.

```
pvc cisco 46
  random-detect
```

The following example creates a DWRED group called Rome and then applies the parameter group to an ATM PVC:

```
! The following commands create the DWRED parameter group Rome:
random-detect-group Rome
precedence rsvp 46 50 10
precedence 1 32 50 10
precedence 2 34 50 10
precedence 3 36 50 10
precedence 4 38 50 10
precedence 5 40 50 10
precedence 6 42 50 10
precedence 7 44 50 10
exit
exit
```

```
! The following commands create a PVC on an ATM interface and then apply the
! DWRED group Rome to that PVC:
interface ATM2/0.23 point-to-point
ip address 10.9.23.10 255.255.255.0
no ip mroute-cache
```

```
pvc vc1 201/201
  random-detect attach Rome
  vbr-rt 2000 1000 200
  encapsulation aal5snap
```

The following **show queueing** command displays the current settings for each of the IP Precedences following configuration of per-VC DWRED:

```
Router# show queueing random-detect interface atm2/0.23 vc 201/201
```

```
random-detect group Rome:
```

```
exponential weight 9
class    min-threshold    max-threshold    mark-probability
-----
0        30                    50                1/10
1        32                    50                1/10
2        34                    50                1/10
3        36                    50                1/10
4        38                    50                1/10
5        40                    50                1/10
6        42                    50                1/10
7        44                    50                1/10
rsvp    46                    50                1/10
```

#### Related Commands

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect-group</b>	Defines the WRED or DWRED parameter group.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
<b>show interfaces</b>	Displays the statistical information specific to a serial interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect aggregate

To enable aggregate Weighted Random Early Detection (WRED), use the **random-detect aggregate** command in policy-map class configuration mode. To disable aggregate WRED, use the **no** form of this command.

**random-detect** [**precedence-based** | **dscp-based**] **aggregate** [**minimum-thresh** *min-thresh*  
**maximum-thresh** *max-thresh* **mark-probability** *mark-prob*]

**no random-detect** [**precedence-based** | **dscp-based**] **aggregate**

Syntax Description		
<b>precedence-based</b>	(Optional) Enables aggregate WRED based on IP precedence values. This is the default.	
<b>dscp-based</b>	(Optional) Enables aggregate WRED based on differentiated services code point (DSCP) values.	
<b>minimum-thresh</b> <i>min-thresh</i>	(Optional) Default minimum threshold (in number of packets) to be used for all subclasses (IP precedence or DSCP values) that have not been specifically configured. Valid values are from 1 to 12288.	
<b>maximum-thresh</b> <i>max-thresh</i>	(Optional) Default maximum threshold (in number of packets) to be used for all subclasses (IP precedence or DSCP values) that have not been specifically configured. Valid values are from the minimum threshold argument to 12288.	
<b>mark-probability</b> <i>mark-prob</i>	(Optional) Default denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. This value is used for all subclasses (IP precedence or DSCP values) that have not been specifically configured. Valid values are from 1 to 255.	

Command Default	
	If no <b>precedence-based</b> or <b>dscp-based</b> keyword is specified in the command, the default is <b>precedence-based</b> .
	If optional parameters for a default aggregate class are not defined, all subclass values that are not explicitly configured will use plain (non-weighted) RED drop behavior. This is different from standard random-detect configuration where the default is to always use WRED behavior.

Command Modes	
	Policy-map class configuration

Command History	Release	Modification
	12.2(18)SXE	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2 on the Cisco 10000 series router for the PRE3.

**Usage Guidelines**

For ATM interfaces, the Aggregate WRED feature requires that the ATM SPA cards are installed in a Cisco 7600 SIP-200 carrier card or a Cisco 7600 SIP-400 carrier card.

To configure WRED on an ATM interface, you must use the random-detect aggregate commands; the standard random-detect commands are no longer supported on ATM interfaces.

The **precedence-based** and **dscp-based** keywords are mutually exclusive. If you do not specify either keyword, **precedence-based** is the default.

Defining WRED profile parameter values for the default aggregate class is optional. If defined, WRED profile parameters applied to the default aggregate class will be used for all subclasses that have not been explicitly configured. If all possible IP precedence or DSCP values are defined as subclasses, a default specification is unnecessary. If the optional parameters for a default aggregate class are not defined and packets with an unconfigured IP precedence or DSCP value arrive at the interface, plain (non-weighted) RED drop behavior will be used.

Use this command with a **random-detect precedence** (aggregate) or **random-detect dscp** (aggregate) command within a policy map configuration to configure aggregate Weighted Random Early Detection (WRED) parameters for specific IP precedence or DSCP value(s).

After the policy map is defined, the policy map must be attached at the VC level.

Use the **show policy-map interface** command to display the statistics for aggregated subclasses.

**Examples**

The following example shows a precedence-based aggregate WRED configuration for an ATM interface. Note that first a policy map named prec-aggr-wred is defined for the default class, then precedence-based Aggregate WRED is enabled with the **random-detect aggregate** command, then subclasses and WRED parameter values are assigned in a series of **random-detect precedence** (aggregate) commands, and, finally, the policy map is attached at the ATM VC level using the **interface** and **service-policy** commands.

```
Router (config)# policy-map prec-aggr-wred
Router (config-pmap)# class class-default
Router (config-pmap-c)# random-detect aggregate
Router (config-pmap-c)# random-detect precedence values 0 1 2 3 minimum-thresh 10
maximum-thresh 100 mark-prob 10
Router (config-pmap-c)# random-detect precedence values 4 5 minimum-thresh 40
maximum-thresh 400 mark-prob 10
Router (config-pmap-c)# random-detect precedence values 6 minimum-thresh 60 maximum-thresh
600 mark-prob 10
Router (config-pmap-c)# random-detect precedence values 7 minimum-thresh 70 maximum-thresh
700 mark-prob 10
Router (config-pmap-c)# interface ATM4/1/0.10 point-to-point
Router (config-subif)# ip address 10.0.0.2 255.255.255.0
Router (config-subif)# pvc 10/110
Router (config-subif)# service-policy output prec-aggr-wred
```

The following example shows a DSCP-based aggregate WRED configuration for an ATM interface. Note that first a policy map named dscp-aggr-wred is defined for the default class, then dscp-based Aggregate WRED is enabled with the **random-detect dscp-based aggregate** command, then subclasses and WRED parameter values are assigned in a series of **random-detect dscp** (aggregate) commands, and, finally, the policy map is attached at the ATM VC level using the **interface** and **service-policy** commands.

```
Router (config)# policy-map dscp-aggr-wred
Router (config-pmap)# class class-default
Router (config-pmap-c)# random-detect dscp-based aggregate minimum-thresh 1 maximum-thresh
10 mark-prob 10
```

```

Router (config-pmap-c)# random-detect dscp values 0 1 2 3 4 5 6 7 minimum-thresh 10
maximum-thresh 20 mark-prob 10
Router (config-pmap-c)# random-detect dscp values 8 9 10 11 minimum-thresh 10
maximum-thresh 40 mark-prob 10
Router (config)# interface ATM4/1/0.11 point-to-point
Router (config-subif)# ip address 10.0.0.2 255.255.255.0
Router (config-subif)# pvc 11/101
Router (config-subif)# service-policy output dscp-aggr-wred

```

**Related Commands**

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>interface</b>	Configures an interface type and enters interface configuration mode.
<b>policy-map</b>	Creates a policy map that can be attached to one or more interfaces to specify a service policy.
<b>random-detect precedence (aggregate)</b>	Configures aggregate WRED parameters for specific IP precedence values.
<b>random-detect dscp (aggregate)</b>	Configures aggregate WRED parameters for specific DSCP values.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# random-detect discard-class

To configure the weighted random early detection (WRED) parameters for a discard-class value for a class policy in a policy map, use the **random-detect discard-class** command in QoS policy-map class configuration mode. To disable the discard-class values, use the **no** form of this command.

**random-detect discard-class** *value min-threshold max-threshold max-probability-denominator*

**no random-detect discard-class** *value min-threshold max-threshold max-probability-denominator*

## Syntax Description

<i>value</i>	Discard class. This is a number that identifies the drop eligibility of a packet. Valid values are 0 to 7.
<i>min-threshold</i>	Specifies the minimum number of packets allowed in the queue. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified DSCP, IP precedence, or discard-class value. Valid minimum threshold values are 1 to 16384.
<i>max-threshold</i>	Specifies the maximum number of packets allowed in the queue. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified DSCP, IP precedence, or discard-class value. Valid maximum threshold values are 1 to 16384.
<i>max-probability-denominator</i>	Denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the maximum threshold. Valid values are 1 to 65535.

## Command Default

For all precedence levels, the *max-probability-denominator* default is 10 packets; 1 out of every 10 packets is dropped at the maximum threshold.

## Command Modes

QoS policy-map class configuration

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.

## Usage Guidelines

When you configure the **random-detect discard-class** command on an interface, packets are given preferential treatment based on the discard class of the packet. Use the **random-detect discard-class** command to adjust the discard class for different discard-class values.

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You must first enable the drop mode using the **random-detect discard-class-based** command. You can then set the drop probability profile using the **random-detect discard-class** command.

Table 32 lists the default drop thresholds for WRED based on differentiated services code point (DSCP), IP precedence, and discard class. The drop probability indicates that the router drops one packet for every 10 packets.

**Table 32** WRED Default Drop Thresholds

DSCP, Precedence, and Discard-Class Values	Minimum Threshold (Times the Queue Size)	Maximum Threshold (Times the Queue Size)	Drop Probability
All DSCPs	1/4	1/2	1/10
0	1/4	1/2	1/10
1	9/32	1/2	1/10
2	5/16	1/2	1/10
3	11/32	1/2	1/10
4	3/8	1/2	1/10
5	13/32	1/2	1/10
6	7/16	1/2	1/10
7	15/32	1/2	1/10

**Examples**

The following example shows how to configure discard class 2 to randomly drop packets when the average queue reaches the minimum threshold of 100 packets and 1 in 10 packets are dropped when the average queue is at the maximum threshold of 200 packets:

```
policy-map set-MPLS-PHB
class IP-AF11
  bandwidth percent 40
  random-detect discard-class-based
  random-detect-discard-class 2 100 200 10
```

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The following example shows how to enable discard-class-based WRED. In this example, the configuration of the class map named Silver indicates to classify traffic based on discard class 3 and 5. Traffic that matches discard class 3 or 5 is assigned to the class named Silver in the policy map named Premium. The Silver configuration includes WRED packet dropping based on discard class 5 with a minimum threshold of 500, maximum threshold of 1500, and a mark-probability-denominator of 200. The QoS policy is applied to PVC 1/81 on point-to-point ATM subinterface 2/0/0.2 in the outbound direction.

```
Router(config)# class-map Silver
Router(config-cmap)# match discard-class 3 5
Router(config-cmap)# exit
Router(config)# policy-map Premium
Router(config-pmap)# class Silver
Router(config-pmap-c)# bandwidth percent 30
Router(config-pmap-c)# random-detect discard-class-based
Router(config-pmap-c)# random-detect discard-class 5 500 1500 200
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 2/0/0
```

```

Router(config-if)# atm pxf queuing
Router(config-if)# interface atm 2/0/0.2 point-to-point
Router(config-subif)# pvc 1/81
Router(config-subif-atm-vc)#ubr 10000
Router(config-subif-atm-vc)# service-policy output Premium

```

Related Commands	Command	Description
	<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
	<b>match discard-class</b>	Matches packets of a certain discard-class.
	<b>random-detect discard-class-based</b>	Bases WRED on the discard class value of a packet.
	<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
	<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP precedence.
	<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# random-detect discard-class-based

To base weighted random early detection (WRED) on the discard class value of a packet, use the **random-detect discard-class-based** command in policy-map class configuration mode. To disable this feature, use the **no** form of this command.

**random-detect discard-class-based**

**no random-detect discard-class-based**

**Syntax Description** This command has no arguments or keywords.

**Defaults** The defaults are router-dependent.

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

**Usage Guidelines** Enter this command so that WRED is based on the discard class instead of on the IP precedence field.

**Examples** The following example shows that random detect is based on the discard class value of a packet:

```
policy-map name
  class-name
    bandwidth percent 40
    random-detect discard-class-based
```

Related Commands	Command	Description
	<b>match discard-class</b>	Matches packets of a certain discard class.

# random-detect dscp

To change the minimum and maximum packet thresholds for the differentiated services code point (DSCP) value, use the **random-detect dscp** command in interface or QoS policy-map class configuration mode. To return the minimum and maximum packet thresholds to the default for the DSCP value, use the **no** form of this command.

**random-detect dscp** *dscp-value min-threshold max-threshold* [*max-probability-denominator*]

**no random-detect dscp** *dscp-value min-threshold max-threshold* [*max-probability-denominator*]

Syntax Description		
<i>dscp-value</i>		The DSCP value. The DSCP value can be a number from 0 to 63, or it can be one of the following keywords: <b>af11</b> , <b>af12</b> , <b>af13</b> , <b>af21</b> , <b>af22</b> , <b>af23</b> , <b>af31</b> , <b>af32</b> , <b>af33</b> , <b>af41</b> , <b>af42</b> , <b>af43</b> , <b>cs1</b> , <b>cs2</b> , <b>cs3</b> , <b>cs4</b> , <b>cs5</b> , <b>cs7</b> , <b>ef</b> , or <b>rsvp</b> .
<i>min-threshold</i>		Minimum threshold in number of packets. The value range of this argument is from 1 to 4096. When the average queue length reaches the minimum threshold, Weighted Random Early Detection (WRED) or distributed WRED (dWRED) randomly drops some packets with the specified DSCP value.
<i>max-threshold</i>		Maximum threshold in number of packets. The value range of this argument is from the value of the <i>min-threshold</i> argument to 4096. When the average queue length exceeds the maximum threshold, WRED or dWRED drops all packets with the specified DSCP value.
<i>max-probability-denominator</i>		(Optional) Denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the maximum threshold. The value range is from 1 to 65536. The default is 10; 1 out of every 10 packets is dropped at the maximum threshold.

**Command Default** The default values for the **random-detect dscp** command are different on Versatile Interface Processor (VIP)-enabled Cisco 7500 series routers and Catalyst 6000 family switches with a FlexWAN module (dWRED). All other platforms running WRED have another set of default values. For more information about **random-detect dscp** defaults, see the “Usage Guidelines” section.

**Command Modes** Interface configuration  
Policy-map class configuration

Command History	Release	Modification
	12.1(5)T	This command was introduced.
	12.1(5a)E	This command was integrated into Cisco IOS Release 12.1(5a)E in policy-map class configuration mode only.  The command was introduced for VIP-enabled Cisco 7500 series routers and Catalyst 6000 family switches with a FlexWAN module.

Release	Modification
12.0(15)S	This command was integrated into Cisco IOS Release 12.0(15)S in policy-map class configuration mode only.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

Use the **random-detect dscp** command in conjunction with the **random-detect** command in interface configuration mode.

Additionally, the **random-detect dscp** command is available only if you specified the *dscp-based* argument when using the **random-detect** command in interface configuration mode.



#### Note

The **random-detect dscp** command is not available at the interface level for Cisco IOS Release 12.1E or Release 12.0S. The **random-detect dscp** command is available only in policy-map class configuration mode in Cisco IOS Release 12.1E.

### Defaults for VIP-Enabled Cisco 7500 Series Routers and Catalyst 6000 Family Switches with a FlexWAN Module

For all IP precedence values, the default *mark-probability-denominator* is 10, and the *max-threshold* value is based on the output buffering capacity and the transmission speed of the interface.

The default *min-threshold* value depends on the IP precedence value. The *min-threshold* value for IP precedence 0 corresponds to half of the *max-threshold* value. The values for the remaining IP precedence values fall between half the *max-threshold* and the *max-threshold* at even intervals.

Unless the maximum and minimum threshold values for the DSCP values are configured by the user, all DSCP values have the same minimum threshold and maximum threshold values as the value specified for precedence 0.

### Specifying the DSCP Value

The **random-detect dscp** command allows you to specify the DSCP value per traffic class. The DSCP value can be a number from 0 to 63, or it can be one of the following keywords: **af11**, **af12**, **af13**, **af21**, **af22**, **af23**, **af31**, **af32**, **af33**, **af41**, **af42**, **af43**, **cs1**, **cs2**, **cs3**, **cs4**, **cs5**, **cs7**, **ef**, or **rsvp**.

On a particular traffic class, eight DSCP values can be configured per traffic class. Overall, 29 values can be configured on a traffic class: 8 precedence values, 12 AF code points, 1 EF code point, and 8 user-defined DSCP values.

### Assured Forwarding Code Points

The AF code points provide a means for a domain to offer four different levels (four different AF classes). Forwarding assurances for IP packets received from other (such as customer) domains. Each one of the four AF classes is allocated a certain amount of forwarding services (buffer space and bandwidth).

Within each AF class, IP packets are marked with one of three possible drop precedence values (binary 2{010}, 4{100}, or 6{110}), which exist as the three lowest bits in the DSCP header. In congested network environments, the drop precedence value of the packet determines the importance of the packet within the AF class. Packets with higher drop precedence values are discarded before packets with lower drop precedence values.

The upper three bits of the DSCP value determine the AF class; the lower three values determine the drop probability.

### Expedited Forwarding Code Points

The EF code point is usually used to mark high-priority, time-sensitive data. The EF code point marking is equal to the highest precedence value; therefore, the EF code point is always equal to precedence value 7.

### Class Selector Values

The Class Selector (CS) values are equal to IP precedence values (for instance, cs1 is the same as IP precedence 1).

### Default Values

[Table 33](#) lists the default WRED minimum threshold value for each IP precedence value on the distributed platforms.

**Table 33** *Default WRED Minimum Threshold Values for the Distributed Platforms*

IP (Precedence)	Class Selector (CS) Value	Minimum Threshold Value (Fraction of Maximum Threshold Value)	Important Notes About the Value
0	cs0	8/16	All DSCP values that are not configured by the user will have the same threshold values as IP precedence 0.
1	cs1	9/16	—
2	cs2	10/16	—
3	cs3	11/16	—
4	cs4	12/16	—
5	cs5	13/16	—
6	cs6	14/16	—
7	cs7	15/16	The EF code point will always be equal to IP precedence 7.

Defaults for Non-VIP-Enabled Cisco 7500 Series Routers and Catalyst 6000 Family Switches with a FlexWAN Module

All platforms except the VIP-enabled Cisco 7500 series router and the Catalyst 6000 have the default values shown in [Table 34](#).

If WRED is using the DSCP value to calculate the drop probability of a packet, all 64 entries of the DSCP table are initialized with the default settings shown in [Table 34](#).

**Table 34** *random-detect dscp Default Settings*

<b>DSCP (Precedence)</b>	<b>Minimum Threshold</b>	<b>Maximum Threshold</b>	<b>Mark Probability</b>
0(0)	20	40	1/10
1	22	40	1/10
2	24	40	1/10
3	26	40	1/10
4	28	40	1/10
5	30	40	1/10
6	32	40	1/10
7	34	40	1/10
8(1)	22	40	1/10
9	22	40	1/10
10	24	40	1/10
11	26	40	1/10
12	28	40	1/10
13	30	40	1/10
14	32	40	1/10
15	34	40	1/10
16(2)	24	40	1/10
17	22	40	1/10
18	24	40	1/10
19	26	40	1/10
20	28	40	1/10
21	30	40	1/10
22	32	40	1/10
23	34	40	1/10
24(3)	26	40	1/10
25	22	40	1/10
26	24	40	1/10
27	26	40	1/10
28	28	40	1/10
29	30	40	1/10
30	32	40	1/10
31	34	40	1/10
32(4)	28	40	1/10
33	22	40	1/10
34	24	40	1/10

**Table 34** *random-detect dscp Default Settings (continued)*

<b>DSCP (Precedence)</b>	<b>Minimum Threshold</b>	<b>Maximum Threshold</b>	<b>Mark Probability</b>
35	26	40	1/10
36	28	40	1/10
37	30	40	1/10
38	32	40	1/10
39	34	40	1/10
40(5)	30	40	1/10
41	22	40	1/10
42	24	40	1/10
43	26	40	1/10
44	28	40	1/10
45	30	40	1/10
46	36	40	1/10
47	34	40	1/10
48(6)	32	40	1/10
49	22	40	1/10
50	24	40	1/10
51	26	40	1/10
52	28	40	1/10
53	30	40	1/10
54	32	40	1/10
55	34	40	1/10
56(7)	34	40	1/10
57	22	40	1/10
58	24	40	1/10
59	26	40	1/10
60	28	40	1/10
61	30	40	1/10
62	32	40	1/10
63	34	40	1/10
rsvp	36	40	1/10

**Examples**

The following example enables WRED to use the DSCP value 8. The minimum threshold for the DSCP value 8 is 20, the maximum threshold is 40, and the mark probability is 1/10.

```
random-detect dscp 8 20 40 10
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>random-detect</b>	Enables WRED or dWRED.
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

# random-detect dscp (aggregate)

To configure aggregate Weighted Random Early Detection (WRED) parameters for specific differentiated services code point (DSCP) value, use the **random-detect dscp values (aggregate)** command in QoS policy-map class configuration mode. To disable configuration of aggregate WRED DSCP values, use the **no** form of this command.

```
random-detect dscp sub-class-val1 sub-class-val2 sub-class-val3 sub-class-val4 min-thresh
max-thresh mark-prob
```

```
no random-detect dscp sub-class-val1 sub-class-val2 sub-class-val3 sub-class-val4 min-thresh
max-thresh mark-prob
```

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```
random-detect dscp values sub-class-val1 [...[sub-class-val8]] minimum-thresh
min-thresh-value maximum-thresh max-thresh-value mark-prob mark-prob-value
```

```
no random-detect dscp values sub-class-val1 [...[sub-class-val8]] minimum-thresh
min-thresh-value maximum-thresh max-thresh-value mark-prob mark-prob-value
```

### Syntax Description

<i>sub-class-val1</i>	DSCP value(s) to which the following WRED profile parameter specifications are to apply. A maximum of eight subclasses (DSCP values) can be specified per command-line interface (CLI) entry. See the “Usage Guidelines” for a list of valid DSCP values.
<i>sub-class-val2</i>	
<i>sub-class-val3</i>	
<i>sub-class-val4</i>	
<i>min-thresh</i>	The minimum number of packets allowed in the queue. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified DSCP value. Valid minimum threshold values are 1 to 16384.
<i>max-thresh</i>	The maximum number of packets allowed in the queue. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified DSCP value. Valid maximum threshold values are 1 to 16384.
<i>mark-prob</i>	The denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the maximum threshold. Valid values are 1 to 65535.

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<b>values</b> <i>sub-class-val1</i> <i>[...[subclass-val8]]</i>	DSCP value(s) to which the following WRED profile parameter specifications are to apply. A maximum of 8 subclasses (DSCP values) can be specified per CLI entry. The DSCP value can be a number from 0 to 63, or it can be one of the following keywords: <b>ef</b> , <b>af11</b> , <b>af12</b> , <b>af13</b> , <b>af21</b> , <b>af22</b> , <b>af23</b> , <b>af31</b> , <b>af32</b> , <b>af33</b> , <b>af41</b> , <b>af42</b> , <b>af43</b> , <b>cs1</b> , <b>cs2</b> , <b>cs3</b> , <b>cs4</b> , <b>cs5</b> , or <b>cs7</b> .
<b>minimum-thresh</b> <i>min-thresh</i>	Specifies the minimum number of packets allowed in the queue. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified DSCP value. Valid minimum threshold values are 1 to 16384.

<b>maximum-thresh</b> <i>max-thresh</i>	Specifies the maximum number of packets allowed in the queue. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified DSCP value. Valid maximum threshold values are 1 to 16384.
<b>mark-probability</b> <i>mark-prob</i>	Specifies the denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the maximum threshold. Valid values are 1 to 65535.

**Command Default**

For all precedence levels, the *mark-prob* default value is 10 packets.

**Command Modes**

QoS policy-map class configuration

**Command History**

Release	Modification
12.2(18)SXE	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2 and implemented on the Cisco 10000 series router.

**Usage Guidelines**

For ATM interfaces, the Aggregate WRED feature requires that the ATM SPA cards are installed in a Cisco 7600 SIP-200 carrier card or a Cisco 7600 SIP-400 carrier card.

To configure WRED on an ATM interface, you must use the **random-detect aggregate** commands; the standard random-detect commands are no longer supported on ATM interfaces.

Use this command with a **random-detect aggregate** command within a policy map configuration.

Repeat this command for each set of DSCP values that share WRED parameters.

After the policy map is defined, the policy map must be attached at the virtual circuit (VC) level.

The set of subclass (DSCP precedence) values defined on a **random-detect dscp (aggregate)** CLI will be aggregated into a single hardware WRED resource. The statistics for these subclasses will also be aggregated.

Use the **show policy-map interface** command to display the statistics for aggregated subclasses.

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For the PRE2, the **random-detect** command specifies the default profile for the queue. For the PRE3, the aggregate **random-detect** command is used instead to configure aggregate parameters for WRED. The PRE3 accepts the PRE2 **random-detect** command as a hidden command.

On the PRE2, accounting for the default profile is per precedence. On the PRE3, accounting and configuration for the default profile is per class map.

On the PRE2, the default threshold is per precedence for a DSCP or precedence value without an explicit threshold configuration. On the PRE3, the default threshold is to have no WRED configured.

On the PRE2, the drop counter for each precedence belonging to the default profile only has a drop count that matches the specific precedence value. Because the PRE2 has a default threshold for the default profile, the CBQOSMIB displays default threshold values. On the PRE3, the drop counter for each precedence belonging to the default profile has the aggregate counter of the default profile and not the individual counter for a specific precedence. The default profile on the PRE3 does not display any default threshold values in the CBQOSMIB if you do not configure any threshold values for the default profile.

### DSCP Values

You must enter one or more differentiated service code point (DSCP) values. The command may include any combination of the following:

- numbers (0 to 63) representing differentiated services code point values
- af numbers (for example, af11) identifying specific AF DSCPs
- cs numbers (for example, cs1) identifying specific CS DSCPs
- **default**—Matches packets with the default DSCP.
- **ef**—Matches packets with EF DSCP.

For example, if you wanted the DSCP values of 0, 1, 2, 3, 4, 5, 6, or 7 (note that only one of the IP DSCP values must be a successful match criterion, not all of the specified DSCP values), enter the **match dscp 0 1 2 3 4 5 6 7** command.

### Examples

The following example shows how to create a class map named map1 and associate it with the policy map named map2. The configuration enables WRED to drop map1 packets based on DSCP 8 with a minimum threshold of 24 and a maximum threshold of 40. The map2 policy map is attached to the outbound ATM interface 1/0/0.

```
Router(config-if)# class-map map1
Router(config-cmap)# match access-group 10
Router(config-cmap)# exit
Router(config)# policy-map map2
Router(config-pmap)# class map1
Router(config-pmap-c)# bandwidth 48
Router(config-pmap-c)# random-detect dscp-based
Router(config-pmap-c)# random-detect dscp 8 24 40
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config-if)# service-policy output map2
```

The following example shows a DSCP-based aggregate WRED configuration for an ATM interface. Note that first a policy map named dscp-aggr-wred is defined for the default class, then dscp-based aggregate WRED is enabled with the **random-detect dscp-based aggregate** command, then subclasses and WRED parameter values are assigned in a series of **random-detect dscp (aggregate)** commands, and, finally, the policy map is attached at the ATM VC level using the **interface** and **service-policy** commands.

```
Router(config)# policy-map dscp-aggr-wred
Router(config-pmap)# class class-default
Router(config-pmap-c)# random-detect dscp-based aggregate minimum-thresh 1 maximum-thresh
10 mark-prob 10
!
! Define an aggregate subclass for packets with DSCP values of 0-7 and assign the WRED
! profile parameter values for this subclass
```

## random-detect dscp (aggregate)

```

Router(config-pmap-c)# random-detect dscp 0 1 2 3 4 5 6 7 minimum-thresh 10 maximum-thresh
20 mark-prob 10
Router(config-pmap-c) random-detect dscp 8 9 10 11 minimum-thresh 10 maximum-thresh 40
mark-prob 10
Router(config)# interface ATM4/1/0.11 point-to-point
Router(config-subif)# ip address 10.0.0.2 255.255.255.0
Router(config-subif) pvc 11/101
Router(config-subif)# service-policy output dscp-aggr-wred

```

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The following example shows how to create a class map named Gold and associate it with the policy map named Business. The configuration enables WRED to drop Gold packets based on DSCP 8 with a minimum threshold of 24 and a maximum threshold of 40. The Business policy map is attached to the outbound ATM interface 1/0/0.

```

Router(config-if)# class-map Gold
Router(config-cmap)# match access-group 10
Router(config-cmap)# exit
Router(config)# policy-map Business
Router(config-pmap)# class Gold
Router(config-pmap-c)# bandwidth 48
Router(config-pmap-c)# random-detect dscp-based
Router(config-pmap-c)# random-detect dscp values 8 minimum-thresh 24 maximum-thresh 40
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config-if)# service-policy output Business

```

### Related Commands

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>interface</b>	Configures an interface type and enters interface configuration mode.
<b>policy-map</b>	Creates a policy map that can be attached to one or more interfaces to specify a service policy.
<b>random-detect aggregate</b>	Enables aggregate WRED and optionally specifies default WRED parameter values for a default aggregate class. This default class will be used for all subclasses that have not been explicitly configured.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# random-detect ecn

To enable explicit congestion notification (ECN), use the **random-detect ecn** command in policy-map class configuration mode. To disable ECN, use the **no** form of this command.

**random-detect ecn**

**no random-detect ecn**

**Syntax Description** This command has no arguments or keywords.

**Command Default** By default, ECN is disabled.

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.2(8)T	This command was introduced.

**Usage Guidelines** If ECN is enabled, ECN can be used whether Weighted Random Early Detection (WRED) is based on the IP precedence value or the differentiated services code point (DSCP) value.

**Examples** The following example enables ECN in a policy map called “poll”:

```
Router(config)# policy-map poll
Router(config-pmap)# class class-default
Router(config-pmap)# bandwidth per 70
Router(config-pmap-c)# random-detect
Router(config-pmap-c)# random-detect ecn
```

Related Commands	Command	Description
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# random-detect exponential-weighting-constant

To configure the Weighted Random Early Detection (WRED) and distributed WRED (DWRED) exponential weight factor for the average queue size calculation for the queue, use the **random-detect exponential-weighting-constant** command in interface configuration mode. To configure the exponential weight factor for the average queue size calculation for the queue reserved for a class, use the **random-detect exponential-weighting-constant** command in policy-map class configuration mode. To return the value to the default, use the **no** form of this command.

**random-detect exponential-weighting-constant** *exponent*

**no random-detect exponential-weighting-constant**

Syntax Description	<i>exponent</i>	Exponent from 1 to 16 used in the average queue size calculation.
--------------------	-----------------	---

Command Default	The default exponential weight factor is 9.
-----------------	---

Command Modes	Interface configuration when used on an interface Policy-map class configuration when used to specify class policy in a policy map, or when used in the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC).
---------------	---

Command History	Release	Modification
	11.1CC	This command was introduced.
	12.0(5)T	This command was made available as a QoS policy-map class configuration command.
	12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE and implemented on Versatile Interface Processor (VIP) enabled Cisco 7500 series routers.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T and implemented on VIP-enabled Cisco 7500 series routers.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines	WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. DWRED is similar to WRED but uses the VIP instead of the Route Switch Processor (RSP). WRED and DWRED are most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.
------------------	---

Use this command to change the exponent used in the average queue size calculation for the WRED and DWRED services. You can also use this command to configure the exponential weight factor for the average queue size calculation for the queue reserved for a class.

**Note**

The default WRED or DWRED parameter values are based on the best available data. We recommend that you do not change the parameters from their default values unless you have determined that your applications would benefit from the changed values.

The DWRED feature is not supported for class policy.

The DWRED feature is supported only on Cisco 7000 series routers with an RSP7000 card and Cisco 7500 series routers with a VIP2-40 or greater interface processor. A VIP2-50 interface processor is strongly recommended when the aggregate line rate of the port adapters on the VIP is greater than DS3. A VIP2-50 interface processor is required for OC-3 rates.

To use DWRED, distributed Cisco Express Forwarding (dCEF) switching must first be enabled on the interface. For more information on dCEF, refer to the *Cisco IOS IP Switching Configuration Guide* and the *Cisco IOS IP Switching Command Reference*.

**Examples**

The following example configures WRED on an interface with a weight factor of 10:

```
interface Hssi0/0/0
  description 45Mbps to R1
  ip address 10.200.14.250 255.255.255.252
  random-detect
  random-detect exponential-weighting-constant 10
```

The following example configures the policy map called policy1 to contain policy specification for the class called class1. During times of congestion, WRED packet drop is used instead of tail drop. The weight factor used for the average queue size calculation for the queue for class1 is 12.

```
! The following commands create the class map called class1:
class-map class1
  match input-interface FE0/1

! The following commands define policy1 to contain policy specification for class1:
policy-map policy1
  class class1
  bandwidth 1000
  random-detect
  random-detect exponential-weighting-constant 12
```

The following example configures policy for a traffic class named int10 to configure the exponential weight factor as 12. This is the weight factor used for the average queue size calculation for the queue for traffic class int10. WRED packet drop is used for congestion avoidance for traffic class int10, not tail drop.

```
policy-map policy12
  class int10
  bandwidth 2000
  random-detect exponential-weighting-constant 12
```

Related Commands	Command	Description
	<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
	<b>exponential-weighting-constant</b>	Configures the exponential weight factor for the average queue size calculation for a WRED parameter group.
	<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
	<b>precedence</b>	Configures precedence levels for a VC or PVC class that can be assigned to a VC or PVC bundle and thus applied to all of the members of that bundle.
	<b>precedence (WRED group)</b>	Configures a WRED group for a particular IP Precedence.
	<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
	<b>random-detect (per VC)</b>	Enables per-VC WRED or per-VC DWRED.
	<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
	<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
	<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect flow

To enable flow-based Weighted Random Early Detection (WRED), use the **random-detect flow** command in interface configuration mode. To disable flow-based WRED, use the **no** form of this command.

**random-detect flow**

**no random-detect flow**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Flow-based WRED is disabled by default.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.0(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** You must use this command to enable flow-based WRED before you can use the **random-detect flow average-depth-factor** and **random-detect flow count** commands to further configure the parameters of flow-based WRED.

Before you can enable flow-based WRED, you must enable and configure WRED. For complete information, refer to the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Examples** The following example enables flow-based WRED on serial interface 1:

```
interface Serial1
 random-detect
 random-detect flow
```

Related Commands	Command	Description
	<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
	<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.

<b>Command</b>	<b>Description</b>
<b>random-detect flow average-depth-factor</b>	Sets the multiplier to be used in determining the average depth factor for a flow when flow-based WRED is enabled.
<b>random-detect flow count</b>	Sets the flow count for flow-based WRED.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
<b>show interfaces</b>	Displays the statistical information specific to a serial interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect flow average-depth-factor

To set the multiplier to be used in determining the average depth factor for a flow when flow-based Weighted Random Early Detection (WRED) is enabled, use the **random-detect flow average-depth-factor** command in interface configuration mode. To remove the current flow average depth factor value, use the **no** form of this command.

**random-detect flow average-depth-factor** *scaling-factor*

**no random-detect flow average-depth-factor** *scaling-factor*

<b>Syntax Description</b>	<i>scaling-factor</i>	The scaling factor can be a number from 1 to 16.
---------------------------	-----------------------	--

<b>Command Default</b>	The default average depth factor is 4.
------------------------	--

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	Use this command to specify the scaling factor that flow-based WRED should use in scaling the number of buffers available per flow and in determining the number of packets allowed in the output queue for each active flow. This scaling factor is common to all flows. The outcome of the scaled number of buffers becomes the per-flow limit.
-------------------------	---

If this command is not used and flow-based WRED is enabled, the average depth scaling factor defaults to 4.

A flow is considered nonadaptive—that is, it takes up too much of the resources—when the average flow depth times the specified multiplier (scaling factor) is less than the depth for the flow, for example:

average-flow-depth \* (scaling factor) < flow-depth

Before you use this command, you must use the **random-detect flow** command to enable flow-based WRED for the interface. To configure flow-based WRED, you may also use the **random-detect flow count** command.

**Examples**

The following example enables flow-based WRED on serial interface 1 and sets the scaling factor for the average flow depth to 8:

```
interface Serial1
  random-detect
  random-detect flow
  random-detect flow average-depth-factor 8
```

**Related Commands**

Command	Description
<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect flow</b>	Enables flow-based WRED.
<b>random-detect flow count</b>	Sets the flow count for flow-based WRED.
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
<b>show interfaces</b>	Displays the statistical information specific to a serial interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect flow count

To set the flow count for flow-based Weighted Random Early Detection (WRED), use the **random-detect flow count** command in interface configuration mode. To remove the current flow count value, use the **no** form of this command.

**random-detect flow count** *number*

**no random-detect flow count** *number*

<b>Syntax Description</b>	<i>number</i>	Specifies a value from 16 to 2 <sup>15</sup> (32768).
---------------------------	---------------	---

<b>Command Default</b>	256
------------------------	-----

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

<b>Usage Guidelines</b>	Before you use this command, you must use the <b>random-detect flow</b> command to enable flow-based WRED for the interface.
-------------------------	--

<b>Examples</b>	The following example enables flow-based WRED on serial interface 1 and sets the flow threshold constant to 16:
-----------------	---

```
interface Serial1
 random-detect
 random-detect flow
 random-detect flow count 16
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
	<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
	<b>random-detect flow</b>	Enables flow-based WRED.

<b>Command</b>	<b>Description</b>
<b>random-detect precedence</b>	Configures WRED and DWRED parameters for a particular IP Precedence.
<b>show interfaces</b>	Displays the statistical information specific to a serial interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect precedence

To configure Weighted Random Early Detection (WRED) and distributed WRED (DWRED) parameters for a particular IP Precedence, use the **random-detect precedence** command in interface configuration mode. To configure WRED parameters for a particular IP Precedence for a class policy in a policy map, use the **random-detect precedence** command in policy-map class configuration mode. To return the values to the default for the precedence, use the **no** form of this command.

**random-detect precedence** {*precedence* | **rsvp**} *min-threshold max-threshold max-probability-denominator*

**no random-detect precedence** {*precedence* | **rsvp**} *min-threshold max-threshold max-probability-denominator*

## Syntax Description

<i>precedence</i>	IP Precedence number. The value range is from 0 to 7. For Cisco 7000 series routers with an RSP7000 interface processor and Cisco 7500 series routers with a VIP2-40 interface processor (VIP2-50 interface processor strongly recommended), the precedence value range is from 0 to 7 only; see <a href="#">Table 35</a> in the “Usage Guidelines” section.
<b>rsvp</b>	Indicates Resource Reservation Protocol (RSVP) traffic.
<i>min-threshold</i>	Minimum threshold in number of packets. The value range of this argument is from 1 to 4096. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified IP Precedence.
<i>max-threshold</i>	Maximum threshold in number of packets. The value range of this argument is from the value of the <i>min-threshold</i> argument to 4096. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified IP Precedence.
<i>max-probability-denominator</i>	Denominator for the fraction of packets dropped when the average queue depth is at the minimum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the minimum threshold. The value range is from 1 to 65536. The default is 10; 1 out of every 10 packets is dropped at the minimum threshold.

## Command Default

For all precedences, the *max-probability-denominator* default is 10, and the *max-threshold* is based on the output buffering capacity and the transmission speed for the interface.

The default *min-threshold* depends on the precedence. The *min-threshold* for IP Precedence 0 corresponds to half of the *max-threshold*. The values for the remaining precedences fall between half the *max-threshold* and the *max-threshold* at evenly spaced intervals. See [Table 35](#) in the “Usage Guidelines” section of this command for a list of the default minimum threshold values for each IP Precedence.

## Command Modes

Interface configuration when used on an interface  
Policy-map class configuration when used to specify class policy in a policy map

**Command History**

Release	Modification
11.1CC	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. DWRED is similar to WRED but uses the Versatile Interface Processor (VIP) instead of the Route Switch Processor (RSP).

When you configure the **random-detect** command on an interface, packets are given preferential treatment based on the IP Precedence of the packet. Use the **random-detect precedence** command to adjust the treatment for different precedences.

If you want WRED or DWRED to ignore the precedence when determining which packets to drop, enter this command with the same parameters for each precedence. Remember to use reasonable values for the minimum and maximum thresholds.

Note that if you use the **random-detect precedence** command to adjust the treatment for different precedences within class policy, you must ensure that WRED is not configured for the interface to which you attach that service policy.

[Table 35](#) lists the default minimum threshold value for each IP Precedence.

**Table 35** Default WRED and DWRED Minimum Threshold Values

IP Precedence	Minimum Threshold Value (Fraction of Maximum Threshold Value)	
	WRED	DWRED
0	9/18	8/16
1	10/18	9/16
2	11/18	10/16
3	12/18	11/16
4	13/18	12/16
5	14/18	13/16
6	15/18	14/16
7	16/18	15/16
RSVP	17/18	—

**Note**

The default WRED or DWRED parameter values are based on the best available data. We recommend that you do not change the parameters from their default values unless you have determined that your applications would benefit from the changed values.

The DWRED feature is supported only on Cisco 7000 series routers with an RSP7000 card and Cisco 7500 series routers with a VIP2-40 or greater interface processor. A VIP2-50 interface processor is strongly recommended when the aggregate line rate of the port adapters on the VIP is greater than DS3. A VIP2-50 interface processor is required for OC-3 rates.

To use DWRED, distributed Cisco Express Forwarding (dCEF) switching must first be enabled on the interface. For more information on dCEF, refer to the *Cisco IOS IP Switching Configuration Guide* and the *Cisco IOS IP Switching Command Reference*.

**Note**

The DWRED feature is not supported in a class policy.

**Examples**

The following example enables WRED on the interface and specifies parameters for the different IP Precedences:

```
interface Hssi0/0/0
description 45Mbps to R1
ip address 10.200.14.250 255.255.255.252
random-detect
random-detect precedence 0 32 256 100
random-detect precedence 1 64 256 100
random-detect precedence 2 96 256 100
random-detect precedence 3 120 256 100
random-detect precedence 4 140 256 100
random-detect precedence 5 170 256 100
random-detect precedence 6 290 256 100
random-detect precedence 7 210 256 100
random-detect precedence rsvp 230 256 100
```

The following example configures policy for a class called acl10 included in a policy map called policy10. Class acl101 has these characteristics: a minimum of 2000 kbps of bandwidth are expected to be delivered to this class in the event of congestion and a weight factor of 10 is used to calculate the average queue size. For congestion avoidance, WRED packet drop is used, not tail drop. IP Precedence is reset for levels 0 through 4.

```
policy-map policy10
class acl10
bandwidth 2000
random-detect
random-detect exponential-weighting-constant 10
random-detect precedence 0 32 256 100
random-detect precedence 1 64 256 100
random-detect precedence 2 96 256 100
random-detect precedence 3 120 256 100
random-detect precedence 4 140 256 100
```

**Related Commands**

Command	Description
<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
<b>random-detect (per VC)</b>	Enables per-VC WRED or per-VC DWRED.

<b>Command</b>	<b>Description</b>
<b>random-detect exponential-weighting-constant</b>	Configures the WRED and DWRED exponential weight factor for the average queue size calculation.
<b>random-detect flow count</b>	Sets the flow count for flow-based WRED.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# random-detect precedence (aggregate)

To configure aggregate Weighted Random Early Detection (WRED) parameters for specific IP precedence value(s), use the **random-detect precedence** (aggregate) command in policy-map class configuration mode. To disable configuration of aggregate WRED precedence values, use the **no** form of this command.

```
random-detect precedence sub-class-val1 [sub-class-val2 sub-class-val3 sub-class-val4]  
min-thresh max-thresh mark-prob
```

```
no random-detect precedence sub-class-val1 [sub-class-val2 sub-class-val3 sub-class-val4]
```

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```
random-detect precedence sub-class-val1 [...[sub-class-val8]] minimum-thresh min-thresh  
maximum-thresh max-thresh mark-probability mark-prob
```

```
no random-detect precedence sub-class-val1 [...[sub-class-val8]]
```

### Syntax Description

<i>sub-class-val1</i> <i>sub-class-val2</i> <i>sub-class-val3</i> <i>sub-class-val4</i>	IP precedence value to which the following WRED profile parameter specifications are to apply. Up to four subclasses (IP precedence values) can be specified per command line interface (CLI) entry. The value range is from 0 to 7.
<i>min-thresh</i>	Minimum threshold (in number of packets) for the subclass(es). Valid values are from 1 to 12288.
<i>max-thresh</i>	Specifies the maximum threshold (in number of packets) for the subclass(es). Valid values are from the minimum threshold argument to 12288.
<i>mark-prob</i>	Specifies the denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold for the subclass(es). Valid values are from 1 to 255.

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<i>sub-class-val1</i> [... <i>[subclass-val8]</i> ]	IP precedence value(s) to which the following WRED profile parameter specifications are to apply. A maximum of 8 subclasses (IP precedence values) can be specified per CLI entry. The value range is from 0 to 7.
<b>minimum-thresh</b> <i>min-thresh</i>	Specifies the minimum number of packets allowed in the queue. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified IP precedence value. Valid minimum threshold values are 1 to 16384.
<b>maximum-thresh</b> <i>max-thresh</i>	Specifies the maximum number of packets allowed in the queue. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified IP precedence value. Valid maximum threshold values are 1 to 16384.
<b>mark-probability</b> <i>mark-prob</i>	Specifies the denominator for the fraction of packets dropped when the average queue depth is at the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue is at the maximum threshold. Valid values are 1 to 65535.

**Command Default****Cisco 10000 Series Router**

For all precedence levels, the *mark-prob* default is 10 packets.

**Command Modes**

Policy-map class configuration

**Command History**

Release	Modification
12.0(17)SL	This command was introduced on the Cisco 10000 series router.
12.2(18)SXE	This command was introduced.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router for the PRE3.

**Usage Guidelines**

For ATM interfaces, the Aggregate WRED feature requires that the ATM SPA cards are installed in a Cisco 7600 SIP-200 carrier card or a Cisco 7600 SIP-400 carrier card.

To configure WRED on an ATM interface, you must use the random-detect aggregate commands; the standard random-detect commands are no longer supported on ATM interfaces

Use this command with a **random-detect aggregate** command within a policy map configuration.

Repeat this command for each set of IP precedence values that share WRED parameters.

After the policy map is defined, the policy map must be attached at the VC level.

The set of subclass (IP precedence) values defined on a **random-detect precedence** (aggregate) CLI will be aggregated into a single hardware WRED resource. The statistics for these subclasses will also be aggregated.

Use the **show policy-map interface** command to display the statistics for aggregated subclasses.

**Cisco 10000 Series Router**

Table 36 lists the default drop thresholds for WRED based on DSCP, IP precedence, and discard-class. The drop probability indicates that the router drops one packet for every 10 packets.

**Table 36** WRED Default Drop Thresholds

DSCP, Precedence, and Discard-Class Values	Minimum Threshold (times the queue size)	Maximum Threshold (times the queue size)	Drop Probability
All DSCPs	1/4	1/2	1/10
0	1/4	1/2	1/10
1	9/32	1/2	1/10
2	5/16	1/2	1/10
3	11/32	1/2	1/10
4	3/8	1/2	1/10
5	13/32	1/2	1/10
6	7/16	1/2	1/10
7	15/32	1/2	1/10

For the PRE2, the **random-detect** command specifies the default profile for the queue. For the PRE3, the aggregate **random-detect** command is used instead to configure aggregate parameters for WRED. The PRE3 accepts the PRE2 **random-detect** command as a hidden CLI.

On the PRE2, accounting for the default profile is per precedence. On the PRE3, accounting and configuration for the default profile is per class map.

On the PRE2, the default threshold is per precedence for a DSCP or precedence value without an explicit threshold configuration. On the PRE3, the default threshold is to have no WRED configured.

On the PRE2, the drop counter for each precedence belonging to the default profile only has a drop count that matches the specific precedence value. Because the PRE2 has a default threshold for the default profile, the CBQOSMIB displays default threshold values. On the PRE3, the drop counter for each precedence belonging to the default profile has the aggregate counter of the default profile and not the individual counter for a specific precedence. The default profile on the PRE3 does not display any default threshold values in the CBQOSMIB if you do not configure any threshold values for the default profile.

## Examples

### Cisco 10000 Series Router

The following example shows how to enable IP precedence-based WRED on the Cisco 10000 series router. In this example, the configuration of the class map named Class1 indicates to classify traffic based on IP precedence 3, 4, and 5. Traffic that matches IP precedence 3, 4, or 5 is assigned to the class named Class1 in the policy map named Policy1. WRED-based packet dropping is configured for Class1 and is based on IP precedence 3 with a minimum threshold of 500, maximum threshold of 1500, and a mark-probability-denominator of 200. The QoS policy is applied to PVC 1/32 on the point-to-point ATM subinterface 1/0/0.1.

```
Router(config)# class-map Class1
Router(config-cmap)# match ip precedence 3 4 5
Router(config-cmap)# exit
Router(config)# policy-map Policy1
Router(config-pmap)# class Class1
Router(config-pmap-c)# bandwidth 1000
Router(config-pmap-c)# random-detect prec-based
Router(config-pmap-c)# random-detect precedence 3 500 1500 200
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config-if)# atm pxf queuing
Router(config-if)# interface atm 1/0/0.1 point-to-point
Router(config-subif)# pvc 1/32
Router(config-subif-atm-vc)#ubr 10000
Router(config-subif-atm-vc)# service-policy output policy1
```

## Related Commands

Command	Description
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>interface</b>	Configures an interface type and enters interface configuration mode.
<b>policy-map</b>	Creates a policy map that can be attached to one or more interfaces to specify a service policy.

Command	Description
<b>random-detect aggregate</b>	Enables aggregate WRED and optionally specifies default WRED parameter values for a default aggregate class. This default class will be used for all subclasses that have not been explicitly configured.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# random-detect-group

To define the Weighted Random Early Detection (WRED) or distributed WRED (DWRED) parameter group, use the **random-detect group** command in global configuration mode. To delete the WRED or DWRED parameter group, use the **no** form of this command.

**random-detect-group** *group-name* [**dscp-based** | **prec-based**]

**no random-detect-group** *group-name* [**dscp-based** | **prec-based**]

## Syntax Description

<i>group-name</i>	Name for the WRED or DWRED parameter group.
<b>dscp-based</b>	(Optional) Specifies that WRED is to use the differentiated services code point (DSCP) value when it calculates the drop probability for a packet.
<b>prec-based</b>	(Optional) Specifies that WRED is to use the IP Precedence value when it calculates the drop probability for a packet.

## Command Default

No WRED or DWRED parameter group exists.

If you choose not to use either the **dscp-based** or the **prec-based** keywords, WRED uses the IP Precedence value (the default method) to calculate drop probability for the packet.

## Command Modes

Global configuration

## Command History

Release	Modification
11.1(22)CC	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T. Keywords <b>dscp-based</b> and <b>prec-based</b> were added to support Differentiated Services (DiffServ) and Assured Forwarding (AF) Per Hop Behavior (PHB).
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when there is congestion. DWRED is similar to WRED but uses the Versatile Interface Processor (VIP) instead of the Route Switch Processor (RSP). WRED and DWRED are most useful when the traffic uses protocols such as TCP that respond to dropped packets by decreasing the transmission rate.

The router automatically determines parameters to use in the WRED calculations. If you want to change these parameters for a group, use the **exponential-weighting-constant** or **precedence** command.

### Two Methods for Calculating the Drop Probability of a Packet

This command includes two optional arguments, **dscp-based** and **prec-based**, that determine the method WRED uses to calculate the drop probability of a packet.

Note the following points when deciding which method to instruct WRED to use:

- With the **dscp-based** keyword, WRED uses the DSCP value (that is, the first six bits of the IP type of service (ToS) byte) to calculate the drop probability.
- With the **prec-based** keyword, WRED will use the IP Precedence value to calculate the drop probability.
- The **dscp-based** and **prec-based** keywords are mutually exclusive.
- If neither argument is specified, WRED uses the IP Precedence value to calculate the drop probability (the default method).

## Examples

The following example defines the WRED parameter group called sanjose:

```
random-detect-group sanjose
precedence 0 32 256 100
precedence 1 64 256 100
precedence 2 96 256 100
precedence 3 128 256 100
precedence 4 160 256 100
precedence 5 192 256 100
precedence 6 224 256 100
precedence 7 256 256 100
```

The following example enables WRED to use the DSCP value 9. The minimum threshold for the DSCP value 9 is 20 and the maximum threshold is 50. This configuration can be attached to other virtual circuits (VCs) as required.

```
Router(config)# random-detect-group sanjose dscp-based
Router(cfg-red-grp)# dscp 9 20 50
Router(config-subif-vc)# random-detect attach sanjose
```

## Related Commands

Command	Description
<b>dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
<b>exponential-weighting-constant</b>	Configures the exponential weight factor for the average queue size calculation for a WRED parameter group.
<b>precedence (WRED group)</b>	Configures a WRED group for a particular IP Precedence.
<b>random-detect-group</b>	Defines the WRED or DWRED parameter group.
<b>show queueing</b>	Lists all or selected configured queueing strategies.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

# rate-limit

To configure committed access rate (CAR) and distributed committed access rate (DCAR) policies, use the **rate-limit** command in interface configuration mode. To remove the rate limit from the configuration, use the **no** form of this command.

```
rate-limit {input | output} {bps | access-group acl-index | [rate-limit] rate-limit-acl-index} |
dscp dscp-value | qos-group qos-group-number} burst-normal burst-max conform-action
conform-action exceed-action exceed-action
```

```
no rate-limit {input | output} {bps | access-group acl-index | [rate-limit] rate-limit-acl-index} |
dscp dscp-value | qos-group qos-group-number} burst-normal burst-max conform-action
conform-action exceed-action exceed-action
```

## Syntax Description

<b>input</b>	Applies this CAR traffic policy to packets received on this input interface.
<b>output</b>	Applies this CAR traffic policy to packets sent on this output interface.
<i>bps</i>	Average rate, in bits per second (bps). The value must be in increments of 8 kbps. The value is a number from 8000 to 2000000000.
<b>access-group</b>	(Optional) Applies this CAR traffic policy to the specified access list.
<i>acl-index</i>	(Optional) Access list number. Values are numbers from 1 to 2699.
<b>rate-limit</b>	(Optional) The access list is a rate-limit access list.
<i>rate-limit-acl-index</i>	(Optional) Rate-limit access list number. Values are numbers from 0 to 99.
<b>dscp</b>	(Optional) Allows the rate limit to be applied to any packet matching a specified differentiated services code point (DSCP).
<i>dscp-value</i>	(Optional) The DSCP number. Values are numbers from 0 to 63.
<b>qos-group</b>	(Optional) Allows the rate limit to be applied to any packet matching a specified qos-group number. Values are numbers from 0 to 99.
<i>qos-group-number</i>	(Optional) The qos-group number. Values are numbers from 0 to 99.
<i>burst-normal</i>	Normal burst size, in bytes. The minimum value is bps divided by 2000. The value is a number from 1000 to 512000,000.
<i>burst-max</i>	Excess burst size, in bytes. The value is a number from 2000 to 1024000000.

<b>conform-action</b> <i>conform-action</i>	<p>Action to take on packets that conform to the specified rate limit. Specify one of the following keywords:</p> <ul style="list-style-type: none"> <li>• <b>continue</b>—Evaluate the next <b>rate-limit</b> command.</li> <li>• <b>drop</b>—Drop the packet.</li> <li>• <b>set-dscp-continue</b>—Set the differentiated services codepoint (DSCP) (0 to 63) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-dscp-transmit</b>—Transmit the DSCP and transmit the packet.</li> <li>• <b>set-mpls-exp-imposition-continue</b>—Set the Multiprotocol Label Switching (MPLS) experimental bits (0 to 7) during imposition and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-mpls-exp-imposition-transmit</b>—Set the MPLS experimental bits (0 to 7) during imposition and transmit the packet.</li> <li>• <b>set-prec-continue</b>—Set the IP precedence (0 to 7) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-prec-transmit</b>—Set the IP precedence (0 to 7) and transmit the packet.</li> <li>• <b>set-qos-continue</b>—Set the quality of service (QoS) group ID (1 to 99) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-qos-transmit</b>—Set the QoS group ID (1 to 99) and transmit the packet.</li> <li>• <b>transmit</b>—Transmit the packet.</li> </ul>
<b>exceed-action</b> <i>exceed-action</i>	<p>Action to take on packets that exceed the specified rate limit. Specify one of the following keywords:</p> <ul style="list-style-type: none"> <li>• <b>continue</b>—Evaluate the next <b>rate-limit</b> command.</li> <li>• <b>drop</b>—Drop the packet.</li> <li>• <b>set-dscp-continue</b>—Set the DSCP (0 to 63) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-dscp-transmit</b>—Transmit the DSCP and transmit the packet.</li> <li>• <b>set-mpls-exp-imposition-continue</b>—Set the MPLS experimental bits (0 to 7) during imposition and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-mpls-exp-imposition-transmit</b>—Set the MPLS experimental bits (0 to 7) during imposition and transmit the packet.</li> <li>• <b>set-prec-continue</b>—Set the IP precedence (0 to 7) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-prec-transmit</b>—Set the IP precedence (0 to 7) and transmit the packet.</li> <li>• <b>set-qos-continue</b>—Set the QoS group ID (1 to 99) and evaluate the next <b>rate-limit</b> command.</li> <li>• <b>set-qos-transmit</b>—Set the QoS group ID (1 to 99) and transmit the packet.</li> <li>• <b>transmit</b>—Transmit the packet.</li> </ul>

**Command Default** CAR and DCAR are disabled.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.1 CC	This command was introduced.
	12.1(5)T	The <b>conform</b> and <b>exceed</b> keywords for the MPLS experimental field were added.
	12.2(4)T	This command was implemented on the Cisco MGX 8850 switch and the MGX 8950 switch with a Cisco MGX RPM-PR card.
	12.2(4)T2	This command was implemented on the Cisco 7500 series.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** Use this command to configure your CAR policy on an interface. To specify multiple policies, enter this command once for each policy.

CAR and DCAR can be configured on an interface or subinterface.

#### Policing Traffic with CAR

CAR embodies a rate-limiting feature for policing traffic. When policing traffic with CAR, Cisco recommends the following values for the normal and extended burst parameters:

normal burst (in bytes) = configured rate (in bits per second) \* (1 byte)/(8 bits) \* 1.5 seconds

17.000.000 \* (1 byte)/(8 bits) \* 1.5 seconds = 3.187.500 bytes

extended burst = 2 \* normal burst

2 \* 3.187.500 = 6.375.000 bytes

With the listed choices for parameters, extensive test results have shown CAR to achieve the configured rate. If the burst values are too low, then the achieved rate is often much lower than the configured rate.

For more information about using CAR to police traffic, see the “Policing with CAR” section of the “Policing and Shaping Overview” in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Examples** In the following example, the recommended burst parameters for CAR are used:

```
Router(config)# interface serial16/1/0
Router(config-if)# rate-limit input access-group 1 17000000 3187500 6375000 conform-action
transmit exceed-action drop
```

In the following example, the rate is limited by the application in question:

- All World Wide Web traffic is transmitted. However, the MPLS experimental field for web traffic that conforms to the first rate policy is set to 5. For nonconforming traffic, the IP precedence is set to 0 (best effort). See the following commands in the example:

```
rate-limit input rate-limit access-group 101 20000000 24000 32000 conform-action
set-mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 0
access-list 101 permit tcp any any eq www
```

- FTP traffic is transmitted with an MPLS experimental field value of 5 if it conforms to the second rate policy. If the FTP traffic exceeds the rate policy, it is dropped. See the following commands in the example:

```
rate-limit input access-group 102 10000000 24000 32000
conform-action set-mpls-exp-transmit 5 exceed-action drop
access-list 102 permit tcp any any eq ftp
```

- Any remaining traffic is limited to 8 Mbps, with a normal burst size of 1,500,000 bytes and an excess burst size of 3,000,000 bytes. Traffic that conforms is sent with an MPLS experimental field of 5. Traffic that does not conform is dropped. See the following command in the example:

```
rate-limit input 8000000 1500000 3000000 conform-action set-mpls-exp-transmit 5
exceed-action drop
```

Notice that two access lists are created to classify the web and FTP traffic so that they can be handled separately by the CAR feature.

```
Router(config)# interface Hssi0/0/0
Router(config-if)# description 45Mbps to R2
Router(config-if)# rate-limit input rate-limit access-group 101 20000000 3750000 7500000
conform-action set-mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 0
Router(config-if)# rate-limit input access-group 102 10000000 1875000 3750000
conform-action set-mpls-exp-transmit 5 exceed-action drop
Router(config-if)# rate-limit input 8000000 1500000 3000000 conform-action
set-mpls-exp-transmit 5 exceed-action drop
Router(config-if)# ip address 10.1.1.1 255.255.255.252
!
Router(config-if)# access-list 101 permit tcp any any eq www
Router(config-if)# access-list 102 permit tcp any any eq ftp
```

In the following example, the MPLS experimental field is set, and the packet is transmitted:

```
Router(config)# interface FastEthernet1/1/0
Router(config-if)# rate-limit input 8000 1500 3000 access-group conform-action
set mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 5
```

In the following example, any packet with a DSCP of 1 can apply the rate limit:

```
Router(config)# interface serial6/1/0
Router(config-if)# rate-limit output dscp 1 8000 1500 3000 conform-action transmit
exceed-action drop
```

## Related Commands

Command	Description
<b>access-list rate-limit</b>	Configures an access list for use with CAR policies.
<b>show access-lists rate-limit</b>	Displays information about rate-limit access lists.
<b>show interfaces rate-limit</b>	Displays information about CAR for a specified interface.

# rcv-queue bandwidth

To define the bandwidths for ingress (receive) WRR queues through scheduling weights in interface configuration command mode, use the **rcv-queue bandwidth** command. To return to the default settings, use the **no** form of this command.

```
rcv-queue bandwidth weight-1 ... weight-n
```

```
no rcv-queue bandwidth
```

## Syntax Description

*weight-1 ... weight-n* WRR weights; valid values are from 0 to 255.

## Command Default

The defaults are as follows:

- QoS enabled—4:255
- QoS disabled—255:1

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(17a)SX	This command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

This command is supported on 2q8t and 8q8t ports only.

You can configure up to seven queue weights.

## Examples

This example shows how to allocate a three-to-one bandwidth ratio:

```
Router(config-if)# rcv-queue bandwidth 3 1
Router(config-if)#
```

## Related Commands

Command	Description
<b>rcv-queue queue-limit</b>	Sets the size ratio between the strict-priority and standard receive queues.
<b>show queueing interface</b>	Displays queueing information.

## rcv-queue cos-map

To map the class of service (CoS) values to the standard receive-queue drop thresholds, use the **rcv-queue cos-map** command in interface configuration mode. To remove the mapping, use the **no** form of this command.

```
rcv-queue cos-map queue-id threshold-id cos-1 ... cos-n
```

```
no rcv-queue cos-map queue-id threshold-id
```

### Syntax Description

<i>queue-id</i>	Queue ID; the valid value is 1.
<i>threshold-id</i>	Threshold ID; valid values are from 1 to 4.
<i>cos-1 ... cos-n</i>	CoS values; valid values are from 0 to 7.

### Command Default

The defaults are listed in [Table 37](#).

**Table 37 CoS-to-Standard Receive Queue Map Defaults**

queue	threshold	cos-map	queue	threshold	cos-map
<b>With QoS Disabled</b>			<b>With QoS Enabled</b>		
1	1	0,1, 2,3,4,5,6,7	1	1	0,1
1	2		1	2	2,3
1	3		1	3	4
1	4		1	4	6,7
2	1	5	2	1	5

### Command Modes

Interface configuration

### Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

The *cos-n* value is defined by the module and port type. When you enter the *cos-n* value, note that the higher values indicate higher priorities.

Use this command on trusted ports only.

---

**Examples**

This example shows how to map the CoS values 0 and 1 to threshold 1 in the standard receive queue:

```
Router (config-if)# rcv-queue cos-map 1 1 0 1  
cos-map configured on: Gi1/1 Gi1/2
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show queueing interface</b>	Displays queueing information.

---

# rcv-queue queue-limit

To set the size ratio between the strict-priority and standard receive queues, use the **rcv-queue queue-limit** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
rcv-queue queue-limit q-limit-1 q-limit-2
```

```
no rcv-queue queue-limit
```

## Syntax Description

<i>q-limit-1</i>	Standard queue weight; valid values are from 1 and 100 percent.
<i>q-limit-2</i>	Strict-priority queue weight; see the “Usage Guidelines” section for valid values.

## Command Default

The defaults are as follows:

- 80 percent is for low priority.
- 20 percent is for strict priority.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Valid strict-priority weight values are from 1 to 100 percent, except on 1p1q8t ingress LAN ports, where valid values for the strict-priority queue are from 3 to 100 percent.

The **rcv-queue queue-limit** command configures ports on a per-ASIC basis.

Estimate the mix of strict-priority-to-standard traffic on your network (for example, 80-percent standard traffic and 20-percent strict-priority traffic) and use the estimated percentages as queue weights.

## Examples

This example shows how to set the receive-queue size ratio for Gigabit Ethernet interface 1/2:

```
Router# configure terminal
Router(config)# interface gigabitethernet 1/2
Router(config-if)# rcv-queue queue-limit 75 15
Router(config-if)# end
```

Related Commands	Command	Description
	show queueing interface	Displays queueing information.

# rcv-queue random-detect

To specify the minimum and maximum threshold for the specified receive queues, use the **rcv-queue random-detect** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
rcv-queue random-detect {max-threshold | min-threshold} queue-id threshold-percent-1 ...
threshold-percent-n
```

```
no rcv-queue random-detect {max-threshold | min-threshold} queue-id
```

## Syntax Description

<b>max-threshold</b>	Specifies the maximum threshold.
<b>min-threshold</b>	Specifies the minimum threshold.
<i>queue-id</i>	Queue ID; the valid value is 1.
<i>threshold-percent-1</i> <i>threshold-percent-n</i>	Threshold weights; valid values are from 1 to 100 percent.

## Command Default

The defaults are as follows:

- **min-threshold**—80 percent
- **max-threshold**—20 percent

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

This command is supported on 1p1q8t and 8q8t ports only.

The 1p1q8t interface indicates one strict queue and one standard queue with eight thresholds. The 8q8t interface indicates eight standard queues with eight thresholds. The threshold in the strict-priority queue is not configurable.

Each threshold has a low- and a high-threshold value. The threshold values are a percentage of the receive-queue capacity.

For additional information on configuring receive-queue thresholds, refer to the QoS chapter in the *Cisco 7600 Series Router Cisco IOS Software Configuration Guide*.

---

**Examples**

This example shows how to configure the low-priority receive-queue thresholds:

```
Router (config-if)# rcv-queue random-detect max-threshold 1 60 100
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show queueing interface</b>	Displays queueing information.

---

# rcv-queue threshold

To configure the drop-threshold percentages for the standard receive queues on 1p1q4t and 1p1q0t interfaces, use the **rcv-queue threshold** command in interface configuration mode. To return the thresholds to the default settings, use the **no** form of this command.

**rcv-queue threshold** *queue-id threshold-percent-1 ... threshold-percent-n*

**no rcv-queue threshold**

## Syntax Description

<i>queue-id</i>	Queue ID; the valid value is 1.
<i>threshold-percent-1 ...</i>	Threshold ID; valid values are from 1 to 100 percent.
<i>threshold-percent-n</i>	

## Command Default

The defaults for the 1p1q4t and 1p1q0t configurations are as follows:

- Quality of service (QoS) assigns all traffic with class of service (CoS) 5 to the strict-priority queue.
- QoS assigns all other traffic to the standard queue.

The default for the 1q4t configuration is that QoS assigns all traffic to the standard queue.

If you enable QoS, the following default thresholds apply:

- 1p1q4t interfaces have this default drop-threshold configuration:
  - Frames with CoS 0, 1, 2, 3, 4, 6, or 7 go to the standard receive queue.
  - Using standard receive-queue drop threshold 1, the Cisco 7600 series router drops incoming frames with CoS 0 or 1 when the receive-queue buffer is 50 percent or more full.
  - Using standard receive-queue drop threshold 2, the Cisco 7600 series router drops incoming frames with CoS 2 or 3 when the receive-queue buffer is 60 percent or more full.
  - Using standard receive-queue drop threshold 3, the Cisco 7600 series router drops incoming frames with CoS 4 when the receive-queue buffer is 80 percent or more full.
  - Using standard receive-queue drop threshold 4, the Cisco 7600 series router drops incoming frames with CoS 6 or 7 when the receive-queue buffer is 100 percent full.
  - Frames with CoS 5 go to the strict-priority receive queue (queue 2), where the Cisco 7600 series router drops incoming frames only when the strict-priority receive-queue buffer is 100 percent full.
- 1p1q0t interfaces have this default drop-threshold configuration:
  - Frames with CoS 0, 1, 2, 3, 4, 6, or 7 go to the standard receive queue. The Cisco 7600 series router drops incoming frames when the receive-queue buffer is 100 percent full.
  - Frames with CoS 5 go to the strict-priority receive queue (queue 2), where the Cisco 7600 series router drops incoming frames only when the strict-priority receive-queue buffer is 100 percent full.



### Note

The 100-percent threshold may be actually changed by the module to 98 percent to allow Bridge Protocol Data Unite (BPDU) traffic to proceed. The BPDU threshold is factory set at 100 percent.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines**

The *queue-id* value is always 1.

A value of 10 indicates a threshold when the buffer is 10 percent full.

Always set threshold 4 to 100 percent.

Receive thresholds take effect only on ports whose trust state is trust cos.

Configure the 1q4t receive-queue tail-drop threshold percentages with the **wrr-queue threshold** command.

**Examples** This example shows how to configure the receive-queue drop thresholds for Gigabit Ethernet interface 1/1:

```
Router(config-if)# rcv-queue threshold 1 60 75 85 100
```

Related Commands	Command	Description
	<b>show queueing interface</b>	Displays queueing information.
	<b>wrr-queue threshold</b>	Configures the drop-threshold percentages for the standard receive and transmit queues on 1q4t and 2q2t interfaces.

# recoverable-loss

To enable Enhanced Compressed Real-Time Transport Protocol (ECRTP), use the **recoverable-loss** command in IPHC-profile configuration mode. To disable ECRTP, use the **no** form of this command.

**recoverable-loss** { **dynamic** | *packet-drops* }

**no recoverable-loss** { **dynamic** | *packet-drops* }

## Syntax Description

<b>dynamic</b>	Indicates that the dynamic recoverable loss calculation is used.
<i>packet-drops</i>	Maximum number of consecutive packet drops. Range is from 1 to 8.

## Command Default

ECRTP is disabled.

## Command Modes

IPHC-profile configuration

## Command History

Release	Modification
12.4(9)T	This command was introduced.
12.4(11)T	Support was added for Frame Relay encapsulation.

## Usage Guidelines

The **recoverable-loss** command is part of the ECRTP feature.

### ECRTP Functionality

ECRTP reduces corruption by managing the way the compressor updates the context information at the decompressor. The compressor sends updated context information periodically to keep the compressor and decompressor synchronized. By repeating the updates, the probability of context corruption because of packet loss is minimized.

The synchronization of context information between the compressor and the decompressor can be performed dynamically (by specifying the **dynamic** keyword) or whenever a specific number of packets are dropped (by using the *packet-drops* argument).

The number of packet drops represents the quality of the link between the hosts. The lower the number of packet drops, the higher the quality of the link between the hosts.

The packet drops value is maintained independently for each context and does not have to be the same for all contexts.



**Note** If you specify the number of packet drops with the *packet-drops* argument, the **recoverable-loss** command automatically enables ECRTP.

**Intended for Use with IPHC Profiles**

The **recoverable-loss** command is intended for use as part of an IP Header Compression (IPHC) profile. An IPHC profile is used to enable and configure header compression on a network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples**

The following example shows how to configure an IPHC profile called profile2. In this example, ECRTTP is enabled with a maximum number of five consecutive packet drops.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# recoverable-loss 5
Router(config-iphcp)# end
```

**Related Commands**

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.

# refresh max-period

To set the number of packets sent between full-header refresh occurrences, use the **refresh max-period** command in IPHC-profile configuration mode. To use the default number of packets, use the **no** form of this command.

**refresh max-period** {*number-of-packets* | **infinite**}

**no refresh max-period**

## Syntax Description

<i>number-of-packets</i>	Number of packets sent between full-header refresh occurrences. Range is from 0 to 65535. Default is 256.
<b>infinite</b>	Indicates no limitation on the number of packets sent between full-header refresh occurrences.

## Command Default

The number of packets sent between full-header refresh occurrences is 256.

## Command Modes

IPHC-profile configuration

## Command History

Release	Modification
12.4(9)T	This command was introduced.

## Usage Guidelines

Use the **refresh max-period** command to set the number of non-TCP packets sent between full-header refresh occurrences. The **refresh max-period** command also allows you to specify no limitation on the number of packets sent between full-header refresh occurrences. To specify no limitation on the number of packets sent, use the **infinite** keyword.

### Prerequisite

Before you use the **refresh max-period** command, you must enable non-TCP header compression by using the **non-tcp** command.

### Intended for Use with IPHC Profiles

The **refresh max-period** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples**

The following is an example of an IPHC profile called profile2. In this example, the number of packets sent before a full-header refresh occurrence is 700 packets.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp
Router(config-iphcp)# refresh max-period 700
Router(config-iphcp)# end
```

**Related Commands**

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.
<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.

# refresh max-time

To set the amount of time to wait before a full-header refresh occurrence, use the **refresh max-time** command in IPHC-profile configuration mode. To use the default time, use the **no** form of this command.

**refresh max-time** {*seconds* | **infinite**}

**no refresh max-time**

## Syntax Description

<i>seconds</i>	Length of time, in seconds, to wait before a full-header refresh occurrence. Range is from 0 to 65535. Default is 5.
<b>infinite</b>	Indicates no limitation on the time between full-header refreshes.

## Command Default

The amount of time to wait before a full-header refresh occurrence is set to 5 seconds.

## Command Modes

IPHC-profile configuration

## Command History

Release	Modification
12.4(9)T	This command was introduced.

## Usage Guidelines

Use the **refresh max-time** command to set the maximum amount of time to wait before a full-header refresh occurs. The **refresh max-time** command also allows you to indicate no limitation on the time between full-header refresh occurrences. To specify no limitation on the time between full-header refresh occurrences, use the **infinite** keyword.

### Prerequisite

Before you use the **refresh max-time** command, you must enable non-TCP header compression by using the **non-tcp** command.

### Intended for Use with IPHC Profiles

The **refresh max-time** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples**

The following is an example of an IPHC profile called profile2. In this example, the maximum amount of time to wait before a full-header refresh occurs is 500 seconds.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# non-tcp
Router(config-iphcp)# refresh max-time 500
Router(config-iphcp)# end
```

**Related Commands**

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.
<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.

# refresh rtp

To enable a context refresh occurrence for Real-Time Transport Protocol (RTP) header compression, use the **refresh rtp** command in IPHC-profile configuration mode. To disable a context refresh occurrence for RTP header compression, use the **no** form of this command.

**refresh rtp**

**no refresh rtp**

## Syntax Description

This command has no arguments or keywords.

## Command Default

Context refresh occurrences for RTP header compression are disabled.

## Command Modes

IPHC-profile configuration

## Command History

Release	Modification
12.4(9)T	This command was introduced.

## Usage Guidelines

Use the **refresh rtp** command to enable a context refresh occurrence for RTP header compression. A context is the state that the compressor uses to compress a header and that the decompressor uses to decompress a header. The context is the uncompressed version of the last header sent and includes information used to compress and decompress the packet.

### Prerequisite

Before you use the **refresh rtp** command, you must enable RTP header compression by using the **rtp** command.

### Intended for Use with IPHC Profiles

The **refresh rtp** command is intended for use as part of an IP header compression (IPHC) profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

## Examples

The following is an example of an IPHC profile called profile2. In this example, the **refresh rtp** command is used to enable a context refresh occurrence for RTP header compression.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# rtp
Router(config-iphcp)# refresh rtp
Router(config-iphcp)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>iphc-profile</b>	Creates an IPHC profile.
<b>rtp</b>	Enables RTP header compression within an IPHC profile.

# rtp

To enable Real-Time Transport Protocol (RTP) header compression within an IP Header Compression (IPHC) profile, use the **rtp** command in IPHC-profile configuration mode. To disable RTP header compression within an IPHC profile, use the **no** form of this command.

**rtp**

**no rtp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** RTP header compression is enabled.

**Command Modes** IPHC-profile configuration

Command History	Release	Modification
	12.4(9)T	This command was introduced.

**Usage Guidelines** The **rtp** command enables RTP header compression and automatically enables non-TCP header compression (the equivalent of using the **non-tcp** command).

### Intended for Use with IPHC Profiles

The **rtp** command is intended for use as part of an IP Header Compression (IPHC) profile. An IPHC profile is used to enable and configure header compression on a network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples** The following example shows how to configure an IPHC profile called profile2. In this example, RTP header compression is configured.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 ietf
Router(config-iphcp)# rtp
Router(config-iphcp)# end
```

Related Commands	Command	Description
	<b>iphc-profile</b>	Creates an IPHC profile.
	<b>non-tcp</b>	Enables non-TCP header compression within an IPHC profile.

# send qdm message

To send a text message to all Quality Device Manager (QDM) clients, use the **send qdm message** command in EXEC mode.

```
send qdm [client client-id] message message-text
```

## Syntax Description

<b>client</b>	(Optional) Specifies a QDM client to receive the message.
<i>client-id</i>	(Optional) Specifies the QDM identification of the client that will receive the text message.
<b>message</b>	Specifies that a message will be sent.
<i>message-text</i>	The actual text of the message.

## Command Default

No text messages are sent.

## Command Modes

EXEC

## Command History

Release	Modification
12.1(1)E	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Use the **send qdm** command to send a message to a specific QDM client. For example, entering the **send qdm client 9 message hello** command will send the message “hello” to client ID 9.

Use the **send qdm message** *message-text* command to send a message to all QDM clients. For example, entering the **send qdm message hello** command sends the message “hello” to all open QDM clients.

## Examples

The following example sends the text message “how are you?” to client ID 12:

```
send qdm client 12 message how are you?
```

The following example sends the text message “how is everybody?” to all QDM clients connected to the router:

```
send qdm message how is everybody?
```

■ send qdm message

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show qdm status</b>	Displays the status of connected QDM clients.

---

# service-policy

To attach a policy map to an input interface, a virtual circuit (VC), an output interface, or to a VC that will be used as the service policy for the interface or VC, use the **service-policy** command in the appropriate configuration mode. To remove a service policy from an input or output interface or from an input or output VC, use the **no** form of this command.

```
service-policy [type access-control] {input | output} policy-map-name
```

```
no service-policy [type access-control] {input | output} policy-map-name
```

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```
service-policy {input | output} policy-map-name
```

```
no service-policy {input | output} policy-map-name
```

## Cisco 10000 Series Routers

```
service-policy [history | {input | output}] policy-map-name | type control control-policy-name]
```

```
no service-policy [history | {input | output}] policy-map-name | type control control-policy-name]
```

### Syntax Description

<b>type access-control</b>	Determines the exact pattern to look for in the protocol stack of interest.
<b>input</b>	Attaches the specified policy map to the input interface or input VC.
<b>output</b>	Attaches the specified policy map to the output interface or output VC.
<i>policy-map-name</i>	The name of a service policy map (created using the <b>policy-map</b> command) to be attached. The name can be a maximum of 40 alphanumeric characters.
<b>history</b>	Maintains a history of QoS metrics.
<b>type control</b> <i>control-policy-name</i>	Creates a Class-Based Policy Language (CPL) control policy map that is applied to a context.

### Command Default

No service policy is specified.  
A control policy is not applied to a context.  
No policy map is attached.

### Command Modes

Interface configuration  
VC submode (for a standalone VC)  
Bundle-VC configuration (for ATM VC bundle members)  
PVC range subinterface configuration (for a range of ATM PVCs)  
PVC-in-range configuration (for an individual PVC within a PVC range)  
Map-class configuration (for Frame Relay VCs)

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
	12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
	12.0(17)SL	This command was implemented on the Cisco 10000 series routers.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(2)T	This command was modified to enable low latency queueing (LLQ) on Frame Relay VCs.
	12.2(14)SX	Support for this command was implemented on Cisco 7600 series routers. This command was changed to support output policy maps.
	12.2(15)BX	This command was implemented on the ESR-PRE2.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.4(2)T	This command was made available in the PVC range subinterface configuration mode and in the PVC-in-range configuration mode to extend policy map functionality on an ATM VC to the ATM VC range.
	12.4(4)T	The <b>type stack</b> and the <b>type access-control</b> keywords were added to support flexible packet matching (FPM).
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series router.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
	12.3(7)XI2	This command was modified to support PVC range configuration mode and PVC-in-range configuration mode for ATM VCs on the Cisco 10000 series router and the Cisco 7200 series router.
	12.2(18)ZY	The <b>type stack</b> and the <b>type access-control</b> keywords were integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

### Usage Guidelines

You can attach a single policy map to one or more interfaces or to one or more VCs to specify the service policy for those interfaces or VCs.

Currently a service policy specifies class-based weighted fair queueing (CBWFQ). The class policies that comprise the policy map are then applied to packets that satisfy the class map match criteria for the class.

To successfully attach a policy map to an interface or ATM VC, the aggregate of the configured minimum bandwidths of the classes that make up the policy map must be less than or equal to 75 percent of the interface bandwidth or the bandwidth allocated to the VC.

To enable Low Latency Queuing (LLQ) for Frame Relay (priority queueing [PQ]/CBWFQ), you must first enable Frame Relay Traffic Shaping (FRTS) on the interface using the **frame-relay traffic-shaping** command in interface configuration mode. You then attach an output service policy to the Frame Relay VC using the **service-policy** command in map-class configuration mode.

For a policy map to be successfully attached to an interface or ATM VC, the aggregate of the configured minimum bandwidths of the classes that make up the policy map must be less than or equal to 75 percent of the interface bandwidth or the bandwidth allocated to the VC. For a Frame Relay VC, the total amount of bandwidth allocated must not exceed the minimum committed information rate (CIR) configured for the VC less any bandwidth reserved by the **frame-relay voice bandwidth** or **frame-relay ip rtp priority** map-class commands. If not configured, the minimum CIR defaults to half of the CIR.

Configuring CBWFQ on a physical interface is only possible if the interface is in the default queuing mode. Serial interfaces at E1 (2.048 Mbps) and below use WFQ by default. Other interfaces use FIFO by default. Enabling CBWFQ on a physical interface overrides the default interface queuing method. Enabling CBWFQ on an ATM permanent virtual circuit (PVC) does not override the default queuing method.

When you attach a service policy with CBWFQ enabled to an interface, commands related to fancy queuing such as those pertaining to fair queuing, custom queuing, priority queuing, and Weighted Random Early Detection (WRED) are available using the modular quality of service command line interface (MQC). However, you cannot configure these features directly on the interface until you remove the policy map from the interface.

You can modify a policy map attached to an interface or VC, changing the bandwidth of any of the classes that comprise the map. Bandwidth changes that you make to an attached policy map are effective only if the aggregate of the bandwidth amounts for all classes comprising the policy map, including the modified class bandwidth, is less than or equal to 75 percent of the interface bandwidth or the VC bandwidth. If the new aggregate bandwidth amount exceeds 75 percent of the interface bandwidth or VC bandwidth, the policy map is not modified.

After you apply the **service-policy** command to set a class of service (CoS) bit to an Ethernet interface, the policy is set in motion as long as there is a subinterface that is performing 802.1Q or Inter-Switch Link (ISL) trunking. Upon reload, however, the service policy is removed from the configuration due to the following error message:

```
Process 'set' action associated with class-map voip failed: Set cos supported only with IEEE 802.1Q/ISL interfaces.
```

### Cisco 10000 Series Router Usage Guidelines

The Cisco 10000 series router does not support applying class-based weighted fair queuing (CBWFQ) policies to unspecified bit rate (UBR) VCs.

To successfully attach a policy map to an interface or a VC, the aggregate of the configured minimum bandwidths of the classes comprising the policy map must be less than or equal to 99 percent of the interface bandwidth or the bandwidth allocated to the VC. If you attempt to attach a policy map to an interface when the sum of the bandwidth assigned to classes is greater than 99 percent of the available bandwidth, the router logs a warning message and does not allocate the requested bandwidth to all of the classes. If the policy map is already attached to other interfaces, it is removed from them.

The total bandwidth is the speed (rate) of the ATM layer of the physical interface. The router converts the minimum bandwidth that you specify to the nearest multiple of 1/255 (ESR-PRE1) or 1/65535 (ESR-PRE2) of the interface speed. When you request a value that is not a multiple of 1/255 or 1/65535, the router chooses the nearest multiple.

The bandwidth percentage is based on the interface bandwidth. In a hierarchical policy, the bandwidth percentage is based on the nearest parent shape rate.

By default, a minimum bandwidth guaranteed queue has buffers for up to 50 milliseconds of 256-byte packets at line rate, but not less than 32 packets.

For Cisco IOS Release 12.0(22)S and later releases, to enable LLQ for Frame Relay (priority queueing (PQ)/CBWFQ) on the Cisco 10000 series router, first create a policy map and then assign priority to a defined traffic class using the **priority** command. For example, the following sample configuration shows how to configure a priority queue with a guaranteed bandwidth of 8000 kbps. In the example, the Business class in the policy map named Gold is configured as the priority queue. The Gold policy also includes the Non-Business class with a minimum bandwidth guarantee of 48 kbps. The Gold policy is attached to serial interface 2/0/0 in the outbound direction.

```
class-map Business
  match ip precedence 3
policy-map Gold
  class Business
    priority
    police 8000
  class Non-Business
    bandwidth 48
interface serial 2/0/0
  frame-relay encapsulation
  service-policy output Gold
```

On the PRE2, you can use the **service-policy** command to attach a QoS policy to an ATM subinterface or to a PVC. However, on the PRE3, you can attach a QoS policy only to a PVC.

### Cisco 7600 Series Routers

The **output** keyword is not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2.

Do not attach a service policy to a port that is a member of an EtherChannel.

Although the CLI allows you to configure PFC-based QoS on the WAN ports on the OC-12 ATM OSMs and on the WAN ports on the channelized OSMs, PFC-based QoS is not supported on the WAN ports on these OSMs. OSMs are not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 32.

PFC QoS supports the optional **output** keyword only on VLAN interfaces. You can attach both an input policy map and an output-policy map to a VLAN interface.

### Cisco 10000 Series Routers Control Policy Maps

A control policy map must be activated by applying it to a context. A control policy map can be applied to one or more of the following types of contexts:

1. Global
2. Interface
3. Subinterface
4. Virtual template
5. VC class
6. PVC

In general, control policy maps that are applied to more specific contexts take precedence over policy maps applied to more general contexts. In the list, the context types are numbered in order of precedence. For example, a control policy map that is applied to a permanent virtual circuit (PVC) takes precedence over a control policy map that is applied to an interface.

Control policies apply to all sessions hosted on the context. Only one control policy map can be applied to a given context.

**Examples**

The following example shows how to attach a policy map to a Fast Ethernet interface:

```
Router(config)# interface fastethernet 5/20
Router(config-if)# service-policy input pmap1
```

The following example shows how to attach the service policy map called policy9 to data-link connection identifier (DLCI) 100 on output serial interface 1 and enables LLQ for Frame Relay:

```
Router(config)# interface Serial1/0.1 point-to-point
Router(config-if)# frame-relay interface-dlci 100
Router(config-if)# class fragment
!
Router(config-if)# map-class frame-relay fragment
Router(config-if)# service-policy output policy9
```

The following example shows how to attach the service policy map called policy9 to input serial interface 1:

```
Router(config)# interface Serial1
Router(config-if)# service-policy input policy9
```

The following example attaches the service policy map called policy9 to the input PVC called cisco:

```
Router(config)# pvc cisco 0/34
Router(config)# service-policy input policy9
Router(config)# vbr-nt 5000 3000 500
Router(config)# precedence 4-7
```

The following example shows how to attach the policy called policy9 to output serial interface 1 to specify the service policy for the interface and enable CBWFQ on it:

```
Router(config)# interface serial1
Router(config-if)# service-policy output policy9
```

The following example attaches the service policy map called policy9 to the output PVC called cisco:

```
Router(config)# pvc cisco 0/5
Router(config)# service-policy output policy9
Router(config)# vbr-nt 4000 2000 500
Router(config)# precedence 2-3
```

**Cisco 10000 Series Router Examples**

The following example shows how to attach the service policy named user\_policy to data link connection identifier (DLCI) 100 on serial subinterface 1/0/0.1 for outbound packets.

```
interface serial 1/0/0.1 point-to-point
    frame-relay interface-dlci 100
    service-policy output user_policy
```

**Note**

You must be running Cisco IOS Release 12.0(22)S or later releases to attach a policy to a DLCI in this way. If you are running a release prior to Cisco IOS Release 12.0(22)S, attach the service policy as described in the previous configuration examples using the Frame Relay legacy commands.

The following example shows how to attach a QoS service policy named bronze to PVC 0/101 on the ATM subinterface 3/0/0.1 for inbound traffic.

```
interface atm 3/0/0
    atm pxf queuing
interface atm 3/0/0.1
    pvc 0/101
    service-policy input bronze
```

The following example shows how to attach a service policy named myQoS to the physical Gigabit Ethernet interface 1/0/0 for inbound traffic. VLAN 4, configured on the GigabitEthernet subinterface 1/0/0.3, inherits the service policy of the physical Gigabit Ethernet interface 1/0/0.

```
interface GigabitEthernet 1/0/0
  service-policy input myQoS
interface GigabitEthernet 1/0/0.3
  encapsulation dot1q 4
```

The following example shows how to attach the service policy map called voice to ATM VC 2/0/0 within a PVC range of a total of 3 PVCs and enable PVC range configuration mode where a point-to-point subinterface is created for each PVC in the range. Each PVC created as part of the range has the voice service policy attached to it.

```
configure terminal
  interface atm 2/0/0
  range pvc 1/50 1/52
  service-policy input voice
```

The following example shows how to attach the service policy map called voice to ATM VC 2/0/0 within a PVC range, where every VC created as part of the range has the voice service policy attached to it. The exception is PVC 1/51, which is configured as an individual PVC within the range and has a different service policy called data attached to it in PVC-in-range configuration mode.

```
configure terminal
  interface atm 2/0/0
  range pvc 1/50 1/52
  service-policy input voice
  pvc-in-range 1/51
  service-policy input data
```

## Related Commands

Command	Description
<b>class-map</b>	Accesses the QoS class map configuration mode to configure QoS class maps.
<b>frame-relay ip rtp priority</b>	Reserves a strict priority queue on a Frame Relay PVC for a set of RTP packet flows belonging to a range of UDP destination ports,
<b>frame-relay traffic-shaping</b>	Enables both traffic shaping and per-virtual-circuit queueing for all PVCs and SVCs on a Frame Relay interface.
<b>frame-relay voice bandwidth</b>	Specifies the amount of bandwidth to be reserved for voice traffic on a specific DLCI.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# service-policy (class-map)

To attach a policy map to a class, use the **service-policy** command in class-map configuration mode. To remove a service policy from a class, use the **no** form of this command.

**service-policy** *policy-map*

**no service-policy**

<b>Syntax Description</b>	<i>policy-map</i>	The name of a service policy map (created using the <b>policy-map</b> command) to be attached. The name can be a maximum of 40 alphanumeric characters.
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<b>Command Default</b>	No service policy is specified.
------------------------	---------------------------------

<b>Command Modes</b>	Class-map configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(2)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	You can attach a single policy map to one or more classes to specify the service policy for those classes. This command is only available for the output interface, which is assumed.
-------------------------	---

<b>Examples</b>	<p>In the following example, three policy maps are defined—cust1-classes, cust2-classes, and cust-policy. The policy maps cust1-classes and cust2-classes have three classes defined—gold, silver, and bronze. For cust1-classes, gold is configured to use 50 percent of the bandwidth. Silver is configured to use 20 percent of the bandwidth, and bronze is configured to use 15 percent of the bandwidth. For cust2-classes, gold is configured to use 30 percent of the bandwidth. Silver is configured to use 15 percent of the bandwidth, and bronze is configured to use 10 percent of the bandwidth. The policy map cust-policy specifies average rate shaping of 384 kbps and assigns the service policy called cust1-classes to the policy map called cust1-classes. The policy map called cust-policy specifies peak rate shaping of 512 kbps and assigns the service policy called cust2-classes to the policy map called cust2-classes.</p>
-----------------	--

To configure classes for cust1-classes, use the following commands:

```
Router(config)# policy-map cust1-classes
Router(config-pmap)# class gold
Router(config-pmap-c)# bandwidth percent 50
Router(config-pmap-c)# exit
```

```
Router(config-pmap)# class silver
Router(config-pmap-c)# bandwidth percent 20
Router(config-pmap-c)# exit
Router(config-pmap)# class bronze
Router(config-pmap-c)# bandwidth percent 15
```

To configure classes for cust2, use the following commands:

```
Router(config)# policy-map cust2-classes
Router(config-pmap)# class gold
Router(config-pmap-c)# bandwidth percent 30
Router(config-pmap-c)# exit
Router(config-pmap)# class silver
Router(config-pmap-c)# bandwidth percent 15
Router(config-pmap-c)# exit
Router(config-pmap)# class bronze
Router(config-pmap-c)# bandwidth percent 10
```

To define the customer policy with cust1-classes and cust2-classes and QoS features, use the following commands:

```
Router(config)# policy-map cust-policy
Router(config-pmap)# class cust1
Router(config-pmap-c)# shape average 38400
Router(config-pmap-c)# service-policy cust1-classes
Router(config-pmap-c)# exit
Router(config-pmap)# class cust2
Router(config-pmap-c)# shape peak 51200
Router(config-pmap-c)# service-policy cust2-classes
Router(config-pmap-c)# interface Serial 3/2
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# exit
Router(config)# interface serial10/0
Router(config-if)# service out cust-policy
```

#### Related Commands

Command	Description
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.

# service-policy (control-plane)

To attach a policy map to a control plane for aggregate or distributed control plane services, use the **service-policy** command in control-plane configuration mode. To remove a service policy from a control plane, use the **no** form of this command.

**service-policy** {**input** | **output**} *policy-map-name*

**no service-policy** {**input** | **output**} *policy-map-name*

## Syntax Description

<b>input</b>	Applies the specified service policy to packets that are entering the control plane.
<b>output</b>	Applies the specified service policy to packets that are exiting the control plane, and enables the router to silently discard packets.
<i>policy-map-name</i>	Name of a service policy map (created using the <b>policy-map</b> command) to be attached. The name can be a maximum of 40 alphanumeric characters.

## Command Default

No service policy is specified.

## Command Modes

Control-plane configuration

## Command History

Release	Modification
12.2(18)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T, and support for the <b>output</b> keyword was added.
12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(25)S	Support for the <b>output</b> keyword was integrated into Cisco IOS Release 12.2(25)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

After entering the **control-plane** command, use the **service-policy** command to configure a quality of service (QoS) policy. This policy is attached to the control plane interface for aggregate or distributed control plane services, and controls the number or rate of packets that are going to the process level.

When you configure output policing on control-plane traffic, using the **service-policy output policy-map-name** command, a router is automatically enabled to silently discard packets. Output policing is supported as follows:

- Supported only in:
  - Cisco IOS Release 12.2(25)S and later Cisco IOS 12.2S releases.
  - Cisco IOS Release 12.3(4)T and later Cisco IOS 12.3T releases.
  - Cisco IOS Release 12.2(18)SXD1 and later Cisco IOS 12.2SX releases.
- Not supported for attaching a QoS policy for distributed control-plane services.
- Not supported on the Cisco 6500 router, Cisco 7500 series, and Cisco 10720 Internet router.

The **service-policy output** command configures output policing, which is performed in silent mode to silently discard packets exiting from the control plane according to the attached QoS policy. Silent mode allows a router that is running Cisco IOS software to operate without sending any system messages. If a packet that is exiting from the control plane is discarded for output policing, you do not receive an error message.

Silent mode allows a router that is running Cisco IOS software to operate without sending any system messages. If a packet that is destined for the router is discarded for any reason, users will not receive an error message. Some events that will not generate error messages are as follows:

- Traffic that is being transmitted to a port to which the router is not listening
- A connection to a legitimate address and port that is rejected because of a malformed request

## Examples

The following example shows how to configure trusted hosts with source addresses 10.1.1.1 and 10.1.1.2 to forward Telnet packets to the control plane without constraint, while allowing all remaining Telnet packets to be policed at the specified rate:

```
! Allow 10.1.1.1 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Router(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate limit all other Telnet traffic.
Router(config)# access-list 140 permit tcp any any eq telnet
! Define class-map "telnet-class."
Router(config)# class-map telnet-class
Router(config-cmap)# match access-group 140
Router(config-cmap)# exit
Router(config)# policy-map control-plane-policy
Router(config-pmap)# class telnet-class
Router(config-pmap-c)# police 80000 conform transmit exceed drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
! Define aggregate control plane service for the active Route Processor.
Router(config)# control-plane
Router(config-cp)# service-policy input control-plane-policy
Router(config-cp)# exit
```

The next example shows how to configure trusted networks with source addresses 10.0.0.0 and 10.0.0.2 to receive Internet Control Message Protocol (ICMP) port-unreachable responses without constraint, while allowing all remaining ICMP port-unreachable to be dropped:

```
! Allow 10.0.0.0 trusted network traffic.
Router(config)# access-list 141 deny icmp host 10.0.0.0 255.255.255.224 any
port-unreachable
! Allow 10.0.0.2 trusted network traffic.
```

```

Router(config)# access-list 141 deny icmp host 10.0.0.2 255.255.255.224 any
port-unreachable
! Rate limit all other ICMP traffic.
Router(config)# access-list 141 permit icmp any any port-unreachable
Router(config)# class-map icmp-class
Router(config-cmap)# match access-group 141
Router(config-cmap)# exit
Router(config)# policy-map control-plane-out-policy
! Drop all traffic that matches the class "icmp-class."
Router(config-pmap)# class icmp-class
Router(config-pmap-c)# drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# control-plane
! Define aggregate control plane service for the active route processor.
Router(config-cp)# service-policy output control-plane-out-policy
Router(config-cp)# exit

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>control-plane</b>	Enters control-plane configuration mode to apply a QoS policy to police traffic destined for the control plane.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show policy-map control-plane</b>	Displays the configuration of a class or all classes for the policy map attached to the control plane.

## service-policy (policy-map class)

To use a service policy as a QoS policy within a policy map (called a hierarchical service policy), use the **service-policy** command in policy-map class configuration mode. To disable a particular service policy as a QoS policy within a policy map, use the **no** form of this command.

**service-policy** *policy-map-name*

**no service-policy** *policy-map-name*

### Syntax Description

<i>policy-map-name</i>	Specifies the name of the predefined policy map to be used as a QoS policy. The name can be a maximum of 40 alphanumeric characters.
------------------------	--

### Command Default

No service policies are used.

### Command Modes

Policy-map class configuration

### Command History

Release	Modification
12.1(2)E	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

This command is used to create hierarchical service policies in policy-map class configuration mode.

This command is different from the **service-policy [input | output] policy-map-name** command used in interface configuration mode. The purpose of the **service-policy [input | output] policy-map-name** is to attach service policies to interfaces.

The child policy is the previously defined service policy that is being associated with the new service policy through the use of the **service-policy** command. The new service policy using the preexisting service policy is the parent policy.

This command has the following restrictions:

- The **set** command is not supported on the child policy.
- The **priority** command can be used in either the parent or the child policy, but not *both* policies simultaneously.
- The **shape** command can be used in either the parent or the child policy, but not *both* policies simultaneously on a subinterface.

- The **fair-queue** command cannot be defined in the parent policy.
- If the **bandwidth** command is used in the child policy, the **bandwidth** command must also be used in the parent policy. The one exception is for policies using the default class.

## Examples

The following example creates a hierarchical service policy in the service policy called parent:

```
Router(config)# policy-map child
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 50
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# policy-map parent
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 10000000
Router(config-pmap-c)# service-policy child
```

FRF.11 and FRF.12 configurations on a Versatile Interface Processor (VIP)-enabled Cisco 7500 series router often require a hierarchical service policy for configuration. A hierarchical service policy for FRF.11 and FRF.12 requires the following elements:

1. A traffic class that uses the Voice over Frame Relay (VoFR) protocol as the only match criterion.
2. A traffic policy that insures low latency queueing (LLQ), which is achieved using the **priority** command, for all VoFR protocol traffic
3. A traffic policy that defines the shaping parameters and includes the elements listed in element 2.

Element 3 can only be fulfilled through the use of a hierarchical service policy, which is configured using the **service-policy** command.

In the following example, element 1 is configured in the traffic class called frf, element 2 is configured in the traffic policy called llq, and element 3 is configured in the traffic policy called llq-shape.

```
Router(config)# class-map frf
Router(config-cmap)# match protocol vofr
Router(config-cmap)# exit
Router(config)# policy-map llq
Router(config-pmap)# class frf
Router(config-pmap-c)# priority 2000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# policy-map llq-shape
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 1000 128000
Router(config-pmap-c)# service-policy llq
```

The final step in using a hierarchical service policy for FRF.11 and FRF.12 is using the service policy in map-class configuration mode. In the following example, the traffic policy called llq-shape is attached to the map class called frag:

```
Router(config)# map-class frame-relay frag
Router(config-map-class)# frame-relay fragment 40
Router(config-map-class)# service-policy llq-shape
```

Related Commands	Command	Description
	<b>bandwidth (policy-map class)</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
	<b>fair-queue</b>	Specifies the number of queues to be reserved for use by a traffic class.
	<b>policy-map</b>	Specifies the name of the service policy to configure.
	<b>priority</b>	Gives priority to a class of traffic belonging to a policy map.
	<b>service-policy</b>	Specifies the name of the service policy to be attached to the interface.
	<b>shape</b>	Specifies average or peak rate traffic shaping.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# set atm-clp

To set the cell loss priority (CLP) bit when a policy map is configured, use the **set atm-clp** command in policy-map class configuration mode. To remove a specific CLP bit setting, use the **no** form of this command.

**set atm-clp**

**no set atm-clp**

## Syntax Description

This command has no arguments or keywords.

## Command Default

The CLP bit is automatically set to 0 when Cisco routers convert IP packets into ATM cells for transmission through Multiprotocol Label Switching (MPLS)-aware ATM networks.

## Command Modes

Policy-map class configuration

## Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(4)T	This command was implemented on the Cisco MGX 8850 switch and the MGX 8950 switch with a Cisco MGX RPM-PR card.
12.2(4)T2	This command was implemented on the Cisco 7500 series.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

To disable this command, remove the service policy from the interface.

The **set atm-clp** command works only on platforms that support one of the following adapters: the Enhanced ATM Port Adapter (PA-A3), the ATM Inverse Multiplexer over ATM Port Adapter with eight T1 ports (PA-A3-8T1IMA), or the ATM Inverse Multiplexer over ATM Port Adapter with eight E1 ports (PA-A3-8E1IMA). For more information, refer to the documentation for your specific router.

A policy map containing the **set atm-clp** command can be attached as an output policy only. The **set atm-clp** command does not support packets that originate from the router.

## Examples

The following example illustrates setting the CLP bit using the **set atm-clp** command in the policy map:

```
Router(config)# class-map ip-precedence
Router(config-cmap)# match ip precedence 0 1
Router(config-cmap)# exit
```

```

Router(config)# policy-map atm-clp-set
Router(config-pmap)# class ip-precedence
Router(config-pmap-c)# set atm-clp
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0.1
Router(config-if)# service-policy output policy1

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show atm pvc</b>	Displays all ATM PVCs and traffic information.
<b>show policy-map</b>	Displays information about the policy map for an interface.

# set cos

To set the Layer 2 class of service (CoS) value of an outgoing packet, use the **set cos** command in policy-map class configuration mode. To remove a specific CoS value setting, use the **no** form of this command.

```
set cos {cos-value | from-field [table table-map-name]}
```

```
no set cos {cos-value | from-field [table table-map-name]}
```

## Cisco 10000 Series Router

```
set cos cos-value
```

Syntax Description		
<i>cos-value</i>		Specific IEEE 802.1Q CoS value from 0 to 7.
<i>from-field</i>		Specific packet-marking category to be used to set the CoS value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the “map from” packet-marking category. Packet-marking category keywords are as follows: <ul style="list-style-type: none"> <li>• <b>precedence</b></li> <li>• <b>dscp</b></li> </ul>
<b>table</b>		(Optional) Indicates that the values set in a specified table map will be used to set the CoS value.
<i>table-map-name</i>		(Optional) Name of the table map used to specify the CoS value. The table map name can be a maximum of 64 alphanumeric characters.

**Command Default** No CoS value is set for the outgoing packet.

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.1(5)T	This command was introduced.
	12.2(13)T	This command was modified for Enhanced Packet Marking to allow a mapping table (table map) to be used to convert and propagate packet-marking values.
	12.0(16)BX	This command was implemented on the Cisco 10000 series router for the ESR-PRE2.
	12.0(31)S	This command was integrated into Cisco IOS Release 12.0(31)S.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

### Usage Guidelines

CoS packet marking is supported only in the Cisco Express Forwarding switching path.

The **set cos** command should be used by a router if a user wants to mark a packet that is being sent to a switch. Switches can leverage Layer 2 header information, including a CoS value marking.

The **set cos** command can be used only in service policies that are attached in the output direction of an interface. Packets entering an interface cannot be set with a CoS value.

The **match cos** and **set cos** commands can be used together to allow routers and switches to interoperate and provide quality of service (QoS) based on the CoS markings.

Layer 2 to Layer 3 mapping can be configured by matching on the CoS value because switches already can match and set CoS values. If a packet that needs to be marked to differentiate user-defined QoS services is leaving a router and entering a switch, the router should set the CoS value of the packet because the switch can process the Layer 2 header.

### Using This Command with the Enhanced Packet Marking Feature

You can use this command as part of the Enhanced Packet Marking feature to specify the “from-field” packet-marking category to be used for mapping and setting the CoS value. The “from-field” packet-marking categories are as follows:

- Precedence
- Differentiated services code point (DSCP)

If you specify a “from-field” category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the “from-field” category as the CoS value. For instance, if you configure the **set cos precedence** command, the precedence value will be copied and used as the CoS value.

You can do the same for the DSCP marking category. That is, you can configure the **set cos dscp** command, and the DSCP value will be copied and used as the CoS value.



#### Note

If you configure the **set cos dscp** command, only the *first three bits* (the class selector bits) of the DSCP field are used.

### Examples

In the following example, the policy map called “cos-set” is created to assign different CoS values for different types of traffic. This example assumes that the class maps called “voice” and “video-data” have already been created.

```
Router(config)# policy-map cos-set
Router(config-pmap)# class voice
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# exit
Router(config-pmap)# class video-data
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# end
```

### Enhanced Packet Marking Example

In the following example, the policy map called “policy-cos” is created to use the values defined in a table map called “table-map1”. The table map called “table-map1” was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

In this example, the setting of the CoS value is based on the precedence value defined in “table-map1”:

```
Router(config)# policy-map policy-cos
Router(config-pmap)# class class-default
Router(config-pmap-c)# set cos precedence table table-map1
Router(config-pmap-c)# end
```



#### Note

The **set cos** command is applied when you create a service policy in QoS policy-map configuration mode and attach the service policy to an interface or ATM virtual circuit (VC). For information on attaching a service policy, refer to the “Modular Quality of Service Command-Line Interface Overview” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

#### Related Commands

Command	Description
<b>match cos</b>	Matches a packet on the basis of Layer 2 CoS marking.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set dscp</b>	Marks a packet by setting the Layer 3 DSCP value in the ToS byte.
<b>set precedence</b>	Sets the precedence value in the packet header.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

## set cos cos-inner (policy-map configuration)

To set the 802.1Q prioritization bits in the trunk VLAN tag of a QinQ-translated outgoing packet with the priority value from the inner customer-edge VLAN tag, use the **set cos cos-inner** command in policy-map class configuration mode. To return to the default settings, use the **no** form of this command.

**set cos cos-inner**

**no set cos cos-inner**

**Syntax Description** This command has no arguments or keywords.

**Command Default** P bits are copied from the outer provider-edge VLAN tag.

**Command Modes** Policy-map class configuration

### Command History

Release	Modification
12.2(18)SXD	Support for this command was introduced on the Supervisor Engine 720.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

This command is supported on the Gigabit Ethernet WAN interfaces on Cisco 7600 series routers that are configured with an Optical Service Module (OSM)-2+4GE-WAN+ OSM module only.

OSMs are not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 32.

The 802.1P prioritization bits are used in the VLAN tag for QoS processing.

When the router copies the double-tagged QinQ packets to the destination interface, by default it uses the P bits from the outer (provider) VLAN tag. To preserve the P bits that are in the inner (customer) VLAN tag, use the **set cos cos-inner** command.

For the **set cos cos-inner** command to be effective, you must configure the appropriate interface or subinterface as a trusted interface using the **mls qos trust** command. Otherwise, the interface or subinterface defaults to being untrusted, where the Layer 2 interface zeroes out the P bits of the incoming packets before the **set cos cos-inner** command can copy them to the outer VLAN tag.

The **set cos cos-inner** command is supported only for the subinterfaces that are configured with an inner (customer) VLAN. The **set cos cos-inner** command is not supported for the subinterfaces that use the **out-range** keyword on the **bridge-domain** (subinterface configuration) command or that are not configured with any form of the **bridge-domain** (subinterface configuration) command.

This behavior remains when you configure the **set cos cos-inner** command on a policy that is applied to a main interface. The **set cos cos-inner** command affects the subinterfaces that are configured with a specific inner VLAN but it does not affect the subinterfaces that are not configured with any VLAN or that are configured with the **out-range** keyword.

**Examples**

This example shows how to configure a policy map for voice traffic that uses the P bits from the inner VLAN tag:

```
Router(config-cmap)# set cos cos-inner
```

This example shows how to configure the default policy map class to reset to its default value:

```
Router(config-cmap)# no set cos cos-inner
```

This example shows the system message that appears when you attempt to apply a policy to a subinterface that is configured with the **bridge-domain (subinterface configuration)** command:

```
Router(config-if)# bridge-vlan 32 dot1q-tunnel out-range
Router(config-if)# service-policy output cos1
```

```
%bridge-vlan 32 does not have any inner-vlan configured. 'set cos cos-inner' is not supported
```

**Related Commands**

Command	Description
<b>bridge-domain (subinterface configuration)</b>	Binds a PVC to the specified <i>vlan-id</i> .
<b>class map</b>	Accesses the QoS class map configuration mode to configure QoS class maps.
<b>mode dot1q-in-dot1q access-gateway</b>	Enables a Gigabit Ethernet WAN interface to act as a gateway for QinQ VLAN translation.
<b>policy-map</b>	Accesses QoS policy-map configuration mode to configure the QoS policy map.
<b>service-policy</b>	Attaches a policy map to an interface.
<b>set in dscp (policy-map configuration)</b>	Marks a packet by setting the IP DSCP in the ToS byte.
<b>set ip precedence (policy-map configuration)</b>	Sets the precedence value in the IP header.
<b>show cwan qinq</b>	Displays the inner, outer, and trunk VLANs that are used in QinQ translation.
<b>show cwan qinq bridge-domain</b>	Displays the provider-edge VLAN IDs that are used on a Gigabit Ethernet WAN interface for QinQ translation or shows the customer-edge VLANs that are used for a specific provider-edge VLAN.
<b>show cwan qinq interface</b>	Displays interface statistics for IEEE 802.1Q-in-802.1Q (QinQ) translation on one or all Gigabit Ethernet WAN interfaces and port-channel interfaces.
<b>show policy-map</b>	Displays information about the policy map.
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

# set cos-inner

To mark the inner class of service field in a bridged frame, use the **set cos-inner** command in policy-map class configuration mode. To remove marking of the inner CoS field, use the **no** form of this command.

**set cos-inner** *cos-value*

**no set cos-inner** *cos-value*

## Syntax Description

<i>cos-value</i>	IEEE 802.1q CoS value from 0–7.
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## Defaults

No default behavior or values.

## Command Modes

Policy-map class configuration

## Command History

Release	Modification
12.2(33)SRA	This command was introduced.

## Usage Guidelines

This command was introduced in Cisco IOS Release 12.2(33)SRA to support marking of the inner CoS value when using multipoint bridging (MPB) features on the Enhanced FlexWAN module, and when using MPB features on SPAs with the Cisco 7600 SIP-200 and Cisco 7600 SIP-400 on the Cisco 7600 series router.

This command is not supported on the Cisco 7600 SIP-600.

On the Cisco 7600 SIP-200, this command is not supported with the **set cos** command on the same interface.

For more information about QoS and the forms of marking commands supported by the SIPs on the Cisco 7600 series router, refer to the *Cisco 7600 Series SIP, SSC, and SPA Software Configuration Guide*.

## Examples

The following example shows configuration of a QoS class that filters all traffic matching on VLAN 100 into a class named “vlan-inner-100.” The configuration shows the definition of a policy-map (also named “vlan-inner-100”) that marks the inner CoS with a value of 3 for traffic in the vlan-inner-100 class. Since marking of the inner CoS value is only supported with bridging features, the configuration also shows the service policy being applied as an output policy to a serial SPA interface that bridges traffic into VLAN 100 using the **bridge-domain** command:

```
Router(config)# class-map match-all vlan-inner-100
Router(config-cmap)# match vlan inner 100
Router(config-cmap)# exit
Router(config)# policy-map vlan-inner-100
Router(config-pmap)# class vlan-inner-100
Router(config-pmap-c)# set cos-inner 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

```

Router(config)# interface serial3/0/0
Router(config-if)# no ip address
Router(config-if)# encapsulation ppp
Router(config-if)# bridge-domain 100 dot1q
Router(config-if)# service-policy output vlan-inner-100
Router(config-if)# shutdown
Router(config-if)# no shutdown
Router(config-if)# end

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>bridge-domain</b>	Enables RFC 1483 ATM bridging or RFC 1490 Frame Relay bridging to map a bridged virtual LAN (VLAN) to an ATM permanent virtual circuit (PVC) or Frame Relay data-link connection identifier (DLCI).
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>service-policy</b>	Attaches a policy map to an input interface or virtual circuit (VC) or an output interface or VC, to be used as the service policy for that interface or VC.

# set cos-inner cos

To copy the outer COS to the inner COS for double-tagged packets, use the **set cos-inner cos** command in policy-map class configuration mode. To remove the outer COS copied to the inner COS for double-tagged packets, use the **no** form of this command.

**set cos-inner cos** *cos-value*

**no set cos-inner cos** *cos-value*

<b>Syntax Description</b>	<i>cos-value</i>	IEEE 802.1q CoS value from 0–7.
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<b>Defaults</b>	No default behavior or values.	
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<b>Command Modes</b>	Policy-map class configuration	
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(33)SRB	This command was introduced.

<b>Usage Guidelines</b>	<p>This command was introduced in Cisco IOS Release 12.2(33)SRB and is limited to policies that are applied to the EVC service instances.</p> <p>For classification, the reference to the outer and inner tags is made to the frames as seen on the wire - that is, for ingress frames, tags prior to the "rewrite", while the for egress, it is after the "rewrite" of the tags, if any.</p> <p>For marking, the reference to the outer COS at the ingress is to the DBUS-COS and reference to the inner is to the COS in the first tag on the frame; while, at the egress, the reference to outer and inner COS is to the ones in the frame.</p>
-------------------------	--

**Examples** The following example matches on outer COS 3 and 4 and copies the outer COS to the inner COS.

```
Router(config)# class-map cos3_4
Router(config-cmap)# match cos 3 4
Router(config)# policy-map mark-it-in
Router(config-pmap)# class cos3_4
Router(config-pmap-c)# set cos-inner cos
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>bridge-domain</b>	Enables RFC 1483 ATM bridging or RFC 1490 Frame Relay bridging to map a bridged virtual LAN (VLAN) to an ATM permanent virtual circuit (PVC) or Frame Relay data-link connection identifier (DLCI).
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.

<b>Command</b>	<b>Description</b>
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>service-policy</b>	Attaches a policy map to an input interface or virtual circuit (VC) or an output interface or VC, to be used as the service policy for that interface or VC.

# set discard-class

To mark a packet with a discard-class value, use the **set discard-class** command in QoS policy-map configuration mode. To prevent the discard-class value of a packet from being altered, use the **no** form of this command.

**set discard-class** *value*

**no set discard-class** *value*

## Syntax Description

<i>value</i>	Specifies per-hop behavior (PHB) for dropping traffic. The value sets the priority of a type of traffic. Valid values are numbers from 0 to 7.
--------------	--

## Command Default

If you do not enter this command, the packet has a discard-class value of 0.

## Command Modes

QoS policy-map configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.
12.3(7)XI	This command was implemented on the Cisco 10000 series router for the ESR-PRE2.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

## Usage Guidelines

The discard class value indicates the discard portion of the PHB. Use the **set discard-class** command only in DiffServ Tunneling Pipe mode. The discard class value is required when the input PHB marking will be used to classify packets on the output interface.

You can also use this command to specify the type of traffic that will be dropped when there is congestion.

### Cisco 10000 Series Router

This command is supported only on the ESR-PRE2.

## Examples

The following example shows that traffic will be set to the discard-class value of 2:

```
set discard-class 2
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>match discard-class</b>	Matches packets of a certain discard class.
<b>random-detect discard-class-based</b>	Bases WRED on the discard class value of a packet.

# set dscp

To mark a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte, use the **set dscp** command in policy-map class configuration mode. To remove a previously set DSCP value, use the **no** form of this command.

```
set [ip] dscp {dscp-value | from-field [table table-map-name]}
```

```
no set [ip] dscp {dscp-value | from-field [table table-map-name]}
```

Syntax Description		
<b>ip</b>	(Optional) Specifies that the match is for IPv4 packets only. If not used, the match is on both IPv4 and IPv6 packets.	
<i>dscp-value</i>	A number from 0 to 63 that sets the DSCP value. The following reserved keywords can be specified instead of numeric values:	<ul style="list-style-type: none"> <li>• <b>EF</b> (expedited forwarding)</li> <li>• <b>AF11</b> (assured forwarding class AF11)</li> <li>• <b>AF12</b> (assured forwarding class AF12)</li> </ul>
<i>from-field</i>	Specific packet-marking category to be used to set the DSCP value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the “map from” packet-marking category. Packet-marking category keywords are as follows:	<ul style="list-style-type: none"> <li>• <b>cos</b></li> <li>• <b>qos-group</b></li> </ul>
<b>table</b>	(Optional) Used in conjunction with the <i>from-field</i> argument. Indicates that the values set in a specified table map will be used to set the DSCP value.	
<i>table-map-name</i>	(Optional) Used in conjunction with the <b>table</b> keyword. Name of the table map used to specify the DSCP value. The name can be a maximum of 64 alphanumeric characters.	

**Command Default** Disabled

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced. It replaces the <b>set ip dscp</b> command.
	12.0(28)S	Support for this command in IPv6 was added on the in Cisco IOS Release 12.0(28)S

---

**Usage Guidelines**

Once the DSCP bit is set, other quality of service (QoS) features can then operate on the bit settings.

**DSCP and Precedence Values Are Mutually Exclusive**

The **set dscp** command cannot be used with the **set precedence** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can have one value or the other, but not both.

**Precedence Value and Queueing**

The network gives priority (or some type of expedited handling) to marked traffic. Typically, you set the precedence value at the edge of the network (or administrative domain); data then is queued according to the precedence. Weighted fair queueing (WFQ) can speed up handling for high-precedence traffic at congestion points. Weighted Random Early Detection (WRED) ensures that high-precedence traffic has lower loss rates than other traffic during times of congestion.

**Use of the “from-field” Packet-marking Category**

If you are using this command as part of the Enhanced Packet Marking feature, you can use this command to specify the “from-field” packet-marking category to be used for mapping and setting the DSCP value. The “from-field” packet-marking categories are as follows:

- Class of service (CoS)
- QoS group

If you specify a “from-field” category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the “from-field” category as the DSCP value. For instance, if you configure the **set dscp cos** command, the CoS value will be copied and used as the DSCP value.

**Note**

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The CoS field is a three-bit field, and the DSCP field is a six-bit field. If you configure the **set dscp cos** command, only the three bits of the CoS field will be used.

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If you configure the **set dscp qos-group** command, the QoS group value will be copied and used as the DSCP value.

The valid value range for the DSCP is a number from 0 to 63. The valid value range for the QoS group is a number from 0 to 99. Therefore, when configuring the **set dscp qos-group** command, note the following points:

- If a QoS group value falls within both value ranges (for example, 44), the packet-marking value will be copied and the packets will be marked.
- If QoS group value exceeds the DSCP range (for example, 77), the packet-marking value will not be copied and the packet will not be marked. No action is taken.

**Set DSCP Values in IPv6 Environments**

When this command is used in IPv6 environments, the default match occurs on both IP and IPv6 packets. However, the actual packets set by this function are only those which meet the match criteria of the class-map containing this function.

**Set DSCP Values for IPv6 Packets Only**

To set DSCP values for IPv6 values only, the **match protocol ipv6** command must also be used. Without that command, the precedence match defaults to match both IPv4 and IPv6 packets.

### Set DSCP Values for IPv4 Packets Only

To set DSCP values for IPv4 packets only, use the **ip** keyword. Without the **ip** keyword, the match occurs on both IPv4 and IPv6 packets.

## Examples

### Packet-marking Values and Table Map

In the following example, the policy map called “policy1” is created to use the packet-marking values defined in a table map called “table-map1”. The table map was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the table-map (value mapping) command page.

In this example, the DSCP value will be set according to the CoS value defined in the table map called “table-map1”.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class-default
Router(config-pmap-c)# set dscp cos table table-map1
Router(config-pmap-c)# end
```

The **set dscp** command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface” section of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

## Related Commands

Command	Description
<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set cos</b>	Sets the Layer 2 CoS value of an outgoing packet.
<b>set precedence</b>	Sets the precedence value in the packet header.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show table-map</b>	Displays the configuration of a specified table map or all table maps.
<b>table-map (value mapping)</b>	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

# set fr-de

To change the discard eligible (DE) bit setting in the address field of a Frame Relay frame to 1 for all traffic leaving an interface, use the **set fr-de** command in policy-map class command. To remove the DE bit setting, use the **no** form of this command.

**set fr-de**

**no set fr-de**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The DE bit is usually set to 0. This command changes the DE bit setting to 1.

## Command Modes

Policy-map class

## Command History

Release	Modification
12.2(2)T	This command was introduced.
12.2(31)SB2	This command was integrated in Cisco IOS Release 12.2(31)SB2, and introduced on the PRE3 for the Cisco 10000 series router.

## Usage Guidelines

To disable this command in a traffic policy, use the **no set fr-de** command in policy-map class configuration mode of the traffic policy.

If the DE bit is already set to 1, no changes are made to the frame.

## Examples

The following example shows how to set the DE bit using the **set fr-de** command in the traffic policy. The router sets the DE bit of outbound packets belonging to the ip-precedence class.

```
Router(config)# class-map ip-precedence
Router(config-cmap)# match ip precedence 0 1
Router(config-cmap)# exit
Router(config)# policy-map set-de
Router(config-pmap)# class ip-precedence
Router(config-pmap-c)# set fr-de
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface serial 1/0/0
Router(config-if)# no ip address
Router(config-if)# encapsulation frame-relay
Router(config-if)# interface serial 1/0/0.1
Router(config-subif)# ip address 10.1.1.1 255.255.255.252
Router(config-subif)# no ip directed-broadcast
Router(config-subif)# service-policy output set-de
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.

# set ip dscp

The **set ip dscp** command is replaced by the [set dscp](#) command. See the [set dscp](#) command for more information.

## set ip dscp (policy-map configuration)

To mark a packet by setting the IP differentiated services code point (DSCP) value in the type of service (ToS) byte, use the **set ip dscp** command in policy-map configuration mode. To remove a previously set IP DSCP value, use the **no** form of this command.

**set ip dscp** *ip-dscp-value*

**no set ip dscp** *ip-dscp-value*

### Syntax Description

<i>ip-dscp-value</i>	IP DSCP value; valid values are from 0 to 63. See the “Usage Guidelines” section for additional information.
----------------------	--

### Command Default

This command has no default settings.

### Command Modes

Policy-map configuration

### Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

You can enter reserved keywords **EF** (expedited forwarding), **AF11** (assured forwarding class AF11), and **AF12** (assured forwarding class AF12) instead of numeric values for *ip-dscp-value*.

After the IP DSCP bit is set, other quality of service (QoS) features can operate on the bit settings.

You cannot mark a packet by the IP precedence using the **set ip precedence** (policy-map configuration) command and then mark the same packet with an IP DSCP value using the **set ip dscp** command.

The network gives priority (or some type of expedited handling) to marked traffic. Typically, you set IP precedence at the edge of the network (or administrative domain); data is queued based on the precedence. Weighted Fair Queueing (WFQ) can speed up handling for high-precedence traffic at congestion points. Weighted Random Early Detection (WRED) ensures that high-precedence traffic has lower loss rates than other traffic during traffic congestion.

The **set ip precedence** (policy-map configuration) command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not attached to an interface or to an ATM virtual circuit. See the **service-policy** command for information on attaching a service policy to an interface.

When configuring policy-map class actions, note the following:

- For hardware-switched traffic, Policy Feature Card (PFC) QoS does not support the **bandwidth**, **priority**, **queue-limit**, or **random-detect** policy-map class commands. You can configure these commands because they can be used for software-switched traffic.
- PFC QoS does not support the **set mpls** or **set qos-group** policy-map class commands.
- PFC QoS supports the **set ip dscp** and **set ip precedence** policy-map class commands (see the “Configuring Policy Map Class Marking” section in the *Cisco 7600 Series Router Cisco IOS Software Configuration Guide*).
- You cannot do all three of the following in a policy-map class:
  - Mark traffic with the **set ip dscp** or **set ip precedence** (policy-map configuration) commands
  - Configure the trust state
  - Configure policing

In a policy-map class, you can either mark traffic with the **set ip dscp** or **set ip precedence** (policy-map configuration) commands or do one or both of the following:

- Configure the trust state
- Configure policing

## Examples

This example shows how to set the IP DSCP ToS byte to 8 in the policy map called policy1:

```
Router(config)# policy-map policy1
Router(config-cmap)# class class1
Router(config-cmap)# set ip dscp 8
```

All packets that satisfy the match criteria of class1 are marked with the IP DSCP value of 8. How packets that are marked with the IP DSCP value of 8 are treated is determined by the network configuration.

This example shows that after you configure the settings that are shown for voice packets at the edge of the network, all intermediate routers are then configured to provide low-latency treatment to the voice packets:

```
Router(config)# class-map voice
Router(config-cmap)# match ip dscp ef
Router(config)# policy qos-policy
Router(config-cmap)# class voice
Router(config-cmap)# priority 24
```

## Related Commands

Command	Description
<b>policy-map</b>	Accesses QoS policy-map configuration mode to configure the QoS policy map.
<b>service-policy</b>	Attaches a policy map to an interface.
<b>show policy-map</b>	Displays information about the policy map.
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

# set ip dscp tunnel

To set the differentiated services code point (DSCP) value in the tunnel header of a Layer 2 Tunnel Protocol Version 3 (L2TPv3) or Generic Routing Encapsulation (GRE) tunneled packet for tunnel marking, use the **set ip dscp tunnel** command in policy-map class configuration mode. To disable this functionality, use the **no** form of this command.

**set ip dscp tunnel** *dscp-value*

**no set ip dscp tunnel** *dscp-value*

## Syntax Description

<i>dscp-value</i>	Number from 0 to 63 that identifies the tunnel header value. The following reserved keywords can be specified instead of numeric values: <ul style="list-style-type: none"> <li>• <b>EF</b> (expedited forwarding)</li> <li>• <b>AF11</b> (assured forwarding class AF11)</li> </ul>
-------------------	--

## Command Default

The DSCP value is not set.

## Command Modes

Policy-map class configuration (config-pmap-c)

## Command History

Release	Modification
12.0(28)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRC	This command was integrated into Cisco IOS Release 12.2(33)SRC.
12.4(15)T2	This command was integrated into Cisco IOS Release 12.4(15)T2, and support for marking GRE-tunneled packets was included.  <b>Note</b> For this release, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco MGX Route Processor Module (RPM-XF).
12.2(33)SB	Support for marking GRE-tunneled packets was included, and support for the Cisco 7300 series router was added.

## Usage Guidelines

It is possible to configure L2TPv3 (or GRE) tunnel marking and the **ip tos** command at the same time. However, Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC) (L2TPv3 or GRE) tunnel marking has higher priority over **ip tos** commands, meaning that tunnel marking always rewrites the IP header of the tunnel packet and overwrites the values set by **ip tos** commands. The order of enforcement is as follows when these commands are used simultaneously:

1. **set ip dscp tunnel** or **set ip precedence tunnel** (L2TPv3 or GRE tunnel marking)
2. **ip tos reflect**
3. **ip tos** *tos-value*

This is the designed behavior. We recommend that you configure only L2TPv3 (or GRE) tunnel marking and reconfigure any peers configured with the **ip tos** command to use L2TPv3 (or GRE) tunnel marking.

**Note**

For Cisco IOS Release 12.4(15)T2, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco RPM-XF.

**Examples**

The following example shows the **set ip dscp tunnel** command used in a tunnel marking configuration. In this example, a class map called “class-cl” has been configured to match traffic on the basis of the Frame Relay discard eligible (DE) bit setting. Also, a policy map called “policy1” has been created within which the **set ip dscp tunnel** command has been configured.

```
Router> enable
Router# configure terminal
Router(config)# class-map class-cl
Router(config-cmap)# match fr-de
Router(config-cmap)# exit
Router(config)# policy-map policy1
Router(config-pmap)# class tunnel
Router(config-pmap-c)# set ip dscp tunnel 5
Router(config-pmap-c)# end
```

**Note**

The policy map must still be attached to an interface or ATM PVC using the **service-policy** command. For more information about attaching a policy map to an interface or ATM PVC, see the “Applying QoS Features Using the MQC” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Related Commands**

Command	Description
<b>ip tos</b>	Specifies the ToS level for IP traffic.
<b>set ip precedence tunnel</b>	Sets the precedence value in the header of an L2TPv3 or GRE tunneled packet.

# set ip precedence (policy-map configuration)

To set the precedence value in the IP header, use the **set ip precedence** command in policy-map configuration mode. To leave the precedence value at the current setting, use the **no** form of this command.

**set ip precedence** *ip-precedence-value*

**no set ip precedence**

## Syntax Description

*ip-precedence-value* Precedence-bit value in the IP header; valid values are from 0 to 7. See [Table 38](#) for a list of value definitions.

## Command Default

This command is disabled by default.

## Command Modes

Policy-map configuration

## Command History

Release	Modification
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

[Table 38](#) lists the value definitions for precedence values in the IP header. They are listed from least to most important.

**Table 38** Value Definitions for IP Precedence

Values	Definitions
0	routine
1	priority
2	immediate
3	flash
4	flash-override
5	critical
6	internet
7	network

After the IP precedence bits are set, other quality of service (QoS) features, such as Weighted Fair Queuing (WFQ) and Weighted Random Early Detection (WRED), operate on the bit settings.

The network priorities (or some type of expedited handling) mark traffic through the application of WFQ or WRED at points downstream in the network. Typically, you set IP precedence at the edge of the network (or administrative domain); data is queued based on the precedence. WFQ can speed up handling for certain precedence traffic at congestion points. WRED can ensure that certain precedence traffic has lower loss rates than other traffic during traffic congestion.

The **set ip precedence** command is applied when you create a service policy in policy-map configuration mode. This service policy is not attached to an interface or to an ATM virtual circuit. See the **service-policy** command for information on attaching a service policy to an interface.

### Examples

This example shows how to set the IP precedence to 5 for packets that satisfy the match criteria of the class map called class1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip precedence 5
```

All packets that satisfy the match criteria of class1 are marked with the IP precedence value of 5. How packets that are marked with the IP-precedence value of 5 are treated is determined by the network configuration.

### Related Commands

Command	Description
<b>policy-map</b>	Accesses QoS policy-map configuration mode to configure the QoS policy map.
<b>service-policy</b>	Attaches a policy map to an interface.
<b>show policy-map</b>	Displays information about the policy map.
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

## set ip precedence (policy-map)

The **set ip precedence** (policy-map) command is replaced by the **set precedence** command. See the **set precedence** command for more information.

# set ip precedence (route-map)

To set the precedence value (and an optional IP number or IP name) in the IP header, use the **set ip precedence** command in route-map configuration mode. To leave the precedence value unchanged, use the **no** form of this command.

**set ip precedence** [*number* | *name*]

**no set ip precedence**

<b>Syntax Description</b>	<i>number</i>   <i>name</i>	(Optional) A number or name that sets the precedence bits in the IP header. The values for the <i>number</i> argument and the corresponding <i>name</i> argument are listed in <a href="#">Table 39</a> from least to most important.
---------------------------	-----------------------------	---

<b>Command Default</b>	Disabled
------------------------	----------

<b>Command Modes</b>	Route-map configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.0	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** [Table 39](#) lists the values for the *number* argument and the corresponding *name* argument for precedence values in the IP header. They are listed from least to most important.

**Table 39** *Number and Name Values for IP Precedence*

<b>Number</b>	<b>Name</b>
0	<b>routine</b>
1	<b>priority</b>
2	<b>immediate</b>
3	<b>flash</b>
4	<b>flash-override</b>
5	<b>critical</b>
6	<b>internet</b>
7	<b>network</b>

You can set the precedence using either a number or the corresponding name. Once the IP Precedence bits are set, other QoS services such as weighted fair queueing (WFQ) and Weighted Random Early Detection (WRED) then operate on the bit settings.

The network gives priority (or some type of expedited handling) to marked traffic through the application of WFQ or WRED at points downstream in the network. Typically, you set IP Precedence at the edge of the network (or administrative domain); data then is queued based on the precedence. WFQ can speed up handling for certain precedence traffic at congestion points. WRED can ensure that certain precedence traffic has lower loss rates than other traffic during times of congestion.

The mapping from arguments such as **routine** and **priority** to a precedence value is useful only in some instances. That is, the use of the precedence bit is evolving. You can define the meaning of a precedence value by enabling other features that use the value. In the case of the high-end Internet QoS available from Cisco, IP Precedences can be used to establish classes of service that do not necessarily correspond numerically to better or worse handling in the network.

Use the **route-map** (IP) global configuration command with the **match** and **set** route-map configuration commands to define the conditions for redistributing routes from one routing protocol into another, or for policy routing. Each **route-map** command has an associated list of **match** and **set** commands. The **match** commands specify the match criteria—the conditions under which redistribution or policy routing is allowed for the current **route-map** command. The **set** commands specify the set actions—the particular redistribution or policy routing actions to perform if the criteria enforced by the **match** commands are met. The **no route-map** command deletes the route map.

The **set** route-map configuration commands specify the redistribution set actions to be performed when all of the match criteria of a route map are met.

## Examples

The following example sets the IP Precedence to 5 (critical) for packets that pass the route map match:

```
interface serial 0
  ip policy route-map texas

route-map texas
match length 68 128
set ip precedence 5
```

## Related Commands

Command	Description
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>ip policy route-map</b>	Identifies a route map to use for policy routing on an interface.
<b>random-detect dscp</b>	Changes the minimum and maximum packet thresholds for the DSCP value.
<b>send qdm message</b>	Configures CAR and DCAR policies.
<b>route-map (IP)</b>	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape fecn-adapt</b>	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# set ip precedence tunnel

To set the precedence value in the header of a Layer 2 Tunnel Protocol Version 3 (L2TPv3) or Generic Routing Encapsulation (GRE) tunneled packet for tunnel marking, use the **set ip precedence tunnel** command in policy-map class configuration mode. To disable this functionality, use the **no** form of this command.

**set ip precedence tunnel** *precedence-value*

**no set ip precedence tunnel** *precedence-value*

<b>Syntax Description</b>	<i>precedence-value</i>	Number from 0 to 7 that identifies the precedence value of the tunnel header.
---------------------------	-------------------------	---

<b>Command Default</b>	The precedence value is not set.
------------------------	----------------------------------

<b>Command Modes</b>	Policy-map class configuration (config-pmap-c)
----------------------	--

Command History	Release	Modification
	12.0(28)S	This command was introduced.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRC	This command was integrated into Cisco IOS Release 12.2(33)SRC.
	12.4(15)T2	This command was integrated into Cisco IOS Release 12.4(15)T2, and support for marking GRE-tunneled packets was included.  <b>Note</b> For this release, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco MGX Route Processor Module (RPM-XF).
	12.2(33)SB	Support for marking GRE-tunneled packets was included, and support for the Cisco 7300 series router was added.

**Usage Guidelines** It is possible to configure L2TPv3 (or GRE) tunnel marking and the **ip tos** command at the same time. However, Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC) (L2TPv3 or GRE) tunnel marking has higher priority over **ip tos** commands, meaning that tunnel marking always rewrites the IP header of the tunnel packet and overwrites the values set by **ip tos** commands. The order of enforcement is as follows when these commands are used simultaneously:

1. **set ip dscp tunnel** or **set ip precedence tunnel** (L2TPv3 or GRE tunnel marking)
2. **ip tos reflect**
3. **ip tos** *tos-value*

This is the designed behavior. We recommend that you configure only L2TPv3 (or GRE) tunnel marking and reconfigure any peers configured with the **ip tos** command to use L2TPv3 (or GRE) tunnel marking.

**Note**

For Cisco IOS Release 12.4(15)T2, marking GRE-tunneled packets is supported only on platforms equipped with a Cisco RPM-XF.

**Examples**

The following example shows the **set ip precedence tunnel** command used in a tunnel marking configuration. In this example, a class map called “MATCH\_FRDE” has been configured to match traffic on the basis of the Frame Relay discard eligible (DE) bit setting. Also, a policy map called “policy1” has been created within which the **set ip precedence tunnel** command has been configured.

```
Router> enable
Router# configure terminal
Router(config)# class-map MATCH_FRDE
Router(config-cmap)# match fr-de
Router(config-cmap)# exit
Router(config)# policy-map policy1
Router(config-pmap)# class tunnel
Router(config-pmap-c)# set ip precedence tunnel 7
Router(config-pmap-c)# end
```

**Note**

The policy map must still be attached to an interface or ATM PVC using the **service-policy** command. For more information about attaching a policy map to an interface or ATM PVC, see the “Applying QoS Features Using the MQC” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

**Related Commands**

Command	Description
<b>ip tos</b>	Specifies the ToS level for IP traffic in the TN3270 server.
<b>set ip dscp tunnel</b>	Sets the DSCP value in the header of an L2TPv3 tunneled packet.

## set ip tos (route-map)

To set the type of service (ToS) bits in the header of an IP packet, use the **set ip tos** command in route-map configuration mode. To leave the ToS bits unchanged, use the **no** form of this command.

```
set ip tos [tos-bit-value | max-reliability | max-throughput | min-delay | min-monetary-cost |
normal]
```

```
no set ip tos
```

Syntax Description		
<i>tos-bit-value</i>	(Optional)	A value (number) from 0 to 15 that sets the ToS bits in the IP header. See <a href="#">Table 40</a> for more information.
<b>max-reliability</b>	(Optional)	Sets the maximum reliability ToS bits to 2.
<b>max-throughput</b>	(Optional)	Sets the maximum throughput ToS bits to 4.
<b>min-delay</b>	(Optional)	Sets the minimum delay ToS bits to 8.
<b>min-monetary-cost</b>	(Optional)	Sets the minimum monetary cost ToS bits to 1.
<b>normal</b>	(Optional)	Sets the normal ToS bits to 0.

**Command Default** Disabled

**Command Modes** Route-map configuration

Command History	Release	Modification
	11.2	This command was introduced.
	12.4T	This command was integrated into Cisco IOS Release 12.4T.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command allows you to set four bits in the ToS byte header. [Table 40](#) shows the format of the four bits in binary form.

**Table 40 ToS Bits and Description**

T3	T2	T1	T0	Description
0	0	0	0	0 normal forwarding
0	0	0	1	1 minimum monetary cost
0	0	1	0	2 maximum reliability

**Table 40** ToS Bits and Description (continued)

0	1	0	0	4 maximum throughput
1	0	0	0	8 minimum delay

The T3 bit sets the delay. Setting T3 to 0 equals normal delay, and setting it to 1 equals low delay.

The T2 bit sets the throughput. Setting this bit to 0 equals normal throughput, and setting it to 1 equals maximum throughput. Similarly, the T1 and T0 bits set reliability and cost, respectively. Therefore, as an example, if you want to set a packet with the following requirements:

- minimum delay T3 = 1
- normal throughput T2 = 0
- normal reliability T1 = 0
- minimum monetary cost T0 = 1

You would set the ToS to 9, which is 1001 in binary format.

Use the **route-map** (IP) global configuration command with the **match** and **set** (route-map) configuration commands to define the conditions for redistributing routes from one routing protocol into another, or for policy routing. Each **route-map** command has an associated list of **match** and **set** commands. The **match** commands specify the match criteria—the conditions under which redistribution or policy routing is allowed for the current route-map command. The **set** commands specify the set actions—the particular redistribution or policy routing actions to perform if the criteria enforced by the match commands are met. The **no route-map** command deletes the route map.

The **set** (route-map) commands specify the redistribution set actions to be performed when all of the match criteria of a route map are met.

### Examples

The following example sets the IP ToS bits to 8 (minimum delay as shown in [Table 40](#)) for packets that pass the route-map match:

```
interface serial 0
 ip policy route-map texas
!
route-map texas
 match length 68 128
 set ip tos 8
!
```

### Related Commands

Command	Description
<b>ip policy route-map</b>	Identifies a route map to use for policy routing on an interface.
<b>route-map (IP)</b>	Defines the conditions for redistributing routes from one routing protocol into another, or enables policy routing.

# set precedence

To set the precedence value in the packet header, use the **set precedence** command in policy-map class configuration mode. To remove the precedence value, use the **no** form of this command.

## Supported Platforms Other Than Cisco 10000 Series Routers

```
set precedence {precedence-value | from-field [table table-map-name]}
```

```
no set precedence {precedence-value | from-field [table table-map-name]}
```

## Cisco 10000 Series Routers

```
set precedence precedence-value
```

```
no set precedence precedence-value
```

Syntax Description		
<i>precedence-value</i>		A number from 0 to 7 that sets the precedence bit in the packet header.
<i>from-field</i>		Specific packet-marking category to be used to set the precedence value of the packet. If you are using a table map for mapping and converting packet-marking values, this argument value establishes the “map from” packet-marking category. Packet-marking category keywords are as follows: <ul style="list-style-type: none"> <li>• <b>cos</b></li> <li>• <b>qos-group</b></li> </ul>
<b>table</b>		(Optional) Indicates that the values set in a specified table map will be used to set the precedence value.
<i>table-map-name</i>		(Optional) Name of the table map used to specify a precedence value based on the class of service (CoS) value. The name can be a maximum of 64 alphanumeric characters.

Command Default	
	Disabled

Command Modes	
	Policy-map class configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced. This command replaces the <b>set ip precedence</b> command.
	12.0(28)S	Support for this command in IPv6 was added in Cisco IOS Release 12.0(28)S on the Cisco 12000 series Internet routers.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB and implemented on the Cisco 10000 series router.

---

**Usage Guidelines****Command Compatibility**

If a router is loaded with an image from this version (that is, Cisco IOS Release 12.2(13)T) that contained an old configuration, the **set ip precedence** command is still recognized. However, the **set precedence** command will be used in place of the **set ip precedence** command.

The **set precedence** command cannot be used with the **set dscp** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can be one value or the other, but not both.

**Bit Settings**

Once the precedence bits are set, other quality of service (QoS) features such as weighted fair queuing (WFQ) and Weighted Random Early Detection (WRED) then operate on the bit settings.

**Precedence Value**

The network gives priority (or some type of expedited handling) to marked traffic through the application of WFQ or WRED at points downstream in the network. Typically, you set the precedence value at the edge of the network (or administrative domain); data then is queued according to the specified precedence. WFQ can speed up handling for certain precedence traffic at congestion points. WRED can ensure that certain precedence traffic has lower loss rates than other traffic during times of congestion.

The **set precedence** command cannot be used with the **set dscp** command to mark the *same* packet. The two values, differentiated services code point (DSCP) and precedence, are mutually exclusive. A packet can have one value or the other, but not both.

**Using This Command with the Enhanced Packet Marking Feature**

If you are using this command as part of the Enhanced Packet Marking feature, you can use this command to specify the “from-field” packet-marking category to be used for mapping and setting the precedence value. The “from-field” packet-marking categories are as follows:

- CoS
- QoS group

If you specify a “from-field” category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the “from-field” category as the precedence value. For instance, if you configure the **set precedence cos** command, the CoS value will be copied and used as the precedence value.

You can do the same for the QoS group-marking category. That is, you can configure the **set precedence qos-group** command, and the QoS group value will be copied and used as the precedence value.

The valid value range for the precedence value is a number from 0 to 7. The valid value range for the QoS group is a number from 0 to 99. Therefore, when configuring the **set precedence qos-group** command, note the following points:

- If a QoS group value falls within both value ranges (for example, 6), the packet-marking value will be copied and the packets will be marked.
- If QoS group value exceeds the precedence range (for example, 10), the packet-marking value will not be copied, and the packet will not be marked. No action is taken.

**Precedence Values in IPv6 Environments**

When this command is used in IPv6 environments it can set the value in both IPv4 and IPv6 packets. However, the actual packets set by this function are only those that meet the match criteria of the class-map containing this function.

### Setting Precedence Values for IPv6 Packets Only

To set the precedence values for IPv6 packets only, the **match protocol ipv6** command must also be used in the class-map that classified packets for this action. Without the **match protocol ipv6** command, the class-map may classify both IPv6 and IPv4 packets, (depending on other match criteria) and the **set precedence** command will act upon both types of packets.

### Setting Precedence Values for IPv4 Packets Only

To set the precedence values for IPv4 packets only, use a command involving the **ip** keyword like the **match ip precedence** or **match ip dscp** command or include the **match protocol ip** command along with the others in the class map. Without the additional **ip** keyword, the class-map may match both IPv6 and IPv4 packets (depending on the other match criteria) and the **set precedence** or **set dscp** command may act upon both types of packets.

## Examples

In the following example, the policy map named policy-cos is created to use the values defined in a table map named table-map1. The table map named table-map1 was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

In this example, the precedence value will be set according to the CoS value defined in table-map1.

```
Router(config)# policy-map policy-cos
Router(config-pmap)# class class-default
Router(config-pmap-c)# set precedence cos table table-map1
Router(config-pmap-c)# end
```

The **set precedence** command is applied when you create a service policy in QoS policy-map configuration mode. This service policy is not yet attached to an interface or to an ATM virtual circuit. For information on attaching a service policy to an interface, refer to the “Modular Quality of Service Command-Line Interface Overview” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

## Related Commands

Command	Description
<b>match dscp</b>	Identifies a specific IP DSCP value as a match criterion.
<b>match precedence</b>	Identifies IP precedence values as match criteria.
<b>match protocol</b>	Configures the match criteria for a class map on the basis of the specified protocol.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>set cos</b>	Sets the Layer 2 CoS value of an outgoing packet.
<b>set dscp</b>	Marks a packet by setting the Layer 3 DSCP value in the ToS byte.
<b>set qos-group</b>	Sets a group ID that can be used later to classify packets.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration for all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

<b>Command</b>	<b>Description</b>
<b>show table-map</b>	Displays the configuration of a specified table map or all table maps.
<b>table-map (value mapping)</b>	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

# set qos-group

To set a quality of service (QoS) group identifier (ID) that can be used later to classify packets, use the **set qos-group** command in policy-map class configuration mode. To remove the group ID, use the **no** form of this command.

## Supported Platforms Except the Cisco 10000 Series Router

```
set qos-group {group-id \ from-field [table table-map-name]}
```

```
no set qos-group {group-id \ from-field [table table-map-name]}
```

## Cisco 10000 Series Router

```
set qos-group group-id
```

```
no set qos-group group-id
```

Syntax Description		
<i>group-id</i>		Group ID number in the range from 0 to 99.
<i>from-field</i>		Specific packet-marking category to be used to set the QoS group value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the “map from” packet-marking category. Packet-marking category keywords are as follows: <ul style="list-style-type: none"> <li>• <b>cos</b>—Specifies that the QoS group value is set from the packet’s original 802.1P class of service (CoS) field.</li> <li>• <b>precedence</b>—Specifies that the QoS group value is set from the packet’s original IP precedence field.</li> <li>• <b>dscp</b>—Specifies that the QoS group value is set from the packet’s original Differentiated Services Code Point (DSCP) field.</li> <li>• <b>mpls exp topmost</b>—Specifies that the QoS group value is set from the packet’s original topmost MPLS EXP field.</li> </ul>
<b>table</b> <i>table-map-name</i>		(Optional) Used in conjunction with the <i>from-field</i> argument. Indicates that the values set in a table map specified by <i>table-map-name</i> will be used to set the QoS group value.

**Command Default** No group ID is specified.

**Command Modes** Policy-map class configuration

Command History	Release	Modification
	11.1CC	This command was introduced.
	12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
	12.0(17)SL	This command was introduced on the Cisco 10000 series router.

Release	Modification
12.2(13)T	This command can now be used with the <b>random-detect discard-class-based</b> command, and this command was modified for the Enhanced Packet Marking feature. A mapping table (table map) can now be used to convert and propagate packet-marking values.
12.2(18)SXE	This command was integrated into Cisco IOS 12.2(18)SXE, and the <b>cos</b> keyword was added.
12.2(31)SB	This command was integrated into Cisco IOS Release 12.2(31)SB.

### Usage Guidelines

The **set qos-group** command allows you to associate a group ID with a packet. The group ID can be used later to classify packets into QoS groups based as prefix, autonomous system, and community string.

A QoS group and discard class are required when the input per-hop behavior (PHB) marking will be used for classifying packets on the output interface.

#### Using This Command with the Enhanced Packet Marking Feature

If you are using this command as part of the Enhanced Packet Marking feature, you can use this command to specify the “from-field” packet-marking category to be used for mapping and setting the precedence value.

If you specify a “from-field” category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the “from-field” category as the precedence value. For instance, if you enter **set qos-group precedence**, the precedence value will be copied and used as the QoS group value.

A packet is marked with a QoS group value only while it is being processed within the router. The QoS group value is not included in the packet’s header when the packet is transmitted over the output interface. However, the QoS group value can be used to set the value of a Layer 2 or Layer 3 field that is included as part of the packet’s headers (such as the MPLS EXP, CoS, and DSCP fields).



#### Note

The **set qos-group cos** and **set qos-group precedence** commands are equivalent to the **mls qos trust cos** and **mls qos trust prec** commands.



#### Tip

The **set qos-group** command cannot be applied until you create a service policy in policy-map configuration mode and then attach the service policy to an interface or ATM virtual circuit (VC). For information on attaching a service policy, refer to the “Modular Quality of Service Command-Line Interface Overview” chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.

### Examples

The following example shows how to set the QoS group to 1 for all packets that match the class map called class 1. These packets are then rate limited on the basis of the QoS group ID.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set qos-group 1
Router(config-pmap-c)# end
```

The following example shows how to set the QoS group value based on the packet's original 802.1P CoS value:

```
Router(config)# policy map policy1
Router(config-pmap)# class class-default
Router(config-pmap-c)# set qos-group cos
Router(config-pmap-c)# end
```

#### Enhanced Packet Marking Example

The following example shows how to set the QoS group value based on the values defined in a table map called table-map1. This table map is configured in a policy map called policy1. Policy map policy1 converts and propagates the QoS value according to the values defined in table-map1.

In this example, the QoS group value will be set according to the precedence value defined in table-map1.

```
Router(config)# policy map policy1
Router(config-pmap)# class class-default
Router(config-pmap-c)# set qos-group precedence table table-map1
Router(config-pmap-c)# end
```

#### Related Commands

Command	Description
<b>match input vlan</b>	Configures a class map to match incoming packets that have a specific VLAN ID.
<b>match qos-group</b>	Identifies a specified QoS group value as a match criterion.
<b>mls qos trust</b>	Sets the trusted state of an interface to determine which incoming QoS field on a packet, if any, should be preserved.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# shape

To specify average or peak rate traffic shaping, use the **shape** command in class-map configuration mode. To remove traffic shaping, use the **no** form of this command.

```
shape {average | peak} cir [bc] [be]
```

```
no shape {average | peak} cir [bc] [be]
```

## Syntax Description

<b>average</b>	Specifies average rate shaping.
<b>peak</b>	Specifies peak rate shaping.
<i>cir</i>	Specifies the committed information rate (CIR), in bits per second (bps).
<i>bc</i>	(Optional) Specifies the Committed Burst size, in bits.
<i>be</i>	(Optional) Specifies the Excess Burst size, in bits.

## Command Default

Average or peak rate traffic shaping is not specified.

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Traffic shaping limits the rate of transmission of data. In addition to using a specifically configured transmission rate, you can use Generic Traffic Shaping (GTS) to specify a derived transmission rate based on the level of congestion.

You can specify two types of traffic shaping; average rate shaping and peak rate shaping. Average rate shaping limits the transmission rate to the CIR. Using the CIR ensures that the average amount of traffic being sent conforms to the rate expected by the network.

Peak rate shaping configures the router to send more traffic than the CIR. To determine the peak rate, the router uses the following formula:

$$\text{peak rate} = \text{CIR}(1 + \text{Be} / \text{Bc})$$

where:

- Be is the Excess Burst size.
- Bc is the Committed Burst size.

Peak rate shaping allows the router to burst higher than average rate shaping. However, using peak rate shaping, the traffic sent above the CIR (the delta) could be dropped if the network becomes congested.

If your network has additional bandwidth available (over the provisioned CIR) and the application or class can tolerate occasional packet loss, that extra bandwidth can be exploited through the use of peak rate shaping. However, there may be occasional packet drops when network congestion occurs. If the traffic being sent to the network must strictly conform to the configured network provisioned CIR, then you should use average traffic shaping.

### Examples

The following example sets the uses average rate shaping to ensure a bandwidth of 256 kbps:

```
shape average 256000
```

The following example uses peak rate shaping to ensure a bandwidth of 300 kbps but allow throughput up to 512 kbps if enough bandwidth is available on the interface:

```
bandwidth 300
shape peak 512000
```

### Related Commands

Command	Description
<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>shape max-buffers</b>	Specifies the maximum number of buffers allowed on shaping queues.

## shape (percent)

To specify average or peak rate traffic shaping on the basis of a percentage of bandwidth available on an interface, use the **shape** command in policy-map class configuration mode. To remove traffic shaping, use the **no** form of this command.

**shape** { **average** | **peak** } **percent** *percentage* [*sustained-burst-in-msec* **ms**] [**be** *excess-burst-in-msec* **ms**] [**bc** *committed-burst-in-msec* **ms**]

**no shape** { **average** | **peak** } **percent** *percentage* [*sustained-burst-in-msec* **ms**] [**be** *excess-burst-in-msec* **ms**] [**bc** *committed-burst-in-msec* **ms**]

### Syntax Description

<b>average</b>	Specifies average rate traffic shaping.
<b>peak</b>	Specifies peak rate traffic shaping.
<b>percent</b>	Specifies that a percent of bandwidth will be used for either the average rate traffic shaping or peak rate traffic shaping.
<i>percentage</i>	Specifies the bandwidth percentage. Valid range is a number from 1 to 100.
<i>sustained-burst-in-msec</i>	(Optional) Sustained burst size used by the first token bucket for policing traffic. Valid range is a number from 4 to 200.
<b>ms</b>	(Optional) Indicates that the burst value is specified in milliseconds (ms).
<b>be</b>	(Optional) Excess burst (be) size used by the second token bucket for policing traffic.
<i>excess-burst-in-msec</i>	(Optional) Specifies the be size in milliseconds. Valid range is a number from 0 to 200.
<b>bc</b>	(Optional) Committed burst (bc) size used by the first token bucket for policing traffic.
<i>committed-burst-in-msec</i>	(Optional) Specifies the bc value in milliseconds. Valid range is a number from 1 to 2000.

### Command Default

The default bc and be is 4 ms.

### Command Modes

Policy-map class configuration

### Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(13)T	This command was modified for the Percentage-Based Policing and Shaping feature.
12.0(28)S	The command was integrated into Cisco IOS Release 12.0(28)S.
12.2(18)SXE	The command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(28)SB	The command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

---

**Usage Guidelines****Committed Information Rate**

This command calculates the committed information rate (CIR) on the basis of a percentage of the available bandwidth on the interface. Once a policy map is attached to the interface, the equivalent CIR value in bits per second (bps) is calculated on the basis of the interface bandwidth and the percent value entered with this command. The **show policy-map interface** command can then be used to verify the CIR bps value calculated.

The calculated CIR bps rate must be in the range of 8000 and 154,400,000 bps. If the rate is less than 8000 bps, the associated policy map cannot be attached to the interface. If the interface bandwidth changes (for example, more is added), the CIR bps values are recalculated on the basis of the revised amount of bandwidth. If the CIR percentage is changed after the policy map is attached to the interface, the bps value of the CIR is recalculated.

**Conform Burst and Peak Burst Sizes in Milliseconds**

This command also allows you to specify the values for the conform burst size and the peak burst size in milliseconds. If you want bandwidth to be calculated as a percentage, the conform burst size and the peak burst size must be specified in milliseconds (ms).

The traffic shape converge rate depends on the traffic pattern and the time slice (Tc) parameter, which is directly affected by the bc that you configured. The Tc and the average rate configured are used to calculate bits per interval sustained. Therefore, to ensure that the shape rate is enforced, use a bc that results in a Tc greater than 10 ms.

**Hierarchical Policy Maps**

The **shape (percent)** command, when used in “child” (hierarchical) policy maps, is not supported on the Cisco 7500, the Cisco 7200, or lower series routers. Therefore, the **shape (percent)** command cannot be configured for use in hierarchical policy maps on these routers.

**How Bandwidth Is Calculated**

The **shape (percent)** command is often used in conjunction with the **bandwidth** and **priority** commands. The **bandwidth** and **priority** commands can be used to calculate the total amount of bandwidth available on an entity (for example, a physical interface). When the **bandwidth** and **priority** commands calculate the total amount of bandwidth available on an entity, the following guidelines are invoked:

- If the entity is a physical interface, the total bandwidth is the bandwidth on the physical interface.
- If the entity is a shaped ATM permanent virtual circuit (PVC), the total bandwidth is calculated as follows:
  - For a variable bit rate (VBR) virtual circuit (VC), the sustained cell rate (SCR) is used in the calculation.
  - For an available bit rate (ABR) VC, the minimum cell rate (MCR) is used in the calculation.

For more information on bandwidth allocation, see the “Congestion Management Overview” chapter in the *Cisco IOS Quality of Service Solutions Configuration Guide*.

---

**Examples**

The following example configures traffic shaping using an average shaping rate on the basis of a percentage of bandwidth. In this example, 25 percent of the bandwidth has been specified. Additionally, an optional bc value and bc value (100 ms and 400 ms, respectively) have been specified.

```
Router> enable
Router# configure terminal
Router(config)# policy-map policy1
```

■ **shape (percent)**

```
Router(config-pmap)# class-map class1
Router(config-pmap-c)# shape average percent 25 20 ms be 100 ms bc 400 ms
Router(config-pmap-c)# end
```

After the policy map and class maps are configured, the policy map is attached to interface as shown in the following example.

```
Router> enable
Router# configure terminal
Router(config)# interface serial4/0
Router(config-if)# service-policy input policy1
Router(config-if)# end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change and the default class (commonly known as the class-default class) before you configure its policy.
<b>police (percent)</b>	Configures traffic policing on the basis of a percentage of bandwidth available on an interface.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>priority</b>	Gives priority to a class of traffic belonging to a policy map.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>shape max-buffers</b>	Specifies the maximum number of buffers allowed on shaping queues.
<b>show policy-map interface</b>	Displays the statistics and the configurations of the input and output policies that are attached to an interface.

# shape (policy-map class)

To shape traffic to the indicated bit rate according to the algorithm specified, or to enable ATM overhead accounting, use the **shape** command in policy-map class configuration mode. To remove shaping and leave the traffic unshaped, use the **no** form of this command.

```
shape [average | peak] mean-rate [burst-size] [excess-burst-size]
```

```
no shape [average | peak]
```

## Cisco 7300 Series Router and Cisco 7600 Series Router

```
shape [average | peak] mean-rate [burst-size] [excess-burst-size] account {qinq | dot1q} aal5
  {subscriber-encapsulation | {user-defined offset}}
```

```
no shape [average | peak] mean-rate [burst-size] [excess-burst-size] account {qinq | dot1q} aal5
  {subscriber-encapsulation | {user-defined offset}}
```

## Cisco 10000 Series Router (PRE1)

```
shape [average | peak] mean-rate [burst-size] [excess-burst-size] [account {qinq | dot1q} aal5
  subscriber-encapsulation]
```

```
no shape [average | peak] mean-rate [burst-size] [excess-burst-size] [account {qinq | dot1q} aal5
  subscriber-encapsulation]
```

## Cisco 10000 Series Router (PRE2)

```
shape [average] mean-rate [unit] [burst-size] [excess-burst-size] [account {qinq | dot1q} aal5
  subscriber-encapsulation]
```

```
no shape [average] mean-rate [unit] [burst-size] [excess-burst-size] [account {qinq | dot1q} aal5
  subscriber-encapsulation]
```

## Cisco 10000 Series Router (PRE3)

```
shape [average] mean-rate [burst-size] [excess-burst-size] account {{{qinq | dot1q} {aal5 | aal3}
  {subscriber-encapsulation}} | {user-defined offset [atm]}}
```

```
no shape [average] mean-rate [burst-size] [excess-burst-size] account {{{qinq | dot1q} {aal5 |
  aal3} {subscriber-encapsulation}} | {user-defined offset [atm]}}
```

### Syntax Description

<b>average</b>	(Optional) Committed Burst (Bc) is the maximum number of bits sent out in each interval.
<b>peak</b>	(Optional) Bc + Excess Burst (Be) is the maximum number of bits sent out in each interval.

■ **shape (policy-map class)**

<i>mean-rate</i>	(Optional) Also called committed information rate (CIR). Indicates the bit rate used to shape the traffic, in bits per second. When this command is used with backward explicit congestion notification (BECN) approximation, the bit rate is the upper bound of the range of bit rates that will be permitted.
<i>unit</i>	Specifies the unit of the specified bit rate (for example, kbps).
<i>burst-size</i>	(Optional) The number of bits in a measurement interval (Bc).
<i>excess-burst-size</i>	(Optional) The acceptable number of bits permitted to go over the Be.
<b>aal3</b>	Specifies the ATM Adaptation Layer 5 that supports both connectionless and connection-oriented links. You must specify either <b>aal3</b> or <b>aal5</b> .  <b>Note</b> For the Cisco 7300 and Cisco 7600 series routers, the <b>aal3</b> keyword is not supported.
<b>user-defined</b>	Specifies that the router is to use an offset size when calculating ATM overhead.
<i>offset</i>	Specifies the offset size when calculating ATM overhead. Valid values are from -63 to 63 bytes.  <b>Note</b> For the Cisco 7300 and Cisco 7600 series routers, valid values are from -48 to +48 bytes.  <b>Note</b> The router configures the offset size if you do not specify the <b>user-defined</b> <i>offset</i> option.
<b>atm</b>	Applies ATM cell tax in the ATM overhead calculation.  <b>Note</b> For the Cisco 7300 and Cisco 7600 series routers, the <b>atm</b> keyword is not supported.  <b>Note</b> Configuring both the <i>offset</i> and <b>atm</b> options adjusts the packet size to the offset size and then adds ATM cell tax.

**Command Default**

When the excess burst size (Be) is not configured, the default Be value is equal to the committed burst size (Bc). For more information about burst size defaults, see the “Usage Guidelines” section.

Traffic shaping overhead accounting for ATM is disabled.

**Command Modes**

Policy-map class configuration (config-pmap-c)

**Command History**

Release	Modification
12.0(5)XE	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.0(17)SL	This command was integrated into Cisco IOS Release 12.0(17)SL and implemented on the PRE1 for the Cisco 10000 series router.
12.2(16)BX	This command was integrated into Cisco IOS Release 12.2(16)BX and implemented on the PRE2 for the Cisco 10000 series router.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Release	Modification
12.2(31)SB2	This command was enhanced for ATM overhead accounting and implemented on the Cisco 10000 series router for the PRE3.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(31)SB6	This command was enhanced to specify an offset size when calculating ATM overhead and implemented on the Cisco 10000 series router for the PRE3.
12.2(33)SRC	Support for the Cisco 7600 series router was added.
12.2(33)SB	Support for the Cisco 7300 series router was added.

### Usage Guidelines

The measurement interval is the committed burst size (Bc) divided by committed information rate (CIR). Bc cannot be set to 0. If the measurement interval is too large (greater than 128 milliseconds), the system subdivides it into smaller intervals.

If you do not specify the committed burst size (Bc) and the excess burst size (Be), the algorithm decides the default values for the shape entity. The algorithm uses a 4 milliseconds measurement interval, so Bc is  $CIR * (4 / 1000)$ .

Burst sizes larger than the default committed burst size (Bc) need to be explicitly specified. The larger the Bc, the longer the measurement interval. A long measurement interval may affect voice traffic latency, if applicable.

When the excess burst size (Be) is not configured, the default value is equal to the committed burst size (Bc).

#### Traffic Shaping on the Cisco 10000 Series Performance Routing Engine

The Cisco 10000 series router does not support the **peak** keyword.

On the PRE2, you specify a shape rate and a unit for the rate. Valid values for the rate are from 1 to 2488320000 and units are bps, kbps, mbps, gbps. The default unit is kbps. For example:

```
shape 128000 bps
```

On the PRE3, you only need to specify a shape rate. Because the unit is always bps on the PRE3, the *unit* argument is not available. Valid values for the shape rate are from 1000 to 2488320000.

```
shape 1000
```

The PRE3 accepts the PRE2 **shape** command as a hidden command. However, the PRE3 rejects the PRE2 **shape** command if the specified rate is outside the valid PRE3 shape rate range (1000 to 2488320000).

#### Traffic Shaping Overhead Accounting for ATM (Cisco 7300 Series Router, Cisco 7600 Series Router, and Cisco 10000 Series Router)

When configuring ATM overhead accounting on the Cisco 7300 series router, the Cisco 7600 series router, or the Cisco 10000 series router, you must specify the BRAS-DSLAM, DSLAM-CPE, and subscriber line encapsulation types. The router supports the following subscriber line encapsulation types:

- **snap-rbe**

- **mux-rbe**
- **snap-dot1q-rbe**
- **mux-dot1q-rbe**
- **snap-pppoa**
- **mux-pppoa**
- **snap-1483routed**
- **mux-1483routed**

For hierarchical policies, configure ATM overhead accounting in the following ways:

- Enabled on parent—If you enable ATM overhead accounting on a parent policy, you are not required to enable accounting on the child policy.
- Enabled on child and parent—If you enable ATM overhead accounting on a child policy, then you must enable ATM overhead accounting on the parent policy.

The encapsulation types must match for the child and parent policies.

The user-defined offset values must match for the child and parent policies.

## Examples

The following example configures a shape entity with a CIR of 1 Mbps and attaches the policy map called dts-interface-all-action to interface pos1/0/0:

```
policy-map dts-interface-all-action
  class class-interface-all
    shape average 1000000

interface pos1/0/0
  service-policy output dts-interface-all-action
```

### Traffic Shaping Overhead Accounting for ATM

When a parent policy has ATM overhead accounting enabled for shaping, you are not required to enable accounting at the child level using the **police** command. In the following configuration example, ATM overhead accounting is enabled for bandwidth on the gaming and class-default class of the child policy map named subscriber\_classes and on the class-default class of the parent policy map named subscriber\_line. The voip and video classes do not have ATM overhead accounting explicitly enabled. These priority classes have ATM overhead accounting implicitly enabled because the parent policy has ATM overhead accounting enabled. Notice that the features in the parent and child policies use the same encapsulation type.

```
policy-map subscriber_classes
  class voip
    priority level 1
    police 8000
  class video
    priority level 2
    police 20
  class gaming
    bandwidth remaining percent 80 account aal5 snap-rbe-dot1q
  class class-default
    bandwidth remaining percent 20 account aal5 snap-rbe-dot1q
policy-map subscriber_line
  class class-default
    bandwidth remaining ratio 10 account aal5 snap-rbe-dot1q
    shape average 512 account aal5 snap-rbe-dot1q
    service policy subscriber_classes
```

In the following example, the router will use 20 overhead bytes and ATM cell tax in calculating ATM overhead. The child and parent policies contain the required matching offset values. The parent policy is attached to virtual template 1.

```
policy-map child
  class class1
    bandwidth 500 account user-defined 20 atm
  class class2
    shape average 30000 account user-defined 20 atm
```

Related Commands	Command	Description
	<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map, and enables ATM overhead accounting.
	<b>shape adaptive</b>	Configures a Frame Relay interface or a point-to-point subinterface to estimate the available bandwidth by BECN integration while traffic shaping is enabled.
	<b>shape fecn-adapt</b>	Configures a Frame Relay PVC to reflect received FECN bits as BECN bits in Q.922 TEST RESPONSE messages.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps. If configured, the command output includes information about ATM overhead accounting.
	<b>show running-config</b>	Displays the current configuration of the router. If configured, the command output includes information about ATM overhead accounting.

# shape adaptive

To configure a Frame Relay interface or a point-to-point subinterface to estimate the available bandwidth by backward explicit congestion notification (BECN) integration while traffic shaping is enabled, use the **shape adaptive** command in policy-map class configuration mode. To leave the available bandwidth unestimated, use the **no** form of this command.

**shape adaptive** *mean-rate-lower-bound*

**no shape adaptive**

<b>Syntax Description</b>	<i>mean-rate-lower-bound</i>	Specifies the lower bound of the range of permitted bit rates.
<b>Command Default</b>	Bandwidth is not estimated.	
<b>Command Modes</b>	Policy-map class configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)XE	This command was introduced.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.2(13)T	This command was implemented on the Cisco 1700 series, Cisco 2500 series, Cisco 2600 series, Cisco 3620 router, Cisco 3631 router, Cisco 3640 router, Cisco 3660 router, Cisco 3725 router, Cisco 3745 router, Cisco 7200 series, Cisco 7400 series routers.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

If traffic shaping is not enabled, this command has no effect.

When continuous BECN messages are received, the shape entity immediately decreases its maximum shape rate by one-fourth for each BECN message received until it reaches the lower bound committed information rate (CIR). If, after several intervals, the interface has not received another BECN and traffic is waiting in the shape queue, the shape entity increases the shape rate back to the maximum rate by 1/16 for each interval. A shape entity configured with the **shape adaptive** *mean-rate-lower-bound* command will always be shaped between the mean rate upper bound and the mean rate lower bound.

**Examples**

The following example configures a shape entity with CIR of 128 kbps and sets the lower bound CIR to 64 kbps when BECNs are received:

```
policy-map dts-p2p-all-action
  class class-p2p-all
    shape average 128000
    shape adaptive 64000
```

# shape fecn-adapt

To configure a Frame Relay interface to reflect received forward explicit congestion notification (FECN) bits as backward explicit congestion notification (BECN) bits in Q.922 TEST RESPONSE messages, use the **shape fecn-adapt** command in policy-map class configuration mode. To configure the Frame Relay interface to not reflect FECN as BECN, use the **no** form of this command.

**shape fecn-adapt**

**no shape fecn-adapt**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Policy-map class configuration

## Command History

Release	Modification
12.0(5)XE	This command was introduced.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
12.2(13)T	This command was implemented on the Cisco 1700 series, Cisco 2500 series, Cisco 2600 series, Cisco 3620 router, Cisco 3631 router, Cisco 3640 router, Cisco 3660 router, Cisco 3725 router, Cisco 3745 router, Cisco 7200 series, Cisco 7400 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

When the downstream Frame Relay switch is congested, a Frame Relay interface or point-to-point interface receives a Frame Relay message with the FECN bit on. This message may be an indication that no traffic is waiting to carry a BECN to the far end (voice/multimedia traffic is one-way). When the **shape fecn-adapt** command is configured, a small buffer is allocated and a Frame Relay TEST RESPONSE is built on behalf of the Frame Relay switch. The Frame Relay TEST RESPONSE is equipped with the triggering data-link connection identifier (DLCI) of the triggering mechanism. It also sets the BECN bit and sends it out to the wire.

**Examples**

The following example configures a shape entity with a committed information rate (CIR) of 1 Mbps and adapts the Frame Relay message with FECN to BECN:

```
policy-map dts-p2p-all-action
class class-p2p-all
  shape average 1000000
  shape fecn-adapt
```

**Related Commands**

Command	Description
<b>shape adaptive</b>	Configures a Frame Relay interface or a point-to-point subinterface to estimate the available bandwidth by BECN integration while traffic shaping is enabled.
<b>shape (percent)</b>	Configures an interface to shape traffic to an indicated bit rate.

# shape max-buffers

To specify the maximum number of buffers allowed on shaping queues, use the **shape max-buffers** command in class-map configuration mode. To remove the maximum number of buffers, use the **no** form of this command.

**shape max-buffers** *number-of-buffers*

**no shape max-buffers** *number-of-buffers*

## Syntax Description

<i>number-of-buffers</i>	Specifies the maximum number of buffers. The minimum number of buffers is 1; the maximum number of buffers is 4096.
--------------------------	---

## Command Default

1000 buffers

## Command Modes

Class-map configuration

## Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You can specify the maximum number of buffers allowed on shaping queues for each class configured to use Generic Traffic Shaping (GTS).

## Examples

The following example configures shaping and sets the maximum buffer limit to 100:

```
shape average 350000
shape max-buffers 100
```

## Related Commands

Command	Description
<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map.
<b>class (policy-map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

Command	Description
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>shape</b>	Specifies average or peak rate traffic shaping.

# show access-lists rate-limit

To display information about rate-limit access lists, use the **show access-lists rate-limit** command in EXEC mode.

```
show access-lists rate-limit [acl-index]
```

Syntax Description	<i>acl-index</i>	(Optional) Rate-limit access list number from 1 to 299.
--------------------	------------------	---

Command Modes	EXEC
---------------	------

Command History	Release	Modification
	11.1CC	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show access-lists rate-limit** command:

```
Router# show access-lists rate-limit
```

```
Rate-limit access list 1
  0
Rate-limit access list 2
  1
Rate-limit access list 3
  2
Rate-limit access list 4
  3
Rate-limit access list 5
  4
Rate-limit access list 6
  5
Rate-limit access list 9
  mask FF
Rate-limit access list 10
  mask 0F
Rate-limit access list 11
  mask F0
Rate-limit access list 100
  1001.0110.1111
Rate-limit access list 101
  00E0.34B8.D840
Rate-limit access list 199
  1111.1111.1111
```

The following is sample output from the **show access-lists rate-limit** command when specific rate-limit access lists are specified:

```
Router# show access-lists rate-limit 1

Rate-limit access list 1
  0

Router# show access-lists rate-limit 9

Rate-limit access list 9
  mask FF

Router# show access-lists rate-limit 101

Rate-limit access list 101
  00E0.34B8.D840
```

[Table 41](#) describes the significant fields shown in the displays.

**Table 41** *show access-lists rate-limit Field Descriptions*

Field	Description
Rate-limit access list	Rate-limit access list number. A number from 1 to 99 represents a precedence-based access list. A number from 100 to 199 indicates a MAC address-based access list.
0	IP Precedence for packets in this rate-limit access list.
mask FF	IP Precedence mask for packets in this rate-limit access list.
1001.0110.1111	MAC address for packets in this rate-limit access list.

#### Related Commands

Command	Description
<b>access-list rate-limit</b>	Configures an access list for use with CAR policies.
<b>show access-lists</b>	Displays the contents of current IP and rate-limit access lists.

# show atm bundle

To display the bundle attributes assigned to each bundle virtual circuit (VC) member and the current working status of the VC members, use the **show atm bundle** command in privileged EXEC mode.

**show atm bundle** *bundle-name*

Syntax Description	<i>bundle-name</i>	The name of the bundle whose member information is displayed. This is the bundle name specified by the <b>bundle</b> command when the bundle was created.
--------------------	--------------------	---

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(3)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show atm bundle** command (\* indicates that this VC is the VC for all precedence levels not explicitly configured):

Router# **show atm bundle**

new-york on atm1/0.1 Status: UP

Name	VPI/VCI	Config. Preced.	Active Preced.	Bumping Predec./ Accept	PG/ PV	Peak kbps	Avg/Min kbps	Burst Cells	Status
ny-control	0/207	7	7	4 /Yes	pv	10000	5000	32	UP
ny-premium	0/206	6-5	6-5	7 /No	pg	20000	10000	32	UP
ny-priority	0/204	4-2	4-2	1 /Yes	pg	10000	3000		UP
ny-basic*	0/201	1-0	1-0	- /Yes	pg	10000			UP

los-angeles on atm1/0.1 - Status: UP

Name	VPI/VCI	Config. Preced.	Active Preced.	Bumping Predec./ Accept	pg/ pv	Peak kbps	Avg/Min kbps	Burst Cells	Status
la-high	0/407	7-5	7-5	4 /Yes	pv	20000	5000	32	UP
la-med	0/404	4-2	4-2	1 /Yes	pg	10000	3000		UP
la-low*	0/401	1-0	1-0	- /Yes	pg	10000			UP

san-francisco on atm1/0.1 Status: UP

Name	VPI/VCI	Config. Preced.	Active Preced.	Bumping Predec./	PG/ PV	Peak kbps	Avg/Min kbps	Burst Cells	Status
------	---------	-----------------	----------------	------------------	--------	-----------	--------------	-------------	--------

Accept										
sf-control	0/307	7	7	4 /Yes	pv	10000	5000	32		UP
sf-premium	0/306	6-5	6-5	7 /No	pg	20000	10000	32		UP
sf-priority	0/304	4-2	4-2	1 /Yes	pg	10000	3000			UP
sf-basic*	0/301	1-0	1-0	- /Yes	pg	10000				UP

**Related Commands**

Command	Description
<b>show atm bundle statistics</b>	Displays statistics on the specified bundle.
<b>show atm map</b>	Displays the list of all configured ATM static maps to remote hosts on an ATM network.

# show atm bundle statistics

To display statistics or detailed statistics on the specified bundle, use the **show atm bundle statistics** command in privileged EXEC mode.

**show atm bundle** *bundle-name* **statistics** [**detail**]

<b>Syntax Description</b>	<i>bundle-name</i>	Specifies the name of the bundle whose member information is displayed. This is the bundle name specified by the <b>bundle</b> command when the bundle was created.
	<b>detail</b>	(Optional) Displays detailed statistics.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
		12.0(3)T
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show atm bundle statistics** command:

```
Router# show atm bundle san-jose statistics
```

```
Bundle Name: Bundle State: UP
AAL5-NLPID
OAM frequency : 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
BUNDLE is not managed.
InARP frequency: 15 minute(s)
InPkts: 3, OutPkts: 3, Inbytes: 1836, Outbytes: 1836
InPRoc: 3, OutPRoc: 0, Broadcasts: 3
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
```

```
Router# show atm bundle san-jose statistics detail
```

```
Bundle Name: Bundle State: UP
AAL5-NLPID
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
BUNDLE is not managed.
InARP frequency: 15 minute(s)
InPkts: 3, OutPkts: 3, InBytes: 1836, OutBytes: 1836
InPRoc: 3, OutPRoc: 0, Broadcasts: 3
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0

ATM1/0.52: VCD: 6, VPI: 0 VCI: 218, Connection Name: sj-basic
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0xE00
```

```

OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OMA VC state: Not Managed
ILMI VC state: Not Managed
InARP frequency: 15 minute(s)
InPkts: 3, OutPkts: 3, InBytes: 1836, OutBytes: 1836
InPRoc: 3, OutPRoc: 0, Broadcasts: 3
InFast: 0, OutFast: 0, InAS: 0, OututAS: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 OutSegloop:0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, f5 Out RDI:0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OUtRDI: 0
OAM cell drops: 0
Status; UP

ATM1/0.52: VCD: 4, VPI: 0 VCI: 216, Connection Name: sj-premium
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype: 0x0, Flags: 0xC20, VCmode: 0xE000
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
ILMI VC state: Not Managed
InARP frequency: 15 minute(s)
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0
OAM cells received: 0
F5 InEndloop: 0, F4 InSegloop: 0, F4InAIS; 0, F4 InRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: F4 OutRDI: 0
OAM cell drops: 0
Status: UP

```

**Related Commands**

Command	Description
<b>show atm bundle</b>	Displays the bundle attributes assigned to each bundle VC member and the current working status of the VC members.
<b>show atm map</b>	Displays the list of all configured ATM static maps to remote hosts on an ATM network.

# show atm bundle svc

To display the bundle attributes assigned to each bundle virtual circuit (VC) member and the current working status of the VC members, use the **show atm bundle svc** command in privileged EXEC mode.

```
show atm bundle svc [bundle-name]
```

<b>Syntax Description</b>	<i>bundle-name</i>	(Optional) Name of the switched virtual circuit (SVC) bundle to be displayed, as identified by the <b>bundle svc</b> command.
---------------------------	--------------------	---

**Command Default** If no bundle name is specified, all SVC bundles configured on the system are displayed.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(4)T	This command was introduced.

## Examples

The following example provides output for the **show atm bundle svc** command. The bundle named “finance” is configured on ATM interface 1/0.1 with eight members. All of the members are up except bundle member zero. Bundle member zero is the default member, which if initiated once will always be on and used as the default for all traffic.

```
Router# show atm bundle svc finance
```

```
finance on ATM1/0.1:UP
```

VC Name	VPI/VCI	Config Preced.	Current Preced.	Peak Kbps	Avg/Min kbps	Burst Cells	Sts
seven	0/37	7	7	10000	5000	32	UP
six	0/36	6	6	6000			UP
five	0/40	5	5	5000			UP
four	0/41	4	4	4000			UP
three	0/42	3	3	3000			UP
two	0/43	2	2	2000			UP
one	0/44	1	1	1000			UP
zero*		0					

Table 42 describes the significant fields in the display.

**Table 42** *show atm bundle svc Field Descriptions*

Field	Description
finance on ATM1/0.1: UP	Name of SVC bundle, interface type and number, status of bundle.
VC Name	Name of SVC bundle.
VPI/VCI	Virtual path identifier / virtual channel identifier.
Config. Preced.	Configured precedence.
Current Preced.	Current precedence.
Peak Kbps	Peak kbps for the SVC.
Avg/Min kbps	Average or minimum kbps for the SVC.
Sts	Status of the bundle member.
*	Indicates the default bundle member.

#### Related Commands

Command	Description
<b>bundle svc</b>	Creates or modifies an SVC bundle.

# show atm bundle svc statistics

To display the statistics of a switched virtual circuit (SVC) bundle, use the **show atm bundle svc statistics** command in privileged EXEC mode.

**show atm bundle svc *bundle-name* statistics**

<b>Syntax Description</b>	<i>bundle-name</i>	Name of the SVC bundle as identified by the <b>bundle svc</b> command.
---------------------------	--------------------	--

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(4)T	This command was introduced.

**Examples** The following example provides output for the **show atm bundle svc statistics** command using a bundle named “city”:

```
Router# show atm bundle svc city statistics

Bundle Name:Bundle State:INITIALIZING
AAL5-NLPID
OAM frequency:0 second(s), OAM retry frequency:10 second(s)
OAM up retry count:4, OAM down retry count:3
BUNDLE is managed by.
InARP frequency:15 minutes(s)
InPkts:0, OutPkts:0, InBytes:0, OutBytes:0
InProc:0, OutProc:0, Broadcasts:0
InFast:0, OutFast:0, InAS:0, OutAS:0
InPktDrops:0, OutPktDrops:0
CrcErrors:0, SarTimeOuts:0, OverSizedSDUs:0,
      LengthViolation:0, CPIDerrors:0
```

Table 43 describes the significant fields in the display.

**Table 43** *show atm bundle svc statistics Field Descriptions*

Field	Description
Bundle Name:	Name of the bundle.
Bundle State:	State of the bundle.
BUNDLE is managed by.	Bundle management.
InARP frequency:	Number of minutes between Inverse ARP messages, or “DISABLED” if Inverse ARP is not in use on this VC.
InPkts:	Total number of packets received on this virtual circuit (VC), including all fast-switched and process-switched packets.

**Table 43** *show atm bundle svc statistics Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
OutPkts:	Total number of packets sent on this VC, including all fast-switched and process-switched packets.
InBytes:	Total number of bytes received on this VC, including all fast-switched and process-switched packets.
OutBytes:	Total number of bytes sent on this VC, including all fast-switched and process-switched packets.
InPRoc:	Number of incoming packets being process switched.
OutPRoc:	Number of outgoing packets being process switched.
Broadcasts:	Number of process-switched broadcast packets.
InFast:	Number of incoming packets being fast switched.
OutFast:	Number of outgoing packets being fast switched.
InAS	Number of autonomous-switched or silicon-switched input packets received.
OutAS	Number of autonomous-switched or silicon-switched input packets sent.
InPktDrops:	Number of incoming packets dropped.
OutPktDrops:	Number of outgoing packets dropped.
CrcErrors:	Number of cyclic redundancy check (CRC) errors.
SarTimeOuts:	Number of packets that timed out before segmentation and reassembly occurred.
LengthViolation:	Number of packets too long or too short.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>bundle svc</b>	Creates or modifies an SVC bundle.

# show auto discovery qos

To display the data collected during the Auto-Discovery (data collection) phase of the AutoQoS for the Enterprise feature, use the **show auto discovery qos** command in privileged EXEC mode.

**show auto discovery qos** [**interface** *type number*]

Syntax Description	interface	(Optional) Indicates that the configurations for a specific interface type will be displayed.
	<i>type number</i>	(Optional) Specifies the interface type and number.

**Command Default** Displays the configurations created for all interface types.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.3(7)T	This command was introduced.
	12.3(11)T	Command output was modified to include suggested policy map information.

**Usage Guidelines** The suggested policy output (shown in the example below) lets you preview class maps and policy maps before you issue the **auto qos** command on an interface. You can then continue with the Auto-Discovery phase until more data is gathered or you can cut and paste the existing data and edit it as desired.

**Examples** The following is sample output from the **show auto discovery qos** command. This example displays the data collected during the Auto-Discovery (data collection) phase using DSCP classification in trusted mode and includes suggested policy map information.

```
Router# show auto discovery qos

Serial2/1.1
AutoQoS Discovery enabled for trusted DSCP
Discovery up time: 2 hours, 42 minutes
AutoQoS Class information:
Class Voice:
Recommended Minimum Bandwidth: 118 Kbps/1% (PeakRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
46/ef           106/1            118/1         129510064
Class Interactive Video:
Recommended Minimum Bandwidth: 25 Kbps/<1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
```

```

-----
34/af41          25/<1          28/<1          31084292
Class Signaling:
Recommended Minimum Bandwidth: 50 Kbps/<1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
24/cs3          50/<1          56/<1          61838040
Class Streaming Video:
Recommended Minimum Bandwidth: 79 Kbps/<1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
32/cs4          79/<1          88/<1          96451788
Class Transactional:
Recommended Minimum Bandwidth: 105 Kbps/1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
18/af21         105/1          117/1         127798678
Class Bulk:
Recommended Minimum Bandwidth: 132 Kbps/1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
10/af11         132/1          147/1         160953984
Class Scavenger:
Recommended Minimum Bandwidth: 24 Kbps (AverageRate)/0% (fixed)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
8/cs1           24/<1          27/<1          30141238
Class Management:
Recommended Minimum Bandwidth: 34 Kbps/<1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
16/cs2          34/<1          38/<1          41419740
Class Routing:
Recommended Minimum Bandwidth: 7 Kbps/<1% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
48/cs6          7/<1           7/<1           8634024
Class Best Effort:
Current Bandwidth Estimation: 820 Kbps/8% (AverageRate)
Detected DSCPs and data:
DSCP value      AverageRate      PeakRate      Total
                (kbps/%)        (kbps/%)      (bytes)
-----
0/default       820/8          915/9          997576380

```

Suggested AutoQoS Policy based on a discovery uptime of 2 hours, 42 minutes:

```

!
class-map match-any AutoQoS-Voice-Trust
match ip dscp ef

```

```

!
class-map match-any AutoQoS-Inter-Video-Trust
  match ip dscp af41
!
class-map match-any AutoQoS-Signaling-Trust
  match ip dscp cs3
!
class-map match-any AutoQoS-Stream-Video-Trust
  match ip dscp cs4
!
class-map match-any AutoQoS-Transactional-Trust
  match ip dscp af21
  match ip dscp af22
  match ip dscp af23
!
class-map match-any AutoQoS-Bulk-Trust
  match ip dscp af11
  match ip dscp af12
  match ip dscp af13
!
class-map match-any AutoQoS-Scavenger-Trust
  match ip dscp cs1
!
class-map match-any AutoQoS-Management-Trust
  match ip dscp cs2
!
class-map match-any AutoQoS-Routing-Trust
  match ip dscp cs6
!

policy-map AutoQoS-Policy-S2/1.1Trust
  class AutoQoS-Voice-Trust
    priority percent 1
  class AutoQoS-Inter-Video-Trust
    bandwidth remaining percent 1
  class AutoQoS-Signaling-Trust
    bandwidth remaining percent 1
  class AutoQoS-Stream-Video-Trust
    bandwidth remaining percent 1
  class AutoQoS-Transactional-Trust
    bandwidth remaining percent 1
    random-detect dscp-based
  class AutoQoS-Bulk-Trust
    bandwidth remaining percent 1
    random-detect dscp-based
  class AutoQoS-Scavenger-Trust
    bandwidth remaining percent 1
  class AutoQoS-Management-Trust
    bandwidth remaining percent 1
  class AutoQoS-Routing-Trust
    bandwidth remaining percent 1
  class class-default
    fair-queue

```

Table 44 describes the significant fields shown in the display.

**Table 44** *show auto discovery qos Field Descriptions*

Field	Description
Serial2/1.1	The interface or subinterface on which data is being collected.
AutoQoS Discovery enabled for trusted DSCP	Indicates that the data collection phase of AutoQoS has been enabled.
Discovery up time	Indicates the period of time in which data was collected.
AutoQoS Class information	Displays information for each AutoQoS class.
Class Voice	Information for the named class, along with data pertaining to the detected applications. This data includes DSCP value, average rate (in kilobits per second (kbps)), peak rate (kbps), and total packets (bytes).
Suggested AutoQoS Policy based on a discovery uptime of hours and minutes	Policy-map and class-map statistics based on a specified discovery time.

#### Related Commands

Command	Description
<b>auto qos</b>	Installs the QoS class maps and policy maps created by the AutoQoS for the Enterprise feature.
<b>auto discovery qos</b>	Begins discovering and collecting data for configuring the AutoQoS for the Enterprise feature.
<b>show auto qos</b>	Displays the interface configurations, policy maps, and class maps created by AutoQoS on a specific interface or all interfaces.

# show auto qos

To display the interface configurations, policy maps, and class maps created by AutoQoS on a specific interface or all interfaces, use the **show auto qos** command in privileged EXEC mode.

```
show auto qos [interface [type slot/port]]
```

Syntax Description	interface	(Optional) Displays the configurations created by the AutoQoS - VoIP feature on all the interfaces or PVCs on which the AutoQoS - VoIP feature is enabled.
		When the <b>interface</b> keyword is configured but an interface type is not specified, the <b>show auto qos interface</b> command displays the configurations created by the AutoQoS - VoIP feature on all the interfaces or Permanent Virtual Circuits (PVCs) on which the AutoQoS - VoIP feature is enabled.
	<i>type</i>	(Optional) Specifies an interface type; valid values are <b>atm</b> , <b>ethernet</b> , <b>fastethernet</b> , <b>ge-wan</b> , <b>gigabitethernet</b> , <b>pos</b> , and <b>tengigabitethernet</b> .
	<i>slot/port</i>	Module and port number.

**Command Default** Configurations created for all interface types are displayed.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	12.2(15)T	This command was introduced as part of the AutoQoS—VoIP feature.
	12.3(7)T	This command was modified for the AutoQoS for the Enterprise feature. The command displays the classes, class maps, and policy maps created on the basis of the data collected during the Auto-Discovery phase of the AutoQoS for the Enterprise feature.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** The **show auto qos interface** command can be used with Frame Relay data-link connection identifiers (DLCIs) and ATM permanent virtual circuits (PVCs).

When the AutoQoS—VoIP or the AutoQoS for the Enterprise features are enabled, configurations are generated for each interface or PVC. These configurations are then used to create the interface configurations, policy maps, class maps, and access control lists (ACLs) for use on the network. The **show auto qos** command can be used to verify the contents of the interface configurations, policy maps, class maps, and ACLs.

### Catalyst 6500 Series Switches

AutoQoS is supported on the following modules:

- WS-X6548-RJ45
- WS-X6548-RJ21
- WS-X6148-GE\_TX
- WS-X6548-GE-TX-CR
- WS-X6148-RJ45V
- WS-X6148-RJ21V
- WS-X6348-RJ45
- WS-X6348-RJ21
- WS-X6248-TEL

### Examples

#### show auto qos interface Command: Configured for the AutoQoS—VoIP Feature

When the **interface** keyword is configured along with the corresponding *type slot/port* argument, the **show auto qos interface type slot/port** command displays the configurations created by the AutoQoS—VoIP feature on the specified interface.

In the following example, the serial subinterface 6/1.1 has been specified:

```
Router# show auto qos interface serial6/1.1

S6/1.1: DLCI 100 -
!
interface Serial6/1
  frame-relay traffic-shaping
!
interface Serial6/1.1 point-to-point
  frame-relay interface-dlci 100
  class AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay ip rtp header-compression
!
map-class frame-relay AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay cir 512000
  frame-relay bc 5120
  frame-relay be 0
  frame-relay mincir 512000
  service-policy output AutoQoS-Policy-UnTrust
  frame-relay fragment 640
```

When the **interface** keyword is configured but an interface type is not specified, the **show auto qos interface** command displays the configurations created by the AutoQoS—VoIP feature on all the interfaces or PVCs on which the AutoQoS—VoIP feature is enabled.

```
Router# show auto qos interface

Serial6/1.1: DLCI 100 -
!
interface Serial6/1
  frame-relay traffic-shaping
!
interface Serial6/1.1 point-to-point
  frame-relay interface-dlci 100
  class AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay ip rtp header-compression
```

```

!
map-class frame-relay AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay cir 512000
  frame-relay bc 5120
  frame-relay be 0
  frame-relay mincir 512000
  service-policy output AutoQoS-Policy-UnTrust
  frame-relay fragment 640

ATM2/0.1: PVC 1/100 -
!
interface ATM2/0.1 point-to-point
  pvc 1/100
    tx-ring-limit 3
    encapsulation aal5mux ppp Virtual-Template200
!
interface Virtual-Template200
  bandwidth 512
  ip address 10.10.107.1 255.255.255.0
  service-policy output AutoQoS-Policy-UnTrust
  ppp multilink
  ppp multilink fragment-delay 10
  ppp multilink interleave

```

The following example displays all of the configurations created by the AutoQoS—VoIP feature:

```
Router# show auto qos
```

```

Serial6/1.1: DLCI 100 -
!
interface Serial6/1
  frame-relay traffic-shaping
!
interface Serial6/1.1 point-to-point
  frame-relay interface-dlci 100
  class AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay ip rtp header-compression
!
map-class frame-relay AutoQoS-VoIP-FR-Serial6/1-100
  frame-relay cir 512000
  frame-relay bc 5120
  frame-relay be 0
  frame-relay mincir 512000
  service-policy output AutoQoS-Policy-UnTrust
  frame-relay fragment 640

```

Table 45 describes the significant fields shown in the display.

**Table 45** show auto qos Field Descriptions (AutoQoS—VoIP Feature Configured)

Field	Description
class AutoQoS-VoIP-FR-Serial6/1-100	Name of the class created by the AutoQoS—VoIP feature. In this instance, the name of the class is AutoQoS-VoIP-FR-Serial6/1-100.
service-policy output AutoQoS-Policy-UnTrust	Indicates that the policy map called “AutoQoS-Policy-UnTrust” has been attached to an interface in the outbound direction of the interface.

**show auto qos interface Command: Configured for the AutoQoS for the Enterprise Feature**

The following is sample output from the **show auto qos** command. This example displays the classes, class maps, and policy maps created on the basis of the data collected during the Auto-Discovery phase of the AutoQoS for the Enterprise feature.

```
Router# show auto qos
!
policy-map AutoQoS-Policy-Se2/1.1
  class AutoQoS-Voice-Se2/1.1
    priority percent 70
    set dscp ef
  class AutoQoS-Inter-Video-Se2/1.1
    bandwidth remaining percent 10
    set dscp af41
  class AutoQoS-Stream-Video-Se2/1.1
    bandwidth remaining percent 1
    set dscp cs4
  class AutoQoS-Transactional-Se2/1.1
    bandwidth remaining percent 1
    set dscp af21
  class AutoQoS-Scavenger-Se2/1.1
    bandwidth remaining percent 1
    set dscp cs1
  class class-default
    fair-queue
!
policy-map AutoQoS-Policy-Se2/1.1-Parent
  class class-default
    shape average 1024000
    service-policy AutoQoS-Policy-Se2/1.1
!
class-map match-any AutoQoS-Stream-Video-Se2/1.1
  match protocol cuseeme
!
class-map match-any AutoQoS-Transactional-Se2/1.1
  match protocol sqlnet
!
class-map match-any AutoQoS-Voice-Se2/1.1
  match protocol rtp audio
!
class-map match-any AutoQoS-Inter-Video-Se2/1.1
  match protocol rtp video
!
rmon event 33333 log trap AutoQoS description "AutoQoS SNMP traps for Voice Drops" owner
AutoQoS

Serial2/1.1: DLCI 58 -
!
interface Serial2/1.1 point-to-point
  frame-relay interface-dlci 58
  class AutoQoS-FR-Serial2/1-58
!
map-class frame-relay AutoQoS-FR-Serial2/1-58
  frame-relay cir 1024000
frame-relay bc 10240
  frame-relay be 0
  frame-relay mincir 1024000
  service-policy output AutoQoS-Policy-Se2/1.1-Parent
```

Table 46 describes the significant fields shown in the display.

**Table 46** *show auto qos Field Descriptions (AutoQoS for the Enterprise Feature Configured)*

Field	Description
policy-map AutoQoS-Policy-Se2/1.1	Name of the policy map created by the AutoQoS feature. In this instance the name of the policy map is AutoQoS-Policy-Se2/1.1.
class AutoQoS-Voice-Se2/1.1 priority percent 70 set dscp ef	Name of class created by the AutoQoS feature. In this instance, the name of the class is AutoQoS-Voice-Se2/1.1. Following the class name, the specific QoS features configured for the class are displayed.
class-map match-any AutoQoS-Stream-Video-Se2/1.1 match protocol cuseeme	Name of the class map and the packet matching criteria specified.

#### Related Commands

Command	Description
<b>auto discovery qos</b>	Begins discovering and collecting data for configuring the AutoQoS for the Enterprise feature.
<b>auto qos</b>	Installs the QoS class maps and policy maps created by the AutoQoS for the Enterprise feature.
<b>auto qos voip</b>	Configures the AutoQoS—VoIP feature on an interface.
<b>show auto discovery qos</b>	Displays the data collected during the Auto-Discovery phase of the AutoQoS for the Enterprise feature.

# show class-map

To display all class maps and their matching criteria, use the **show class-map** command in user or privileged EXEC mode.

## Cisco 3660, 3845, 6500, 7400, and 7500 Series Routers

```
show class-map [type {stack | access-control}] [class-map-name]
```

## Cisco 7600 Series Routers

```
show class-map [class-map-name]
```

Syntax Description		
<b>type stack</b>	(Optional)	Displays class maps configured to determine the correct protocol stack in which to examine via flexible packet matching (FPM).
<b>type access-control</b>	(Optional)	Displays class maps configured to determine the exact pattern to look for in the protocol stack of interest.
<i>class-map-name</i>	(Optional)	Name of the class map. The class map name can be a maximum of 40 alphanumeric characters.

**Command Default** Shows all class maps.

**Command Modes** User or privileged EXEC

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.2(13)T	This command was modified to display the Frame Relay data-link connection identifier (DLCI) number as a criterion for matching traffic inside a class map.  In addition, this command was modified to display Layer 3 packet length as a criterion for matching traffic inside a class map.
	12.2(14)SX	Support for this command was introduced on the Cisco 7600 series routers.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.4(4)T	The <b>type</b> , <b>stack</b> , and <b>access-control</b> keywords were added to support FPM.

**Usage Guidelines** You can use the **show class-map** command to display all class maps and their matching criteria. If you enter the optional *class-map-name* argument, the specified class map and its matching criteria will be displayed.

## Examples

In the following example, three class maps are defined. Packets that match access list 103 belong to class c3, IP packets belong to class c2, and packets that come through input Ethernet interface 1/0 belong to class c1. The output from the **show class-map** command shows the three defined class maps.

```
Router# show class-map

Class Map c3
Match access-group 103

Class Map c2
Match protocol ip

Class Map c1
Match input-interface Ethernet1/0
```

In the following example, a class map called “c1” has been defined, and the Frame Relay DLCI number of 500 has been specified as a match criterion:

```
Router# show class-map

class map match-all c1
  match fr-dlci 500
```

The following example shows how to display class-map information for all class maps:

```
Router# show class-map

Class Map match-any class-default (id 0)
  Match any
Class Map match-any class-simple (id 2)
  Match any
Class Map match-all ipp5 (id 1)
  Match ip precedence 5

Class Map match-all agg-2 (id 3)
```

The following example shows how to display class-map information for a specific class map:

```
Router# show class-map ipp5

Class Map match-all ipp5 (id 1)
  Match ip precedence 5
```

[Table 47](#) describes the significant fields shown in the display.

**Table 47** *show class-map Field Descriptions<sup>1</sup>*

Field	Description
Class Map	Class of traffic being displayed. Output is displayed for each configured class map in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
Match	Match criteria specified for the class map. Criteria include the Frame Relay DLCI number, Layer 3 packet length, IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) groups.

1. A number in parentheses may appear next to the class-map name and match criteria information. The number is for Cisco internal use only and can be disregarded.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>match fr-dlci</b>	Specifies the Frame Relay DLCI number as a match criterion in a class map.
<b>match packet length (class-map)</b>	Specifies and uses the length of the Layer 3 packet in the IP header as a match criterion in a class map.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# show control-plane cef-exception counters

To display the control-plane packet counters for the control-plane cef-exception subinterface, use the **show control-plane cef-exception counters** command in privileged EXEC mode.

**show control-plane cef-exception counters**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane cef-exception counters** command displays the following packet counts for features configured on the control-plane cef-exception subinterface:

- Total number of packets that were processed by the cef-exception subinterface
- Total of packets that were dropped
- Total number of errors

**Examples** The following is sample output from the **show control-plane cef-exception counters** command:

```
Router# show control-plane cef-exception counters

Control plane cef-exception path counters:

Feature                Packets Processed/Dropped/Errors
Control Plane Policing 63456/9273/0
```

[Table 48](#) describes the significant fields shown in the display.

**Table 48** *show control-plane cef-exception counters Field Descriptions*

Field	Description
Feature	Name of the configured feature on this subinterface.
Packets Processed	Total number of packets that were processed by the feature.
Dropped	Total number of packets that were dropped by the feature.
Errors	Total number of errors detected by the feature.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control-plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.

# show control-plane cef-exception features

To display the control-plane features for control-plane cef-exception subinterface, use the **show control-plane cef-exception features** command in privileged EXEC mode.

**show control-plane cef-exception features**

**Syntax Descriptions** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane cef-exception features** command displays the following aggregate feature configurations for the control-plane cef-exception subinterface:

- Number of features configured for the control-plane cef-exception subinterface.
- Name of the feature
- Date and time the feature was activated

**Examples** The following is sample output from the **show control-plane cef-exception features** command:

```
Router# show control-plane cef-exception features

Total 1 features configure
Control plane cef-exception path features:

Control Plane Policing activated Nov 09 2005 12:40
```

[Table 49](#) describes the significant fields shown in the display.

**Table 49** *show control-plane cef-exception features Field Descriptions*

Field	Description
Total features configured	Number of features configured.
Feature Name	Name of the configured features.
Activated	Date and time the feature was activated.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control-plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.

# show control-plane counters

To display the control-plane counters for all control-plane interfaces, use the **show control-plane counters** command in privileged EXEC mode.

**show control-plane counters**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane counters** command displays the following aggregate packet counts for all control-plane interfaces and subinterface:

- Total number of packets that were processed by control-plane aggregate host, transit, and cef-exception subinterfaces
- Total number of packets that were dropped
- Total number of errors

**Examples** The following is sample output from the **show control-plane counters** command:

```
Router# show control-plane counters

Feature Path      Packets Processed/Dropped/Errors
-----
aggregate         43271/6759/0
host              24536/4238/0
transit           11972/2476/0
cef-exception path 6345/0/0
```

[Table 50](#) describes the significant fields shown in the display.

**Table 50** *show control-plane counters Field Descriptions*

Field	Description
Feature	Name of the interface or subinterface displayed.
Packets Processed	Total number of packets that were processed by the subinterface.
Dropped	Total number of packets that were dropped.
Errors	Total number of errors detected.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control-plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# show control-plane features

To display the configured control-plane features, use the **show control-plane features** command in privileged EXEC mode.

## show control-plane features

**Syntax Description** This command has no arguments or keywords

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane features** command displays control-plane features enabled on the control-plane aggregate sub-interfaces. Information includes the following:

- Number of features configured for the control plane
- Name of the feature
- Date and time the feature was activated

**Examples** The following is sample output from the **show control-plane features** command:

```
Router# show control-plane features

Total 1 features configured
Control plane host path features:

TCP/UDP Portfilter activated Nov 09 2005 12:40
```

[Table 51](#) describes the significant fields shown in the display.

**Table 51** *show control-plane features Field Descriptions*

Field	Description
Total features configured	Number of features configured.
Feature Name	Name of the configured features.
activated	Date and time the feature was activated.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control-plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# show control-plane host counters

To display the control-plane packet counters for the control-plane host subinterface, use the **show control-plane host counters** command in privileged EXEC mode.

## show control-plane host counters

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane host counters** command displays the following packet counts for the control-plane host subinterface:

- Total number of packets that were processed by features configured on the host subinterface
- Total number of packets that were dropped
- Total number of errors

**Examples** The following is sample output from the **show control-plane host counters** command:

```
Router# show control-plane host counters

Control plane host path counters:

Feature                Packets Processed/Dropped/Errors
TCP/UDP portfilter     46/46/0
```

[Table 52](#) describes the significant fields shown in the display.

**Table 52** *show control-plane host counters Field Descriptions*

Field	Description
Feature	Name of the feature configured on the host subinterface.
Packets Processed	Total number of packets that were processed by the feature.
Dropped	Total number of packets that were dropped.
Errors	Total number of errors detected.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control-plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control plane transit subinterface.

# show control-plane host features

To display the configured control-plane features for the control-plane host sub-interface, use the **show control-plane host features** command in privileged EXEC mode.

## show control-plane host features

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane host features** command displays the features configured for the control-plane host subinterface. Information includes the following:

- Number of features configured for the control plane
- Name of the feature
- Date and time the feature was activated

**Examples** The following is sample output from the **show control-plane host features** command:

```
Router# show control-plane host features

Control plane host path features:

TCP/UDP Portfilter activated Nov 09 2005 12:40
```

[Table 53](#) describes the significant fields shown in the display.

**Table 53** *show control-plane host features Field Descriptions*

Field	Description
Feature Name	Name of the configured features.
activated	Date and time the feature was activated.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control-plane packet counters for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# show control-plane host open-ports

To display a list of open TCP/UDP ports that are registered with the port-filter database, use the **show control-plane host open-ports** command in privileged EXEC mode.

## show control-plane host open-ports

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane host open-ports** command displays a list of open TCP/UDP ports that are registered with the port-filter database.

**Examples** The following is sample output from the **show control-plane host open-ports** command.

```
Router# show control-plane host open-ports

Active internet connections (servers and established)
Port      Local Address      Foreign Address      Service      State
tcp       *:23               *:0                  Telnet       LISTEN
tcp       *:53               *:0                  DNS Server   LISTEN
tcp       *:80               *:0                  HTTP CORE    LISTEN
tcp       *:1720             *:0                  H.225       LISTEN
tcp       *:5060             *:0                  SIP          LISTEN
tcp       *:23               192.0.2.18:58714    Telnet       ESTABLISHED
udp       *:53               *:0                  DNS Server   LISTEN
udp       *:67               *:0                  DHCPD Receive LISTEN
udp       *:52824            *:0                  IP SNMP     LISTEN
udp       *:161              *:0                  IP SNMP     LISTEN
udp       *:162              *:0                  IP SNMP     LISTEN
udp       *:5060             *:0                  SIP          LISTEN
udp       *:2517             *:0                  CCH323_CT   LISTEN
```

[Table 54](#) describes the significant fields shown in the display.

**Table 54** *show control-plane host open-ports Field Descriptions*

Field	Description
Port	Port type, either TCP or UDP.
Local Address	Local IP address and port number. An asterisk (*) indicates that the service is listening on all configured network interfaces.

**Table 54** *show control-plane host open-ports Field Descriptions (continued)*

Field	Description
Foreign Address	Remote IP address and port number. An asterisk (*) indicates that the service is listening on all configured network interfaces.
Service	Name of the configured Cisco IOS service listening on the port.
State	Listen or Established.

**Related Commands**

Command	Description
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane transit counters</b>	Displays the control plane packet counters for the control-plane transit subinterface.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# show control-plane transit counters

To display the control-plane packet counters for the control-plane transit sub-interface, use the **show control-plane transit counters** command in privileged EXEC mode.

## show control-plane transit counters

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane transit counters** command displays the following packet counts for the control-plane transit subinterface:

- Total number of packets that were processed by the transit subinterface
- Total number of packets that were dropped
- Total number of errors

**Examples** The following is sample output from the **show control-plane transit counters** command.

```
Router# show control-plane transit counters

Control plane transit path counters:

Feature                Packets Processed/Dropped/Errors
Control Plane Policing63456/2391/0
```

[Table 55](#) describes the significant fields shown in the display.

**Table 55** *show control-plane transit counters Field Descriptions*

Field	Description
Feature	Name of the feature configured on the transit sub-interface.
Packets Processed	Total number of packets that were processed by the configured feature.
Dropped	Total number of packets that were dropped.
Errors	Total number of errors detected.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control-plane host open-ports</b>	Displays a list of open TCP/UDP ports that are registered with the port-filter database.
<b>show control-plane transit features</b>	Displays the configured features for the control-plane transit subinterface.

# show control-plane transit features

To display the configured control-plane features for the control-plane transit subinterface, use the **show control-plane transit features** command in privileged EXEC mode.

## show control-plane transit features

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.

**Usage Guidelines** The **show control-plane transit features** command displays the control-plane features configured for the control-plane transit subinterface. Information includes the following:

- Number of features configured for the control plane
- Name of the feature
- Date and time the feature was activated

**Examples** The following is sample output from the **show control-plane transit features** command:

```
Router# show control-plane transit features

Control plane transit path features:

Control Plane Policing activated Nov 09 2005 12:40
```

[Table 56](#) describes the significant fields shown in the display.

**Table 56** *show control-plane transit features Field Descriptions*

Field	Description
Total Features Configured	Number of features configured.
Feature Name	Name of the configured features.
Activated	Date and time the feature was activated.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear control-plane</b>	Clears packet counters for control-plane interfaces and subinterfaces.
<b>control-plane</b>	Enters control-plane configuration mode, which allows you to associate or modify attributes or parameters that are associated with the control plane of the device.
<b>debug control-plane</b>	Displays debugging output from the control-plane routines.
<b>show control-plane cef-exception counters</b>	Displays the control-plane packet counters for the control-plane CEF-exception subinterface.
<b>show control-plane cef-exception features</b>	Displays the configured features for the control-plane CEF-exception subinterface.
<b>show control-plane counters</b>	Displays the control-plane packet counters for the aggregate control-plane interface.
<b>show control-plane features</b>	Displays the configured features for the aggregate control-plane interface.
<b>show control-plane host counters</b>	Displays the control plane packet counters for the control-plane host subinterface.
<b>show control-plane host features</b>	Displays the configured features for the control-plane host subinterface.
<b>show control plane host open-ports</b>	Displays a list of open ports that are registered with the port-filter database.
<b>show control-plane transit counters</b>	Displays the control-plane packet counters for the control-plane transit subinterface.

# show cops servers

To display the IP address and connection status of the policy servers for which the router is configured, use the **show cops servers** command in EXEC mode.

**show cops servers**

**Syntax Description** This command has no keywords or arguments.

**Command Modes** EXEC

Command History	Release	Modification
	12.1(1)T	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** You can also use the show cops server command to display information about the Common Open Policy Service (COPS) client on the router.

**Examples** In the following example, information is displayed about the current policy server and client. When Client Type appears followed by an integer, 1 stands for Resource Reservation Protocol (RSVP) and 2 stands for Differentiated Services Provisioning. (0 indicates keepalive.)

```
Router# show cops servers
```

```
COPS SERVER: Address: 10.0.0.1. Port: 3288. State: 0. Keepalive: 120 sec
             Number of clients: 1. Number of sessions: 1.
COPS CLIENT: Client type: 1. State: 0.
```

Related Commands	Command	Description
	<b>show ip rsvp policy cops</b>	Displays policy server address(es), ACL IDs, and current state of the router-server connection.

# show crypto eng qos

To monitor and maintain low latency queueing (LLQ) for IPSec encryption engines, use the **show crypto eng qos** command in privileged EXEC mode.

**show crypto eng qos**

**Syntax Description** This command has no keywords or arguments.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced in Cisco IOS Release 12.2(13)T.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(33)SRA	This command was integrated into Cisco IOS release 12.(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** Use the **show crypto eng qos** command to determine if QoS is enabled on LLQ for IPSec encryption engines.

**Examples** The following example shows how to determine if LLQ for IPSec encryption engines is enabled:

```
Router# show crypto eng qos

crypto engine name: Multi-ISA Using VAM2
  crypto engine type: hardware
    slot: 5
    queuing: enabled
  visible bandwidth: 30000 kbps
    llq size: 0
  default queue size/max: 0/64
  interface table size: 32

FastEthernet0/0 (3), iftype 1, ctable size 16, input filter:ip
precedence 5
  class voice (1/3), match ip precedence 5
    bandwidth 500 kbps, max token 100000
    IN match pkt/byte 0/0, police drop 0
    OUT match pkt/byte 0/0, police drop 0

  class default, match pkt/byte 0/0, qdrop 0
  crypto engine bandwidth:total 30000 kbps, allocated 500 kbps
```

The field descriptions in the above display are self-explanatory.

# show frame-relay ip rtp header-compression

To display Frame Relay Real-Time Transport Protocol (RTP) header compression statistics, use the **show frame-relay ip rtp header-compression** command in user EXEC or privileged EXEC mode.

**show frame-relay ip rtp header-compression** [*interface type number*] [*dldci*]

Syntax Description	Parameter	Description
	<i>interface type number</i>	(Optional) Specifies an interface for which information will be displayed. A space between the interface type and number is optional.
	<i>dldci</i>	(Optional) Specifies a data-link connection identifier (DLCI) for which information will be displayed. The range is from 16 to 1022.

**Command Default** RTP header compression statistics are displayed for all DLCIs on interfaces that have RTP header compression configured.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	11.3	This command was introduced.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T. The output for this command was modified to display RTP header compression statistics for Frame Relay permanent virtual circuit (PVC) bundles.
	12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC, and the <i>dldci</i> argument was added.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.4(9)T	The <i>dldci</i> argument was added.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.4(11)T	The output for this command was modified to display Enhanced Compressed Real-Time Transport Protocol (ECRTP) header compression statistics for Frame Relay permanent virtual circuit (PVC) bundles.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Examples** The following is sample output from the **show frame-relay ip rtp header-compression** command:

```
Router# show frame-relay ip rtp header-compression

DLCI 21          Link/Destination info: ip 10.1.4.1
Interface Serial3/0 DLCI 21 (compression on, Cisco)
  Rcvd:    0 total, 0 compressed, 0 errors, 0 status msgs
          0 dropped, 0 buffer copies, 0 buffer failures
```

```

Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 20      Link/Destination info: ip 10.1.1.1
Interface Serial3/1 DLCI 20 (compression on, Cisco)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface Serial3/1 DLCI 21 (compression on, Cisco)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 22      Link/Destination info: ip 10.1.3.1
Interface Serial3/1 DLCI 22 (compression on, Cisco)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

```

The following is sample output from the **show frame-relay ip rtp header-compression** command when ECRTTP is enabled:

```

Router# show frame-relay ip rtp header-compression

DLCI 16      Link/Destination info: ip 10.0.0.1
Interface Serial4/1 DLCI 16 (compression on, IETF, ECRTTP)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 16 rx slots, 16 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 16 free contexts

```

In the following example, the **show frame-relay ip rtp header-compression** command displays information about DLCI 21:

```

Router# show frame-relay ip rtp header-compression 21

DLCI 21      Link/Destination info: ip 10.1.4.1
Interface Serial3/0 DLCI 21 (compression on, Cisco)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface Serial3/1 DLCI 21 (compression on, Cisco)
Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
           0 dropped, 0 buffer copies, 0 buffer failures

```

## show frame-relay ip rtp header-compression

```
Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
           0 bytes saved, 0 bytes sent
Connect: 256 rx slots, 256 tx slots,
           0 misses, 0 collisions, 0 negative cache hits, 256 free contexts
```

In the following example, the **show frame-relay ip rtp header-compression** command displays information for all DLCIs on serial interface 3/1:

```
Router# show frame-relay ip rtp header-compression interface serial3/1

DLCI 20      Link/Destination info: ip 10.1.1.1
Interface Serial3/1 DLCI 20 (compression on, Cisco)
  Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
             0 dropped, 0 buffer copies, 0 buffer failures
  Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
             0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
             0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface Serial3/1 DLCI 21 (compression on, Cisco)
  Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
             0 dropped, 0 buffer copies, 0 buffer failures
  Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
             0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
             0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 22      Link/Destination info: ip 10.1.3.1
Interface Serial3/1 DLCI 22 (compression on, Cisco)
  Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
             0 dropped, 0 buffer copies, 0 buffer failures
  Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
             0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
             0 misses, 0 collisions, 0 negative cache hits, 256 free contexts
```

In the following example, the **show frame-relay ip rtp header-compression** command displays information only for DLCI 21 on serial interface 3/1:

```
Router# show frame-relay ip rtp header-compression interface serial3/1 21

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface Serial3/1 DLCI 21 (compression on, Cisco)
  Rcvd:      0 total, 0 compressed, 0 errors, 0 status msgs
             0 dropped, 0 buffer copies, 0 buffer failures
  Sent:      0 total, 0 compressed, 0 status msgs, 0 not predicted
             0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
             0 misses, 0 collisions, 0 negative cache hits, 256 free contexts
```

The following sample output from the **show frame-relay ip rtp header-compression** command shows statistics for a PVC bundle called MP-3-static:

```
Router# show frame-relay ip rtp header-compression interface Serial1/4

vc-bundle MP-3-static      Link/Destination info:ip 10.1.1.1
Interface Serial1/4:
  Rcvd:      14 total, 13 compressed, 0 errors
             0 dropped, 0 buffer copies, 0 buffer failures
  Sent:      15 total, 14 compressed,
             474 bytes saved, 119 bytes sent
             4.98 efficiency improvement factor
```

```

Connect:256 rx slots, 256 tx slots,
      1 long searches, 1 misses 0 collisions, 0 negative cache hits
      93% hit ratio, five minute miss rate 0 misses/sec, 0 max

```

Table 57 describes the significant fields shown in the displays.

**Table 57** *show frame-relay ip rtp header-compression Field Descriptions*

Field	Description
Interface	Type and number of the interface and type of header compression.
Rcvd:	Table of details concerning received packets.
total	Number of packets received on the interface.
compressed	Number of packets with compressed headers.
errors	Number of errors.
dropped	Number of dropped packets.
buffer copies	Number of buffers that were copied.
buffer failures	Number of failures in allocating buffers.
Sent:	Table of details concerning sent packets.
total	Total number of packets sent.
compressed	Number of packets sent with compressed headers.
bytes saved	Total savings in bytes because of compression.
bytes sent	Total bytes sent after compression.
efficiency improvement factor	Compression efficiency.
Connect:	Table of details about the connections.
rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
long searches	Searches that needed more than one lookup.
misses	Number of new states that were created.
hit ratio	Number of times that existing states were revised.
five minute miss rate	Average miss rate.
max	Maximum miss rate.

#### Related Commands

Command	Description
<b>frame-relay ip rtp compression-connections</b>	Specifies the maximum number of RTP header compression connections on a Frame Relay interface.
<b>frame-relay ip rtp header-compression</b>	Enables RTP header compression for all Frame Relay maps on a physical interface.
<b>frame-relay map ip compress</b>	Enables both RTP and TCP header compression on a link.
<b>frame-relay map ip nocompress</b>	Disables both RTP and TCP header compression on a link.
<b>frame-relay map ip rtp header-compression</b>	Enables RTP header compression per DLCI.
<b>show ip rpf events</b>	Displays RTP header compression statistics.

# show frame-relay ip tcp header-compression

To display Frame Relay Transmission Control Protocol (TCP)/IP header compression statistics, use the **show frame-relay ip tcp header-compression** command in user EXEC or privileged EXEC mode.

```
show frame-relay ip tcp header-compression [interface type number] [dlci]
```

Syntax Description	Parameter	Description
	<b>interface</b> <i>type number</i>	(Optional) Specifies an interface for which information will be displayed. A space is optional between the type and number.
	<i>dlci</i>	(Optional) Specifies a data-link connection identifier (DLCI) for which information will be displayed. Range is from 16 to 1022.

Command Modes	Mode
	User EXEC
	Privileged EXEC

Command History	Release	Modification
	10.3	This command was introduced.
	12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T. The command was modified to support display of RTP header compression statistics for Frame Relay permanent virtual circuit (PVC) bundles.
	12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC, and the <i>dlci</i> argument was added.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.4(9)T	The <i>dlci</i> argument was added.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show frame-relay ip tcp header-compression** command:

```
Router# show frame-relay ip tcp header-compression

DLCI 200          Link/Destination info: ip 10.108.177.200
Interface Serial0:
Rcvd:    40 total, 36 compressed, 0 errors
         0 dropped, 0 buffer copies, 0 buffer failures
Sent:    0 total, 0 compressed
         0 bytes saved, 0 bytes sent
Connect: 16 rx slots, 16 tx slots, 0 long searches, 0 misses, 0% hit ratio
         Five minute miss rate 0 misses/sec, 0 max misses/sec
```

The following sample output from the **show frame-relay ip tcp header-compression** command shows statistics for a PVC bundle called “MP-3-static”:

```
Router# show frame-relay ip tcp header-compression interface Serial1/4

vc-bundle MP-3-static      Link/Destination info:ip 10.1.1.1
Interface Serial1/4:
  Rcvd:  14 total, 13 compressed, 0 errors
         0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  15 total, 14 compressed,
         474 bytes saved, 119 bytes sent
         4.98 efficiency improvement factor
  Connect:256 rx slots, 256 tx slots,
          1 long searches, 1 misses 0 collisions, 0 negative cache hits
          93% hit ratio, five minute miss rate 0 misses/sec, 0 max
```

In the following example, the **show frame-relay ip tcp header-compression** command displays information about DLCI 21:

```
Router# show frame-relay ip tcp header-compression 21

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface POS2/0 DLCI 21 (compression on, VJ)
  Rcvd:  0 total, 0 compressed, 0 errors, 0 status msgs
         0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  0 total, 0 compressed, 0 status msgs, 0 not predicted
         0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
          0 misses, 0 collisions, 0 negative cache hits, 256 free contexts

DLCI 21      Link/Destination info: ip 10.1.4.1
Interface Serial3/0 DLCI 21 (compression on, VJ)
  Rcvd:  0 total, 0 compressed, 0 errors, 0 status msgs
         0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  0 total, 0 compressed, 0 status msgs, 0 not predicted
         0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
          0 misses, 0 collisions, 0 negative cache hits, 256 free contexts
```

The following is sample output from the **show frame-relay ip tcp header-compression** command for a specific DLCI on a specific interface:

```
Router# show frame-relay ip tcp header-compression pos2/0 21

DLCI 21      Link/Destination info: ip 10.1.2.1
Interface POS2/0 DLCI 21 (compression on, VJ)
  Rcvd:  0 total, 0 compressed, 0 errors, 0 status msgs
         0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  0 total, 0 compressed, 0 status msgs, 0 not predicted
         0 bytes saved, 0 bytes sent
  Connect: 256 rx slots, 256 tx slots,
          0 misses, 0 collisions, 0 negative cache hits, 256 free contexts
```

Table 58 describes the fields shown in the display.

**Table 58** *show frame-relay ip tcp header-compression Field Descriptions*

Field	Description
Rcvd:	Table of details concerning received packets.
total	Sum of compressed and uncompressed packets received.

**Table 58** *show frame-relay ip tcp header-compression Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
compressed	Number of compressed packets received.
errors	Number of errors caused by errors in the header fields (version, total length, or IP checksum).
dropped	Number of packets discarded. Seen only after line errors.
buffer failures	Number of times that a new buffer was needed but was not obtained.
Sent:	Table of details concerning sent packets.
total	Sum of compressed and uncompressed packets sent.
compressed	Number of compressed packets sent.
bytes saved	Number of bytes reduced because of the compression.
bytes sent	Actual number of bytes transmitted.
Connect:	Table of details about the connections.
rx slots, tx slots	Number of states allowed over one TCP connection. A state is recognized by a source address, a destination address, and an IP header length.
long searches	Number of times that the connection ID in the incoming packet was not the same as the previous one that was processed.
misses	Number of times that a matching entry was not found within the connection table and a new entry had to be entered.
hit ratio	Percentage of times that a matching entry was found in the compression tables and the header was compressed.
Five minute miss rate	Miss rate computed over the most recent 5 minutes and the maximum per-second miss rate during that period.

# show interfaces fair-queue

To display information and statistics about weighted fair queuing (WFQ) for a Versatile Interface Processor (VIP)-based interface, use the **show interfaces fair-queue** command in EXEC mode.

**show interfaces** [*type number*] **fair-queue**

## Syntax Description

<i>type</i>	(Optional) The type of the interface.
<i>number</i>	(Optional) The number of the interface.

## Command Modes

EXEC

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show interfaces fair-queue** command for VIP-distributed WFQ (DWFQ):

```
Router# show interfaces fair-queue

Hssi0/0/0 queue size 0
      packets output 1417079, drops 2
WFQ: aggregate queue limit 54, individual queue limit 27
      max available buffers 54

      Class 0: weight 10 limit 27 qsize 0 packets output 1150 drops 0
      Class 1: weight 20 limit 27 qsize 0 packets output 0 drops 0
      Class 2: weight 30 limit 27 qsize 0 packets output 775482 drops 1
      Class 3: weight 40 limit 27 qsize 0 packets output 0 drops 0
```

[Table 59](#) describes the significant fields shown in the display.

**Table 59** *show interfaces fair-queue Field Descriptions*

Field	Description
queue size	Current output queue size for this interface.
packets output	Number of packets sent out this interface or number of packets in this class sent out the interface.
drops	Number of packets dropped or number of packets in this class dropped.
aggregate queue limit	Aggregate limit, in number of packets.
individual queue limit	Individual limit, in number of packets.

**Table 59** *show interfaces fair-queue Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
max available buffers	Available buffer space allocated to aggregate queue limit, in number of packets.
Class	QoS group or type of service (ToS) class.
weight	Percent of bandwidth allocated to this class during periods of congestion.
limit	Queue limit for this class in number of packets.
qsize	Current size of the queue for this class.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.

# show interfaces random-detect

To display information about Weighted Random Early Detection (WRED) for a Versatile Interface Processor (VIP)-based interface, use the **show interfaces random-detect** command in EXEC mode.

**show interfaces** [*type number*] **random-detect**

## Syntax Description

<i>type</i>	(Optional) The type of the interface.
<i>number</i>	(Optional) The number of the interface.

## Command Modes

EXEC

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show interfaces random-detect** command for VIP-distributed WRED (DWRED):

```
Router# show interfaces random-detect
```

```
FastEthernet1/0/0 queue size 0
  packets output 29692, drops 0
WRED: queue average 0
  weight 1/512
  Precedence 0: 109 min threshold, 218 max threshold, 1/10 mark weight
    1 packets output, drops: 0 random, 0 threshold
  Precedence 1: 122 min threshold, 218 max threshold, 1/10 mark weight
    (no traffic)
  Precedence 2: 135 min threshold, 218 max threshold, 1/10 mark weight
    14845 packets output, drops: 0 random, 0 threshold
  Precedence 3: 148 min threshold, 218 max threshold, 1/10 mark weight
    (no traffic)
  Precedence 4: 161 min threshold, 218 max threshold, 1/10 mark weight
    (no traffic)
  Precedence 5: 174 min threshold, 218 max threshold, 1/10 mark weight
    (no traffic)
  Precedence 6: 187 min threshold, 218 max threshold, 1/10 mark weight
    14846 packets output, drops: 0 random, 0 threshold
  Precedence 7: 200 min threshold, 218 max threshold, 1/10 mark weight
    (no traffic)
```

Table 60 describes the significant fields shown in the display.

**Table 60** *show interfaces random-detect Field Descriptions*

Field	Description
queue size	Current output queue size for this interface.
packets output	Number of packets sent out this interface.
drops	Number of packets dropped.
queue average	Average queue length.
weight	Weighting factor used to determine the average queue size.
Precedence	WRED parameters for this precedence.
min threshold	Minimum threshold for this precedence.
max threshold	Maximum length of the queue. When the average queue is this long, any additional packets will be dropped.
mark weight	Probability of a packet being dropped if the average queue is at the maximum threshold.
packets output	Number of packets with this precedence that have been sent.
random	Number of packets dropped randomly through the WRED process.
threshold	Number of packets dropped automatically because the average queue was at the maximum threshold length.
(no traffic)	No packets with this precedence.

#### Related Commands

Command	Description
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect flow</b>	Enables flow-based WRED.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show queueing</b>	Lists all or selected configured queuing strategies.

# show interfaces rate-limit

To display information about committed access rate (CAR) for an interface, use the **show interfaces rate-limit** command in EXEC mode.

**show interfaces** [*type number*] **rate-limit**

## Syntax Description

<i>type</i>	(Optional) The type of the interface.
<i>number</i>	(Optional) The number of the interface.

## Command Modes

EXEC

## Command History

Release	Modification
11.1CC	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

The following is sample output from the **show interfaces rate-limit** command:

```
Router# show interfaces fddi2/1/0 rate-limit

Fddi2/1/0
Input
 matches: access-group rate-limit 100
  params: 800000000 bps, 64000 limit, 80000 extended limit
  conformed 0 packets, 0 bytes; action: set-prec-continue 1
  exceeded 0 packets, 0 bytes; action: set-prec-continue 0
  last packet: 4737508ms ago, current burst: 0 bytes
  last cleared 01:05:47 ago, conformed 0 bps, exceeded 0 bps
 matches: access-group 101
  params: 800000000 bps, 56000 limit, 72000 extended limit
  conformed 0 packets, 0 bytes; action: set-prec-transmit 5
  exceeded 0 packets, 0 bytes; action: set-prec-transmit 0
  last packet: 4738036ms ago, current burst: 0 bytes
  last cleared 01:02:05 ago, conformed 0 bps, exceeded 0 bps
 matches: all traffic
  params: 500000000 bps, 48000 limit, 64000 extended limit
  conformed 0 packets, 0 bytes; action: set-prec-transmit 5
  exceeded 0 packets, 0 bytes; action: set-prec-transmit 0
  last packet: 4738036ms ago, current burst: 0 bytes
  last cleared 01:00:22 ago, conformed 0 bps, exceeded 0 bps
Output
 matches: all traffic
  params: 800000000 bps, 64000 limit, 80000 extended limit
  conformed 0 packets, 0 bytes; action: transmit
  exceeded 0 packets, 0 bytes; action: drop
  last packet: 4809528ms ago, current burst: 0 bytes
  last cleared 00:59:42 ago, conformed 0 bps, exceeded 0 bps
```

Table 61 describes the significant fields shown in the display.

**Table 61** *show interfaces rate-limit Field Descriptions*

Field	Description
Input	These rate limits apply to packets received by the interface.
matches	Packets that match this rate limit.
params	Parameters for this rate limit, as configured by the <b>rate-limit</b> command.
bps	Average rate, in bits per second.
limit	Normal burst size, in bytes.
extended limit	Excess burst size, in bytes.
conformed	Number of packets that have conformed to the rate limit.
action	Conform action.
exceeded	Number of packets that have exceeded the rate limit.
action	Exceed action.
last packet	Time since the last packet, in milliseconds.
current burst	Instantaneous burst size at the current time.
last cleared	Time since the burst counter was set back to zero by the <b>clear counters</b> command.
conformed	Rate of conforming traffic.
exceeded	Rate of exceeding traffic.
Output	These rate limits apply to packets sent by the interface.

#### Related Commands

Command	Description
<b>access-list rate-limit</b>	Configures an access list for use with CAR policies.
<b>clear counters</b>	Clears the interface counters.
<b>shape</b>	Specifies average or peak rate traffic shaping.
<b>show access-lists</b>	Displays the contents of current IP and rate-limit access lists.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.

# show ip nbar pdlm

To display the Packet Description Language Module (PDLM) in use by network-based application recognition (NBAR), use the **show ip nbar pdlm** command in privileged EXEC mode.

## show ip nbar pdlm

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(5)XE2	This command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** This command is used to display a list of all the PDLMs that have been loaded into NBAR using the **ip nbar pdlm** command.

**Examples** In this example of the **show ip nbar pdlm** command, the citrix.pdlm PDLM has been loaded from Flash memory:

```
Router# show ip nbar pdlm
```

```
The following PDLMs have been loaded:
flash://citrix.pdlm
```

Related Commands	Command	Description
	<b>ip nbar pdlm</b>	Extends or enhances the list of protocols recognized by NBAR through a Cisco-provided PDLM.

# show ip nbar port-map

To display the current protocol-to-port mappings in use by network-based application recognition (NBAR), use the **show ip nbar port-map** command in privileged EXEC mode.

```
show ip nbar port-map [protocol-name]
```

<b>Syntax Description</b>	<i>protocol-name</i> (Optional) Limits the command display to the specified protocol.
---------------------------	---

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(5)XE2	This command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

<b>Usage Guidelines</b>	<p>The <b>show ip nbar port-map</b> command displays port assignments for NBAR protocols.</p> <p>This command is used to display the current protocol-to-port mappings in use by NBAR. When the <b>ip nbar port-map</b> command has been used, the <b>show ip nbar port-map</b> command displays the ports assigned by the user to the protocol. If no <b>ip nbar port-map</b> command has been used, the <b>show ip nbar port-map</b> command displays the default ports. The <i>protocol-name</i> argument can also be used to limit the display to a specific protocol.</p>
-------------------------	--

<b>Examples</b>	The following is sample output from the <b>show ip nbar port-map</b> command:
-----------------	---

```
Router# show ip nbar port-map

port-map bgp      udp 179
port-map bgp      tcp 179
port-map cuseeme  udp 7648 7649
port-map cuseeme  tcp 7648 7649
port-map dhcp     udp 67 68
port-map dhcp     tcp 67 68
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip nbar-port-map</b>	Configures NBAR to search for a protocol or protocol name using a port number other than the well-known port.

# show ip nbar protocol-discovery

To display the statistics gathered by the network-based application recognition (NBAR) Protocol Discovery feature, use the **show ip nbar protocol-discovery** command in privileged EXEC mode.

```
show ip nbar protocol-discovery [interface type number] [stats {byte-count | bit-rate | packet-count}] [protocol protocol-name | top-n number]
```

Syntax Description		
<b>interface</b>		(Optional) Specifies that Protocol Discovery statistics for the interface are to be displayed.
<i>type</i>		Type of interface or subinterface whose policy configuration is to be displayed.
<i>number</i>		Port, connector, or interface card number.
<b>stats</b>		(Optional) Specifies that the byte count, byte rate, or packet count is to be displayed.
<b>byte-count</b>		(Optional) Specifies that the byte count is to be displayed.
<b>bit-rate</b>		(Optional) Specifies that the bit rate is to be displayed.
<b>packet-count</b>		(Optional) Specifies that the packet count is to be displayed.
<b>protocol</b>		(Optional) Specifies that statistics for a specific protocol are to be displayed.
<i>protocol-name</i>		(Optional) User-specified protocol name for which the statistics are to be displayed.
<b>top-n</b>		(Optional) Specifies that a top-n is to be displayed. A top-n is the number of most active NBAR-supported protocols, where n is the number of protocols to be displayed. For instance, if top-n 3 is entered, the three most active NBAR-supported protocols will be displayed.
<i>number</i>		(Optional) Specifies the number of most active NBAR-supported protocols to be displayed.

**Command Default** Statistics for all interfaces on which the Protocol Discovery feature is enabled are displayed.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(5)XE2	This command was introduced.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.1(13)E	This command was implemented on Catalyst 6000 family switches without FlexWAN modules.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.

Release	Modification
12.3(7)T	The command output was modified to include Max Bit Rate.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

Use the **show ip nbar protocol-discovery** command to display statistics gathered by the NBAR Protocol Discovery feature. This command, by default, displays statistics for all interfaces on which protocol discovery is currently enabled. The default output of this command includes, in the following order, input bit rate (in bits per second), input byte count, input packet count, and protocol name.

Protocol discovery can be used to monitor both input and output traffic and may be applied with or without a service policy enabled. NBAR protocol discovery gathers statistics for packets switched to output interfaces. These statistics are not necessarily for packets that exited the router on the output interfaces, because packets may have been dropped after switching for various reasons, including policing at the output interface, access lists, or queue drops.

### Examples

The following example displays output from the **show ip nbar protocol-discovery** command for the five most active protocols on an Ethernet interface:

```
Router# show ip nbar protocol-discovery top-n 5

Ethernet2/0

          Input                               Output
          ----                               -----
Protocol  Packet Count                       Packet Count
          Byte Count                       Byte Count
          30sec Bit Rate (bps)             30sec Bit Rate (bps)
          30sec Max Bit Rate (bps)        30sec Max Bit Rate (bps)
-----
rtp       3272685                             3272685
          242050604                           242050604
          768000                               768000
          2002000                               2002000
gnutella  513574                                 513574
          118779716                             118779716
          383000                               383000
          987000                               987000
ftp       482183                               482183
          37606237                             37606237
          121000                               121000
          312000                               312000
http     144709                               144709
          32351383                             32351383
          105000                               105000
          269000                               269000
netbios  96606                                 96606
          10627650                             10627650
          36000                                36000
          88000                                88000
unknown  1724428                             1724428
          534038683                             534038683
          2754000                               2754000
          4405000                               4405000
Total    6298724                             6298724
          989303872                             989303872
          4213000                               4213000
          8177000                               8177000
```

Table 62 describes the significant fields shown in the display.

**Table 62** *show ip nbar protocol-discovery Field Descriptions*

Field	Description
Interface	Type and number of an interface.
Input	Incoming traffic on an interface.
Output	Outgoing traffic on an interface.
Protocol	The protocols being used. Unknown is the sum of all the protocols that NBAR could not classify for some reason.
Packet Count	Number of packets coming in and going out the interface.
Byte Count	Number of bytes coming in and going out the interface.
30sec Bit Rate	Average value of the bit rate in bits per second (bps) since protocol discovery was enabled, per protocol, over the last 30 seconds.
30sec Max Bit Rate	Highest value of the bit rate in bits per second (bps) since protocol discovery was enabled, per protocol, over the last 30 seconds.
Total	Total input and output traffic.

#### Related Commands

Command	Description
<b>ip nbar protocol-discovery</b>	Configures NBAR to discover traffic for all protocols known to NBAR on a particular interface.

# show ip nbar version

To display information about the version of the network-based application recognition (NBAR) software in your Cisco IOS release or the version of an NBAR Packet Description Language Module (PDLM) on your Cisco IOS router, use the **show ip nbar version** command in privileged EXEC mode.

**show ip nbar version** [*PDLM-name*]

## Syntax Description

<i>PDLM-name</i>	(Optional) Specifies the name of a specific PDLM whose information will be displayed.
------------------	---

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.3(4)T	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(17a)SX1	This command was integrated into Cisco IOS Release 12.2(17a)SX1.

## Usage Guidelines

The **show ip nbar version** command treats all protocols that were added to NBAR after the initial NBAR release as PDLMs, including protocols that were added into the Cisco IOS software without a user having to download a PDLM from Cisco.com. PDLMs downloaded from Cisco.com and incorporated into NBAR by the user also appear when the **show ip nbar version** command is entered.

When using NBAR, various elements within NBAR are assigned versioning numbers. These versioning numbers become significant when you want to download a PDLM. PDLMs, which are also versioned, can be downloaded only to NBAR on a particular Cisco IOS release if the PDLM versioning numbers are compatible with the NBAR version numbers in the Cisco IOS software.

The following NBAR-related version information is available:

- NBAR Software Version—Version of NBAR software running on the current version of Cisco IOS software.
- Resident Module Version—Version of the NBAR-supported PDLM protocol.

The following version number is kept by the PDLM:

- NBAR Software Version—Minimum version of the NBAR software that is required to load this PDLM.

The **show ip nbar version** command provides version information for PDLMs already loaded onto the Cisco IOS software.

## Examples

The following is sample output from the **show ip nbar version** command:

```
Router# show ip nbar version
NBAR software version: 3
```

```

1  base                Mv: 2
2  ftp                 Mv: 2
3  http                Mv: 7, Nv: 3; slot1:http_vers.pdlm
4  static-port        Mv: 6
5  tftp                Mv: 1
6  exchange            Mv: 1
7  vdolive             Mv: 1
8  sqlnet              Mv: 1
9  rcmd                Mv: 1
10 netshow             Mv: 1
11 sunrpc              Mv: 2
12 streamwork         Mv: 1
13 citrix              Mv: 5
14 fasttrack           Mv: 2
15 gnutella            Mv: 1
16 kazaa               Mv: 6, Nv: 3; slot1:kazaa2_vers.pdlm
17 custom-protocols   Mv: 1
18 rtsp                Mv: 1
19 rtp                 Mv: 2
20 mgcp                Mv: 1
21 skinny              Mv: 1
22 h323                Mv: 1
23 sip                 Mv: 1
24 rtcp                Mv: 1

```

Table 63 describes the significant fields shown in the display.

**Table 63** *show ip nbar version Command Field Descriptions*

Field	Description
NBAR Software Version	NBAR software version running in the current Cisco IOS software. In this particular example, version 3 is the NBAR software running on the current version of the Cisco IOS software.
Mv	Resident Module Version. The Resident Module Version is the version of the NBAR-supported PDLM protocol and, therefore, varies by protocol. The Resident Module Version of TFTP, for example, is 1.
Nv	Minimum version of the NBAR software that is required to load a nonnative PDLM. This number is available only for nonnative PDLMs that were loaded onto the router such as the Kazaa PDLM (protocol 17); in that case, the Nv version is 3.

For the same network setup, the following example shows the output if a specific protocol with a PDLM is specified in the **show ip nbar version** CLI:

```

Router# show ip nbar version http

http                Mv: 7, Nv: 3; slot1:http_vers.pdlm

```

**■** show ip nbar version

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip nbar pdlm</b>	Downloads a PDLM onto a router to add support for additional protocols in NBAR.

# show ip rsvp

To display specific information for Resource Reservation Protocol (RSVP) categories, use the **show ip rsvp** command in user EXEC or privileged EXEC mode.

**show ip rsvp** [**atm-peak-rate-limit** | **counters** | **host** | **installed** | **interface** | **listeners** | **neighbor** | **policy** | **precedence** | **request** | **reservation** | **sbm** | **sender** | **signalling** | **tos**]

Syntax Description	
<b>atm-peak-rate-limit</b>	(Optional) Specifies RSVP peak rate limit.
<b>counters</b>	(Optional) Specifies RSVP statistics.
<b>host</b>	(Optional) Specifies RSVP endpoint senders and receivers.
<b>installed</b>	(Optional) Specifies RSVP installed reservations.
<b>interface</b>	(Optional) Specifies RSVP interface information.
<b>listeners</b>	(Optional) Specifies RSVP listeners.
<b>neighbor</b>	(Optional) Specifies RSVP neighbor information.
<b>policy</b>	(Optional) Specifies RSVP policy information.
<b>precedence</b>	(Optional) Specifies RSVP precedence settings.
<b>request</b>	(Optional) Specifies RSVP reservations from upstream.
<b>reservation</b>	(Optional) Specifies RSVP reservation requests from downstream.
<b>sbm</b>	(Optional) Specifies RSVP subnet bandwidth manager (SBM) information.
<b>sender</b>	(Optional) Specifies RSVP path state information.
<b>signalling</b>	(Optional) Specifies RSVP signaling information.
<b>tos</b>	(Optional) Specifies RSVP type of service (TOS) settings.

Command Modes	
	User EXEC (>)
	Privileged EXEC (#)

Command History	Release	Modification
	12.0(3)T	This command was introduced.
	12.2(13)T	The <b>listeners</b> and <b>policy</b> keywords were added, and this command was modified to display RSVP global settings when no keywords or arguments are entered.
	12.2(33)SRB	The command output was modified to display fast local repair (FLR) information.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
	12.2(33)SRC	The command output was modified to display the following: <ul style="list-style-type: none"> <li>• RSVP quality of service (QoS) and Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) information.</li> <li>• RSVP aggregation information.</li> </ul>

**Examples**

The following is sample output from the **show ip rsvp** command:

```

RSVP: enabled (on 1 interface(s))
  RSVP QoS signalling enabled
  MPLS/TE signalling enabled

Signalling:
  Refresh interval (msec): 30000
  Refresh misses: 4

Rate Limiting: enabled
  Burst: 8
  Limit: 37
  Maxsize: 2000
  Period (msec): 20
  Max rate (msgs/sec): 400

Refresh Reduction: disabled
  ACK delay (msec): 250
  Initial retransmit delay (msec): 1000
  Local epoch: 0xCE969B
  Message IDs: in use 0, total allocated 0, total freed 0

Neighbors: 0
  Raw IP encap: 0  UDP encap: 0  Raw IP, UDP encap: 0

RFC 3175 Aggregation: Enabled
  Level: 1
  Default QoS service: Controlled-Load
  Router ID: 10.22.22.22

  Number of signaled aggregate reservations:      0
  Number of signaled E2E reservation:            0
  Number of configured map commands:             0
  Number of configured reservation commands:     0

Hello:
  RSVP Hello for Fast-Reroute/Reroute: Disabled
  Statistics: Disabled
  BFD for Fast-Reroute/Reroute: Disabled
  RSVP Hello for Graceful Restart: Disabled

Graceful Restart: Disabled
  Refresh interval: 10000 msec
  Refresh misses: 4
  DSCP: 0x30
  Advertised restart time: 5 msec
  Advertised recovery time: 0 msec
  Maximum wait for recovery: 3600000 msec

Fast-Reroute:
  PSBs w/ Local protection desired
  Yes: 0
  No: 0

Fast Local Repair: enabled
  Max repair rate (paths/sec): 400
  Max processed (paths/run): 1000

Local policy:
COPS:

```

```
Generic policy settings:
  Default policy: Accept all
  Preemption:      Disabled
```

Table 64 describes the significant fields shown in the display.

**Table 64** *show ip rsvp Field Descriptions*

Field	Description
RSVP	The state of RSVP, QoS, and MPLS/TE signaling; values are enabled (activated) or disabled (deactivated).  <b>Note</b> This field is disabled only if an internal error occurred when registering with RIB.
Signalling	The RSVP signaling parameters in effect are as follows: <ul style="list-style-type: none"> <li>Refresh interval—Time, in milliseconds (ms), between sending refreshes for each RSVP state.</li> <li>Refresh misses—Number of successive refresh messages that can be missed before RSVP considers the state expired and tears it down.</li> </ul>
Rate Limiting: enabled or disabled	The RSVP rate-limiting parameters in effect are as follows: <ul style="list-style-type: none"> <li>Burst—Maximum number of RSVP messages allowed to be sent to a neighboring router during an interval.</li> <li>Limit—Maximum number of RSVP messages to send per queue interval.</li> <li>Maxsize—Maximum size of the message queue, in bytes.</li> <li>Period—Length of an interval (timeframe), in milliseconds (msec).</li> <li>Max rate—Maximum number of messages allowed to be sent per second.</li> </ul>
Refresh Reduction: enabled or disabled	The RSVP refresh-reduction parameters in effect are as follows: <ul style="list-style-type: none"> <li>ACK delay (msec)—How long, in milliseconds, before the receiving router sends an acknowledgment (ACK).</li> <li>Initial retransmit delay (msec)—How long, in milliseconds, before the router retransmits a message.</li> <li>Local epoch—The RSVP message identifier (ID); randomly generated each time a node reboots or the RSVP process restarts.</li> <li>Message IDs—The number of message IDs in use, the total number allocated, and the total number available (freed).</li> </ul>
Neighbors	The total number of neighbors and the types of encapsulation in use including RSVP and User Datagram Protocol (UDP).
RFC 3175 Aggregation	The state of aggregation as defined in RFC 3175, <i>Aggregation of RSVP for IPv4 and IPv6 Reservations</i> ; values are the following: <ul style="list-style-type: none"> <li>Enabled—Active.</li> <li>Disabled—Inactive.</li> </ul>

**Table 64** *show ip rsvp Field Descriptions (continued)*

Field	Description
Level	<p>Aggregation level of the reservations; common values are the following:</p> <ul style="list-style-type: none"> <li>• 0 = End-to-end (E2E) reservations.</li> <li>• 1 = Aggregated reservations.</li> </ul> <p><b>Note</b> Level x reservations can be aggregated to form reservations at level x+1.</p>
Default QoS Service	<p>Type of quality of service (QoS) configured; values are the following:</p> <ul style="list-style-type: none"> <li>• <b>Controlled-Load</b>—Allows applications to reserve bandwidth to meet their requirements. For example, RSVP with Weighted Random Early Detection (WRED) provides this kind of service.</li> <li>• <b>Guaranteed-Rate</b>—Allows applications to have low delay and high throughput even during times of congestion. For example, weighted fair queueing (WFQ) with RSVP provides this kind of service.</li> </ul>
Number of signaled aggregate reservations	Cumulative number of signaled aggregate reservations.
Number of signaled E2E reservations	Cumulative number of signaled E2E reservations.
Number of configured map commands	Cumulative number of configured map commands.
Number of configured reservation commands	Cumulative number of configured reservation commands.
Hello	Subsequent fields describe the processes for which hello is enabled or disabled. Choices are Fast Reroute, reroute (hello for state timer), bidirectional forwarding detection (BFD), and Graceful Restart for a node with restart capability.
Statistics	<p>Status of hello statistics. Valid values are as follows:</p> <ul style="list-style-type: none"> <li>• <b>Enabled</b>—Statistics are configured. Hello packets are time-stamped when they arrive in the hello input queue for the purpose of recording the time it takes until they are processed.</li> <li>• <b>Disabled</b>—Hello statistics are not configured.</li> <li>• <b>Shutdown</b>—Hello statistics are configured, but not operational. The input queue is too long (that is, more than 10,000 packets are queued).</li> </ul>

**Table 64** *show ip rsvp Field Descriptions (continued)*

Field	Description
Graceful Restart: enabled or disabled	<p>The RSVP Graceful Restart parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• Refresh interval—Frequency, in milliseconds (msecs), with which a node sends a hello message to its neighbor.</li> <li>• Refresh misses—Number of missed hello messages that trigger a neighbor-down event upon which stateful switchover (SSO) procedures are started.</li> <li>• DSCP—Differentiated services code point (DSCP) value in the IP header of a hello message.</li> <li>• Advertised restart time—Time, in milliseconds (msecs), required for the sender to restart the RSVP-traffic engineering (TE) component and exchange hello messages after a failure.</li> <li>• Advertised recovery time—Time, in milliseconds (msecs), within which a recovering node wants its neighbor router to resynchronize the RSVP or Multiprotocol Label Switching (MPLS) forwarding state after SSO. A zero value indicates that the RSVP or MPLS forwarding state is not preserved after SSO.</li> <li>• Maximum wait for recovery—Maximum amount of time, in milliseconds (msecs), that a router waits for a neighbor to recover.</li> </ul>
Fast-Reroute	<p>The Fast Reroute parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• PSBs w/ Local protection desired—Yes means that path state blocks (PSBs) are rerouted when a tunnel goes down and packet flow is not interrupted; No means that PSBs are not rerouted.</li> </ul>
Fast Local Repair: enabled or disabled	<p>The Fast Local Repair parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• Max repair rate (paths/sec)—Maximum repair rate, in paths per second.</li> <li>• Max processed (paths/run)—Maximum notification elements processed, in paths per run.</li> </ul>
Local policy	The local policy currently configured.
COPS	The Common Open Policy Service (COPS) currently in effect.
Generic policy settings	<p>Policy settings that are not specific to COPS or the local policy.</p> <ul style="list-style-type: none"> <li>• Default policy: Accept all means that all RSVP messages are accepted and forwarded. Reject all means all RSVP messages are rejected.</li> <li>• Preemption: Disabled means that RSVP is not prioritizing reservations and allocating bandwidth accordingly. Enabled means that RSVP is prioritizing reservations and allocating more bandwidth to those with the highest priority.</li> </ul>

**■** show ip rsvp**Related Commands**

<b>Command</b>	<b>Description</b>
<b>debug ip rsvp</b>	Displays debug messages for RSVP categories.

# show ip rsvp aggregation ip

To display Resource Reservation Protocol (RSVP) summary aggregation information, use the **show ip rsvp aggregation ip** command in user EXEC or privileged EXEC mode.

```
show ip rsvp aggregation ip [endpoints | interface if-name] | map [dscp value] | reservation
[dscp value [aggregator ip-address]]
```

Syntax Description	
<b>endpoints</b>	(Optional) Specifies the aggregator and deaggregator nodes for the aggregation region.
<b>interface</b> <i>if-name</i>	(Optional) Specifies the interface name.
<b>map</b>	(Optional) Displays the map configuration rules.
<b>dscp</b> <i>value</i>	(Optional) Specifies the differentiated services code point (DSCP) for the <b>map</b> keyword. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>
<b>reservation</b>	(Optional) Displays the reservation configuration.
<b>dscp</b> <i>value</i>	(Optional) Specifies the differentiated services code point (DSCP) for the <b>reservation</b> keyword. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>
<b>aggregator</b> <i>ip-address</i>	(Optional) Specifies the IP address of the aggregator.

**Command Default** If you enter the **show ip rsvp aggregation ip** command without an optional keyword, the command displays summary information for all aggregate reservations.

**Command Modes** User EXEC (>)  
Privileged EXEC (#)

Command History	Release	Modification
	12.2(33)SRC	This command was introduced.

**Usage Guidelines**

Use the **show ip rsvp aggregation ip** command to display summary information for aggregation, including the number of aggregate, map, and reservation configurations.

**Examples****show ip rsvp aggregation ip command Example**

The following is sample output from the **show ip rsvp aggregation ip** command:

```
Router# show ip rsvp aggregation ip

RFC 3175 Aggregation:  Enabled
Level: 1
Default QoS service:  Controlled-Load

Number of signaled aggregate reservations:  2
Number of signaled E2E reservations:        8
Number of configured map commands:         4
Number of configured reservation commands:  1
```

[Table 65](#) describes the significant fields shown in the display.

**Table 65** show ip rsvp aggregation ip Field Descriptions

Field	Description
RFC 3175 Aggregation	The state of aggregation as defined in RFC 3175, <i>Aggregation of RSVP for IPv4 and IPv6 Reservations</i> ; values are the following: <ul style="list-style-type: none"> <li>Enabled—Active.</li> <li>Disabled—Inactive.</li> </ul>
Level	Aggregation level of the reservations; common values are the following: <ul style="list-style-type: none"> <li>0 = End-to-end (E2E) reservations.</li> <li>1 = Aggregated reservations.</li> </ul> <p><b>Note</b> Level x reservations can be aggregated to form reservations at the next higher level; for example, level x+1.</p>
Default QoS service	Type of quality of service (QoS) configured; values are the following: <ul style="list-style-type: none"> <li>Controlled-Load—Allows applications to reserve bandwidth to meet their requirements. For example, RSVP with Weighted Random Early Detection (WRED) provides this kind of service.</li> <li>Guaranteed-Rate—Allows applications to have low delay and high throughput even during times of congestion. For example, Weighted Fair Queuing (WFQ) with RSVP provides this kind of service.</li> </ul>
Number of signaled aggregate reservations	Cumulative number of signaled aggregate reservations.
Number of signaled E2E reservations	Cumulative number of signaled E2E reservations.

**Table 65** *show ip rsvp aggregation ip Field Descriptions (continued)*

Field	Description
Number of configured map commands	Cumulative number of configured map commands.
Number of configured reservation commands	Cumulative number of configured reservation commands.

**show ip rsvp aggregation ip interface Examples**

The following is sample output from the **show ip rsvp aggregation ip interface** command:

```
Router# show ip rsvp aggregation ip interface
```

```
Interface Name      Role
-----
Ethernet0/0        interior
Serial2/0           exterior
Serial3/0           exterior
```

[Table 66](#) describes the significant fields shown in the display.

**Table 66** *show ip rsvp aggregation ip interface Field Descriptions*

Field	Description
Interface Name	Name and number of the interface.
Role	Configuration of a router's interfaces; values are interior and exterior.

The following is sample output from the **show ip rsvp aggregation ip interface** command with a specified interface:

```
Router# show ip rsvp aggregation ip interface Ethernet0/0
```

```
Interface Name      Role
-----
Ethernet0/0        interior
```

**Related Commands**

Command	Description
<b>ip rsvp aggregation ip</b>	Enables RSVP aggregation on a router.

# show ip rsvp aggregation ip endpoints

To display Resource Reservation Protocol (RSVP) information about aggregator and deaggregator routers, use the **show ip rsvp aggregation ip endpoints** command in user EXEC or privileged EXEC mode.

```
show ip rsvp aggregation ip endpoints [role {aggregator | deaggregator}] [ip-address]
[dscp value] [detail]
```

## Syntax Description

<b>role</b>	(Optional) Specifies a router's position in the aggregation region.
<b>aggregator</b>	(Optional) Specifies the router at the beginning of the aggregation region.
<b>deaggregator</b>	(Optional) Specifies the router at the end of the aggregation region.
<i>ip-address</i>	(Optional) IP address of the aggregator or the deaggregator.
<b>dscp value</b>	(Optional) Specifies the differentiated services code point (DSCP) for the aggregator and deaggregator routers. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>
<b>detail</b>	(Optional) Displays additional information about the aggregators and deaggregators.

## Command Default

If you enter the **show ip rsvp aggregation ip endpoints** command without an optional keyword, the command displays information for all aggregate reservations.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
12.2(33)SRC	This command was introduced.

## Usage Guidelines

Use the **show ip rsvp aggregation ip endpoints** command to display any of the following output at aggregator and deaggregator routers:

- All aggregate reservations.
- All aggregate reservations for which a node is the aggregator.
- All aggregate reservations for which a node is the deaggregator.
- All aggregate reservations for which the remote node is identified with an IP address.
- All aggregate reservations for a given DSCP.

- Any combination of the preceding options; for example, all aggregates with a given DSCP for which a node is an aggregator and the remote node as specified in the IP address.
- Any of the preceding options with detailed information.

## Examples

The following is sample output from the **show ip rsvp aggregation ip endpoints detail** command:

```
Router# show ip rsvp aggregation ip endpoints detail

Role  DSCP Aggregator      Deaggregator      State  Rate   Used   QBM PoolID
-----
Agg   46   10.3.3.3           10.4.4.4          ESTABL 100K   100K   0x00000003
Aggregate Reservation for the following E2E Flows (PSBs):
To      From      Pro DPort Sport  Prev Hop   I/F       BPS
10.4.4.4  10.1.1.1  UDP 1    1    10.23.20.3 Et1/0     100K

Aggregate Reservation for the following E2E Flows (RSBs):
To      From      Pro DPort Sport  Next Hop   I/F       Fi Serv BPS
10.4.4.4  10.1.1.1  UDP 1    1    10.4.4.4   Se2/0     FF RATE 100K

Aggregate Reservation for the following E2E Flows (Reqs):
To      From      Pro DPort Sport  Next Hop   I/F       Fi Serv BPS
10.4.4.4  10.1.1.1  UDP 1    1    10.23.20.3 Et1/0     FF RATE 100K
```

Table 67 describes the significant fields shown in the display.

**Table 67** *show ip rsvp aggregation ip endpoints detail Field Descriptions*

Field	Description
Role	The router's function; values are aggregator or deaggregator.
DSCP	DSCP value.
Aggregator	IP address of the aggregator.
Deaggregator	IP address of the deaggregator.

**Table 67** *show ip rsvp aggregation ip endpoints detail Field Descriptions (continued)*

Field	Description
State	<p>Status of the reservation. Each aggregate reservation can be in one of the following states:</p> <ul style="list-style-type: none"> <li>• <b>PATH_WAIT</b>—Valid at the deaggregator only. The aggregate reservation at the deaggregator enters this state after the deaggregator has sent a <b>PATHERROR</b> message requesting a new aggregate needed.</li> <li>• <b>RESV_WAIT</b>—Valid at the aggregator only. The aggregate reservation at the aggregator enters this state after the aggregator has sent a <b>PATH</b> message for the aggregate reservation.</li> <li>• <b>RESVCONF_WAIT</b>—Valid at the deaggregator only. The aggregate reservation at the deaggregator enters this state after the deaggregator has sent a <b>RESV</b> message for the aggregate reservation.</li> <li>• <b>ESTABLISHED</b>—Valid at both the aggregator and the deaggregator. The aggregator enters this state after a <b>RESVCONF</b> message has been sent. The deaggregator enters this state after it receives a <b>RESVCONF</b> message for the aggregate reservation.</li> <li>• <b>SHUT_DELAY</b>—Valid at both the aggregator and the deaggregator. The aggregator and the deaggregator enter this state after the last end-to-end (E2E) reservation has been removed.</li> </ul>
Rate	Allocated bandwidth in bits per second (BPS).
Used	Amount of bandwidth used in bits per second (BPS).
QBM Pool ID	The quality of service (QoS) bandwidth manager (QBM) ID for the reservation.
Aggregate Reservation for the following E2E Flows	<p>Information for the reservation:</p> <p><b>PSB</b>—path state block. Contains data used for forwarding <b>PATH</b> messages downstream;</p> <p><b>RSB</b>—reservation state block. Contains data for the incoming <b>RESV</b> message.</p> <p><b>Reqs</b>—requests. Contain data required to forward a <b>RESV</b> message upstream to the node that sent the <b>PATH</b> message.</p>
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. Code indicates IP protocol such as TCP or User Datagram Protocol (UDP).
DPort	Destination port number.
Sport	Source port number.
Prev Hop or Next Hop	IP address of the previous or next hop.
I/F	Interface of the previous or next hop.

**Table 67** *show ip rsvp aggregation ip endpoints detail Field Descriptions (continued)*

Field	Description
Fi	Filter (Wildcard Filter, Shared-Explicit, or Fixed-Filter).
Serv	Service (RATE or LOAD).
BPS	Bandwidth used by the aggregate reservation in bits per second (BPS).

**Related Commands**

Command	Description
<b>ip rsvp aggregation ip</b>	Enables RSVP aggregation on a router.

# show ip rsvp atm-peak-rate-limit

To display the current peak rate limit set for an interface or for all interfaces, if any, use the **show ip rsvp atm-peak-rate-limit** command in EXEC mode.

```
show ip rsvp atm-peak-rate-limit [interface-type interface-number]
```

## Syntax Description

*interface-type* (Optional) Interface type and interface number.  
*interface-number*

## Command Modes

EXEC

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

The **show ip rsvp atm-peak-rate-limit** command displays the configured peak rate using the following notations for brevity:

- Kilobytes is shown as K bytes; for example, 1200 kilobytes is displayed as 1200K bytes.
- 1000 kilobytes is displayed as 1M bytes.

If no interface name is specified, configured peak rates for all Resource Reservation Protocol (RSVP)-enabled interfaces are displayed.

## Examples

The following example depicts results of the **show ip rsvp atm-peak-rate-limit** command, presuming that the ATM subinterface 2/0/0.1 was configured with a reservation peak rate limit of 100 KB using the **ip rsvp atm-peak-rate-limit** command.

The following is sample output from the **show ip rsvp atm-peak-rate-limit** command using the *interface-type interface-number* arguments:

```
Router# show ip rsvp atm-peak-rate-limit atm2/0/0.1

RSVP: Peak rate limit for ATM2/0/0.1 is 100K bytes
```

The following samples show output from the **show ip rsvp atm-peak-rate-limit** command when no interface name is given:

```
Router# show ip rsvp atm-peak-rate-limit

Interface name      Peak rate limit
Ethernet0/1/1      not set
ATM2/0/0            not set
ATM2/0/0.1         100K
```

```
Router# show ip rsvp atm-peak-rate-limit
```

```
Interface name      Peak rate limit
Ethernet0/1         not set
ATM2/1/0            1M
ATM2/1/0.10         not set
ATM2/1/0.11         not set
ATM2/1/0.12         not set
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp atm-peak-rate-limit</b>	Sets a limit on the peak cell rate of reservations for all newly created RSVP SVCs established on the current interface or any of its subinterfaces.

---

# show ip rsvp authentication

To display the security associations that Resource Reservation Protocol (RSVP) has established with other RSVP neighbors, use the **show ip rsvp authentication** command in user EXEC or privileged EXEC mode.

```
show ip rsvp authentication [detail] [from {ip-address | hostname}] [to {ip-address | hostname}]
```

## Syntax Description

<b>detail</b>	(Optional) Displays additional information about RSVP security associations.
<b>from</b>	(Optional) Specifies the starting point of the security associations.
<b>to</b>	(Optional) Specifies the ending point of the security associations.
<i>ip-address</i>	(Optional) Information about a neighbor with a specified IP address.
<i>hostname</i>	(Optional) Information about a particular host.

## Command Modes

User EXEC (<)  
Privileged EXEC (#)

## Command History

Release	Modification
12.2(15)T	This command was introduced.
12.0(29)S	The optional <b>from</b> and <b>to</b> keywords were added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **show ip rsvp authentication** command to display the security associations that RSVP has established with other RSVP neighbors. You can display all security associations or specify an IP address or hostname of a particular RSVP neighbor, which restricts the size of the display.

The difference between the *ip-address* and *hostname* arguments is whether you specify the neighbor by its IP address or by its name.

## Examples

The following is sample output from the **show ip rsvp authentication** command:

```
Router# show ip rsvp authentication

Codes: S - static, D - dynamic, N - neighbor, I -interface, C - chain
From          To           I/F         Mode   Key-Source  Key-ID   Code
192.168.102.1 192.168.104.3 Et2/2      Send   RSVPKey     1        DNC
192.168.104.1 192.168.104.3 Et2/2      Send   RSVPKey     1        DNC
192.168.104.1 192.168.104.3 AT1/0.1    Send   RSVPKey     1        DNC
192.168.106.1 192.168.104.3 AT1/0.1    Send   RSVPKey     1        DNC
192.168.106.1 192.168.106.2 AT1/0.1    Send   RSVPKey     1        DNC
192.168.106.2 192.168.104.1 AT1/0.1    Receive RSVPKey   1        DNC
192.168.106.2 192.168.106.1 AT1/0.1    Receive RSVPKey   1        DNC
```

Table 68 describes the significant fields shown in the display.

**Table 68** *show ip rsvp authentication Field Descriptions*

Field	Description
Codes	Keys can be either static (manually configured) or dynamic (created from a per-ACL key or obtained from a key management server such as Kerberos). Cisco IOS software does not currently support dynamic keys from key management servers. If the field contains the string per-neighbor, it means the security association is using a per-neighbor key; if the field contains the string per-interface, it means the security association is using a per-interface key. If the field contains the string chain, it means the key for the security association comes from the key chain specified in the Key Source.
From	Starting point of the security association.
To	Ending point of the security association.
I/F	Name and number of the interface over which the security association is being maintained.
Mode	Separate associations maintained for sending and receiving RSVP messages for a specific RSVP neighbor. Possible values are <b>Send</b> or <b>Receive</b> .
Key-Source	Indicates where the key was configured.
Key-ID	A string which, along with the IP address, uniquely identifies a security association. The key ID is automatically generated in Cisco IOS software by using the per-interface <b>ip rsvp authentication key</b> command, but it is configured in Cisco IOS software when using key chains for per-neighbor or per-interface RSVP keys. The key ID may be configurable on other RSVP platforms. A key ID is provided in every RSVP authenticated message initiated by a sender and is stored by every RSVP receiver.  <b>Note</b> <b>Key Expired</b> in this field means that all possible keys used for this neighbor have expired.
Code	Indicates the type of key ID used.

The following is sample output from the **show ip rsvp authentication detail** command:

```
Router# show ip rsvp authentication detail

From:                192.168.102.1
To:                  192.168.104.3
Neighbor:            192.168.102.2
Interface:           Ethernet2/2
Mode:                Send
Key ID:              1
Key ACL:             R2 (populated)
Key Source:          RSVPKey (enabled)
Key Type:            Dynamic per-neighbor chain
Handle:              01000411
Hash Type:           MD5
Lifetime:            00:30:00
Expires:             00:17:08
Challenge:           Supported
Window size:        1
Last seq # sent:    14167519095569779135

From:                192.168.104.1
To:                  192.168.104.3
Neighbor:            192.168.102.2
```

## show ip rsvp authentication

```

Interface:          Ethernet2/2
Mode:               Send
Key ID:             1
Key ACL:            R2 (populated)
Key Source:         RSVPKey (enabled)
Key Type:           Dynamic per-neighbor chain
Handle:             0400040F
Hash Type:          MD5
Lifetime:           00:30:00
Expires:            00:22:06
Challenge:          Supported
Window size:        1
Last seq # sent:    14167520384059965440

```

```

From:               192.168.104.1
To:                 192.168.104.3
Neighbor:           192.168.106.2
Interface:          ATM1/0.1
Mode:               Send
Key ID:             1
Key ACL:            R3 (populated)
Key Source:         RSVPKey (enabled)
Key Type:           Dynamic per-neighbor chain
Handle:             02000404
Hash Type:          MD5
Lifetime:           00:30:00
Expires:            00:16:37
Challenge:          Supported
Window size:        1
Last seq # sent:    14167518979605659648

```

```

From:               192.168.106.1
To:                 192.168.104.3
Neighbor:           192.168.106.2
Interface:          ATM1/0.1
Mode:               Send
Key ID:             1
Key ACL:            R3 (populated)
Key Source:         RSVPKey (enabled)
Key Type:           Dynamic per-neighbor chain
Handle:             01000408
Hash Type:          MD5
Lifetime:           00:30:00
Expires:            00:11:37
Challenge:          Supported
Window size:        1
Last seq # sent:    14167517691115473376

```

```

From:               192.168.106.1
To:                 192.168.106.2
Neighbor:           192.168.106.2
Interface:          ATM1/0.1
Mode:               Send
Key ID:             1
Key ACL:            R3 (populated)
Key Source:         RSVPKey (enabled)
Key Type:           Dynamic per-neighbor chain
Handle:             8D00040E
Hash Type:          MD5
Lifetime:           00:30:00
Expires:            00:29:29
Challenge:          Supported
Window size:        1
Last seq # sent:    14167808344437293057

```

```

From:                192.168.106.2
To:                  192.168.104.1
Neighbor:            192.168.106.2
Interface:           ATM1/0.1
Mode:                Receive
Key ID:              1
Key ACL:             R3 (populated)
Key Source:          RSVPKey (enabled)
Key Type:            Dynamic per-neighbor chain
Handle:              CD00040A
Hash Type:           MD5
Lifetime:            00:30:00
Expires:             00:29:33
Challenge:           Not configured
Window size:         1
Last seq # rcvd:    14167808280012783626

From:                192.168.106.2
To:                  192.168.106.1
Neighbor:            192.168.106.2
Interface:           ATM1/0.1
Mode:                Receive
Key ID:              1
Key ACL:             R3 (populated)
Key Source:          RSVPKey (enabled)
Key Type:            Dynamic per-neighbor chain
Handle:              C0000412
Hash Type:           MD5
Lifetime:            00:30:00
Expires:             00:29:33
Challenge:           Not configured
Window size:         1
Last seq # rcvd:    14167808280012783619

```

Table 69 describes the significant fields shown in the display.

**Table 69** *show ip rsvp authentication detail Field Descriptions*

Field	Description
From	Starting point of the security association.
To	Ending point of the security association.
Neighbor	IP address of the RSVP neighbor with which the security association is being maintained.
Interface	Name and number of the interface over which the security association is being maintained.
Mode	Separate associations maintained for sending and receiving RSVP messages for a specific RSVP neighbor. Possible values are <b>Send</b> or <b>Receive</b> .
Key ID	A string which, along with the IP address, uniquely identifies a security association. The key ID is automatically generated in Cisco IOS software by using the per-interface <b>ip rsvp authentication key</b> command, but it is configured in Cisco IOS software when using key chains for per-neighbor or per-interface RSVP keys. The key ID may be configurable on other RSVP platforms. A key ID is provided in every RSVP authenticated message initiated by a sender and is stored by every RSVP receiver.  <b>Note</b> <b>Key Expired</b> in this field means that all possible keys used for this neighbor have expired.

Table 69 show ip rsvp authentication detail Field Descriptions (continued)

Field	Description
Key ACL	For key types that say dynamic and chain, this field indicates which ACL matched that neighbor, and therefore, which key chain to use. Possible values include: <ul style="list-style-type: none"> <li>• <b>populated</b> = ACL has entries in it.</li> <li>• <b>removed</b> = ACL has been removed from the configuration.</li> </ul>
Key Source	Indicates where the key was configured and whether it is enabled or disabled. For key chains, this indicates the name of the key chain; the Key ID field indicates which key in the chain is currently being used. For per-interface keys, this field contains the name of the interface that was configured with the key.
Key Type	Static (manually configured) or dynamic (created from a per-ACL key or obtained from a key management server such as Kerberos). <p><b>Note</b> Cisco IOS software does not currently support dynamic keys from key management servers.</p>
Handle	Internal database ID assigned to the security association by RSVP for bookkeeping purposes.
Hash Type	Type of secure hash algorithm being used with that neighbor.
Lifetime	Maximum amount of time (in hours, minutes, and seconds) that can elapse before a security association is expired. <p><b>Note</b> This is not how long a key is valid; to obtain duration times for keys, use the <b>show key chain</b> command.</p>
Expires	Amount of time remaining (in days, hours, minutes, and seconds) before the security association expires. <p><b>Note</b> This is not when the current key expires; to obtain expiration times for keys, use the <b>show key chain</b> command.</p>
Challenge	For receive-type security associations, possible values are <b>Not Configured</b> , <b>Completed</b> , <b>In Progress</b> , and <b>Failed</b> . For send-type security associations, the value is <b>Supported</b> . Cisco IOS software can always respond to challenges; however, there may be non-Cisco neighbors that do not implement challenges.
Window size	Indicates the size of the window for receive-type security associations and the maximum number of authenticated RSVP messages that can be received out-of-order before a replay attack is to be suspected.
Last seq # sent	Displayed only for send-type security associations. It indicates the sequence number used to send the last authenticated message to the RSVP neighbor. Use this information to troubleshoot certain types of authentication problems.
Last valid seq # rcvd	Displayed only for receive-type security associations. It indicates the authentication sequence number of the last valid RSVP message received from the neighbor. By default, it shows only one sequence number. However, if you use the <b>ip rsvp authentication window-size</b> command to increase the authentication window size to <i>n</i> , then the last <i>n</i> valid received sequence numbers are displayed. Use this information to troubleshoot certain types of authentication problems.

**Related Commands**

Command	Description
<b>clear ip rsvp authentication</b>	Eliminates RSVP security associations before their lifetimes expire.

# show ip rsvp counters

To display the number of Resource Reservation Protocol (RSVP) messages that were sent and received on each interface, use the **show ip rsvp counters** command in user EXEC or privileged EXEC mode.

**show ip rsvp counters** [**authentication**] [**interface** *type number* | **summary** | **neighbor**]

Syntax Description	
<b>authentication</b>	(Optional) Displays a list of RSVP authentication counters.
<b>interface</b> <i>type number</i>	(Optional) Displays the number of RSVP messages sent and received for the specified interface name.
<b>summary</b>	(Optional) Displays the cumulative number of RSVP messages sent and received by the router over all interfaces.
<b>neighbor</b>	(Optional) Displays the number of RSVP messages sent and received by the specified neighbor.

**Command Default** If you enter the **show ip rsvp counters** command without an optional keyword, the command displays the number of RSVP messages that were sent and received for each interface on which RSVP is configured.

**Command Modes** User EXEC (<)  
Privileged EXEC (#)

Command History	Release	Modification
	12.0(14)ST	This command was introduced.
	12.2(13)T	The <b>neighbor</b> keyword was added, and the command was integrated into Cisco IOS Release 12.2(13)T.
	12.2(15)T	The command output was modified to show the errors counter incrementing whenever an RSVP message is received on an interface with RSVP authentication enabled, but the authentication checks failed on that message.
	12.2(11)S	This command was integrated into Cisco IOS Release 12.2(11)S.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
	12.0(29)S	The <b>authentication</b> keyword was added, and the command output was modified to include hello and message queues information.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Examples**

The following example shows the values for the number of RSVP messages of each type that were sent and received by the router over all interfaces, including the hello and message queues information:

```
Router# show ip rsvp counters summary
```

```

All Interfaces          Recv      Xmit
Path                   110       15    Resv                   50       28
PathError              0         0    ResvError              0         0
PathTear               0         0    ResvTear               0         0
ResvConf               0         0    RTearConf              0         0
Ack                    0         0    Srefresh               0         0
Hello                  5555      5554  IntegrityChalle       0         0
IntegrityRespon       0         0    DSBM_WILLING          0         0
I_AM_DSBM              0         0
Unknown                0         0    Errors                 0         0

Recv Msg Queues          Current    Max
RSVP                    0         2
Hello (per-I/F)         0         1
Awaiting Authentication 0         0

```

Table 70 describes the significant fields shown in the display.

**Table 70** *show ip rsvp counters summary* Field Descriptions

Field	Description
All Interfaces	Types of messages displayed for all interfaces. <b>Note</b> Hello is a summary of graceful restart, reroute (hello state timer), and Fast Reroute messages.
Recv	Number of messages received on the specified interface or on all interfaces.
Xmit	Number of messages transmitted from the specified interface or from all interfaces.
Recv Msg Queues	Queues for received messages for RSVP, hello per interface, and awaiting authentication. <ul style="list-style-type: none"> <li>• Current—Number of messages queued.</li> <li>• Max—Maximum number of messages ever queued.</li> </ul>

**Related Commands**

Command	Description
<b>clear ip rsvp counters</b>	Clears (sets to zero) all IP RSVP counters that are being maintained.

# show ip rsvp counters state teardown

To display counters for Resource Reservation Protocol (RSVP) events that caused a state to be torn down, use the **show ip rsvp counters state teardown** command in user EXEC or privileged EXEC mode.

## show ip rsvp counters state teardown

**Syntax Description** This command has no arguments or keywords.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** Use the **show ip rsvp counters state teardown** command when a label-switched path (LSP) is down. If graceful restart triggered the state teardown, the numbers in the Path, Resv-In, and Resv-Out columns in the “Examples” section are greater than 0.

**Examples** The following is sample output from the **show ip rsvp counters state teardown** command:

```
Router# show ip rsvp counters state teardown
```

```
States
Reason for Teardown                                State torn down
                                                    Path    Resv-In  Resv-Out
PathTear arrival                                  0        0        0
ResvTear arrival                                  0        0        0
Local application requested tear                  0        0        0
Output or Input I/F went down                    0        0        0
Missed refreshes                                  0        0        0
Preemption                                         0        0        0
Backup tunnel failed for FRR Active LSP           0        0        0
Reroutabilty changed for FRR Active LSP           0        0        0
Hello RR Client (HST) requested tear              0        0        0
Graceful Restart (GR) requested tear              0        0        0
Downstream neighbor SSO-restarting               0        0        0
Resource unavailable                              0        0        0
Policy rejection                                  0        0        0
Policy server sync failed                         0        0        0
Traffic control error                             0        0        0
Error in received message                         0        0        0
Non RSVP HOP upstream, TE LSP                     0        0        0
Other                                              0        0        0
```

Table 71 describes the significant fields shown in the display.

**Table 71** *show ip rsvp counters state teardown Field Descriptions*

Field	Description
States	RSVP state, including path state block (PSB) and reservation state block (RSB) information.
Reason for Teardown	Event triggering the teardown.

#### Related Commands

Command	Description
<code>clear ip rsvp counters</code>	Clears (sets to zero) the IP RSVP counters that are being maintained.

# show ip rsvp fast bw-protect

To display information about whether backup bandwidth protection is enabled and the status of backup tunnels that may be used to provide that protection, use the **show ip rsvp fast bw-protect** command in user EXEC or privileged EXEC mode.

**show ip rsvp fast bw-protect**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The backup bandwidth protection and backup tunnel status information is not displayed.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	12.0(29)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Examples** The following is sample output from the **show ip rsvp fast bw-protect** command:

```
Router# show ip rsvp fast bw-protect

Primary      Protect  BW          Backup
Tunnel       I/F      BPS:Type    Tunnel:Label  State  BW-P  Type
-----
PRAB-72-5_t500 PO2/0    500K:S      Tu501:19     Ready  ON    Nhop
PRAB-72-5_t601 PO2/0    103K:S      Tu501:20     Ready  OFF   Nhop
PRAB-72-5_t602 PO2/0    70K:S       Tu501:21     Ready  ON    Nhop
PRAB-72-5_t603 PO2/0    99K:S       Tu501:22     Ready  ON    Nhop
PRAB-72-5_t604 PO2/0    100K:S      Tu501:23     Ready  OFF   Nhop
PRAB-72-5_t605 PO2/0    101K:S      Tu501:24     Ready  OFF   Nhop
```

[Table 72](#) describes the significant fields shown in the display.

**Table 72** *show ip rsvp fast bw-protect Field Descriptions*

Field	Description
Primary Tunnel	Identification of the tunnel being protected.
Protect I/F	Interface name.

**Table 72** *show ip rsvp fast bw-protect Field Descriptions (continued)*

Field	Description
BW BPS:Type	Bandwidth, in bits per second, and type of bandwidth. Possible values are: <ul style="list-style-type: none"> <li>• S—Subpool</li> <li>• G—Global pool</li> </ul>
Backup Tunnel:Label	Identification of the backup tunnel.
State	Status of backup tunnel. Valid values are: <ul style="list-style-type: none"> <li>• Ready—Data is passing through the primary tunnel, but the backup tunnel is ready to take over if the primary tunnel goes down.</li> <li>• Active—The primary tunnel is down, so the backup tunnel is used for traffic.</li> <li>• None—There is no backup tunnel.</li> </ul>
BW-P	Status of backup bandwidth protection. Possible values are ON and OFF.
Type	Type of backup tunnel. Possible values are: <ul style="list-style-type: none"> <li>• Nhop—Next hop</li> <li>• NNHOP—Next-next hop</li> </ul>

**Related Commands**

Command	Description
<b>tunnel mpls traffic-eng fast-reroute bw-protect</b>	Enables an MPLS TE tunnel to use an established backup tunnel in the event of a link or node failure.

# show ip rsvp fast detail

To display specific information for Resource Reservation Protocol (RSVP) categories, use the **show ip rsvp fast detail** command in user EXEC or privileged EXEC mode.

## show ip rsvp fast detail

**Syntax Description** This command has no arguments or keywords.

**Command Default** Specific information for RSVP categories is not displayed.

**Command Modes** User EXEC  
Privileged EXEC'

Command History	Release	Modification
	12.0(24)S	This command was introduced
	12.0(29)S	Bandwidth Prot desired was added in the Flag field of the command output.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Examples** The following is sample output from the **show ip rsvp fast detail** command:

```
Router# show ip rsvp fast detail

PATH:
  Tun Dest:   10.0.0.7   Tun ID: 500   Ext Tun ID: 10.0.0.5
  Tun Sender: 10.0.0.5   LSP ID: 8
  Path refreshes:
    sent:      to   NHOP 10.5.6.6 on POS2/0
  Session Attr:
    Setup Prio: 7, Holding Prio: 7
    Flags: Local Prot desired, Label Recording, SE Style, Bandwidth Prot desired
    Session Name: PRAB-72-5_t500
  ERO: (incoming)
    10.0.0.5 (Strict IPv4 Prefix, 8 bytes, /32)
    555.5.6.6 (Strict IPv4 Prefix, 8 bytes, /32)
    555.6.7.7 (Strict IPv4 Prefix, 8 bytes, /32)
    10.0.0.7 (Strict IPv4 Prefix, 8 bytes, /32)
  ERO: (outgoing)
    555.5.6.6 (Strict IPv4 Prefix, 8 bytes, /32)
    555.6.7.7 (Strict IPv4 Prefix, 8 bytes, /32)
    10.0.0.7 (Strict IPv4 Prefix, 8 bytes, /32)
  Traffic params - Rate: 500K bits/sec, Max. burst: 1K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size 4294967295 bytes
  Fast-Reroute Backup info:
    Inbound FRR: Not active
    Outbound FRR: Ready -- backup tunnel selected
      Backup Tunnel: Tu501          (label 19)
      Bkup Sender Template:
        Tun Sender: 555.5.6.5   LSP ID: 8
```

```

Bkup FilerSpec:
  Tun Sender: 555.5.6.5, LSP ID: 8
Path ID handle: 04000405.
Incoming policy: Accepted. Policy source(s): MPLS/TE
Status: Proxied
Output on POS2/0. Policy status: Forwarding. Handle: 02000406

```

Table 73 describes the significant fields shown in the display.

**Table 73** *show ip RSVP fast detail Field Descriptions*

Field	Description
Tun Dest	IP address of the receiver.
Tun ID	Tunnel identification number.
Ext Tun ID	Extended tunnel identification number.
Tun Sender	IP address of the sender.
LSP ID	Label-switched path identification number.
Setup Prio	Setup priority.
Holding Prio	Holding priority.
Flags	Backup bandwidth protection has been configured for the label-switched path (LSP).
Session Name	Name of the session.
ERO (incoming)	EXPLICIT_ROUTE object of incoming path messages.
ERO (outgoing)	EXPLICIT_ROUTE object of outgoing path messages.
Traffic params Rate	Average rate, in bits per second.
Max. burst	Maximum burst size, in bytes.
Min Policed Unit	Minimum policed units, in bytes.
Max Pkt Size	Maximum packet size, in bytes.
Inbound FRR	Status of inbound Fast Reroute (FRR) backup tunnel. If this node is downstream from a rerouted LSP (for example, at a merge point for this LSP), the state is Active.
Outbound FRR	Status of outbound FRR backup tunnel. If this node is a point of local repair (PLR) for an LSP, there are three possible states: <ul style="list-style-type: none"> <li>• Active—This LSP is actively using its backup tunnel, presumably because there has been a downstream failure.</li> <li>• No Backup—This LSP does not have local (Fast Reroute) protection. No backup tunnel has been selected for it to use in case of a failure.</li> <li>• Ready—This LSP is ready to use a backup tunnel in case of a downstream link or node failure. A backup tunnel has been selected for it to use.</li> </ul>

**Table 73** *show ip rsvp fast detail Field Descriptions (continued)*

Field	Description
Backup Tunnel	If the Outbound FRR state is Ready or Active, this field indicates the following: <ul style="list-style-type: none"> <li>Which backup tunnel has been selected for this LSP to use in case of a failure.</li> <li>The inbound label that will be prepended to the LSP's data packets for acceptance at the backup tunnel tail (the merge point).</li> </ul>
Bkup Sender Template	If the Outbound FRR state is Ready or Active, SENDER_TEMPLATE and FILTERSPEC objects are shown. These objects will be used in RSVP messages sent by the backup tunnel if or when the LSP starts actively using the backup tunnel. They differ from the original (prefailure) objects only in that the node (the PLR) substitutes its own IP address for that of the original sender. For example, path and pathTear messages will contain the new SENDER_TEMPLATE. Resv and resvTear messages will contain the new FILTERSPEC object. If this LSP begins actively using the backup tunnel, the display changes.
Bkup FilerSpec	If the Outbound FRR state is Ready or Active, SENDER_TEMPLATE and FILTERSPEC objects are shown. These objects will be used in RSVP messages sent by the backup tunnel if or when the LSP starts actively using the backup tunnel. They differ from the original (prefailure) objects only in that the node (the PLR) substitutes its own IP address for that of the original sender. For example, path and pathTear messages will contain the new SENDER_TEMPLATE. Resv and resvTear messages will contain the new FILTERSPEC object. If this LSP begins actively using the backup tunnel, the display changes.
Path ID handle	Protection Switch Byte (PSB) identifier.
Incoming policy	Policy decision of the LSP. If RSVP policy was not granted for the incoming path message for the tunnel, the LSP does not come up. Accepted is displayed.
Policy source(s)	For FRR LSPs, this value always is MPLS/TE for the policy source.
Status	For FRR LSPs, valid values are: <ul style="list-style-type: none"> <li>Proxied—Headend routers</li> <li>Proxied Terminated—Tailend routers</li> </ul> For midpoint routers, the field always is blank.

**Related Commands**

Command	Description
<b>mpls traffic-eng fast-reroute backup-prot-preemption</b>	Changes the backup protection preemption algorithm to minimize the amount of bandwidth that is wasted.

# show ip rsvp fast-reroute

To display information about fast reroutable primary tunnels and their corresponding backup tunnels that provide protection, use the **show ip rsvp fast-reroute** command in privileged EXEC mode.

**show ip rsvp fast-reroute**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.0(27)S	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Examples** The following example displays information about fast reroutable primary tunnels and their corresponding backup tunnels that provide protection:

```
Router# show ip rsvp fast-reroute

Primary          Protect BW          Backup
Tunnel          I/F    BPS:Type  Tunnel:Label  State  Level  Type
-----
GSR1---R2---_t65336  PO1/0  0:G      Tu1002:0     Ready any-unl Nhop
GSR1---R2---_t65338  PO4/0  0:G      Tu1004:0     Ready any-unl Nhop
```

Table 74 describes the significant fields shown in the display.

**Table 74** *show ip rsvp fast-reroute Field Descriptions*

Field	Description
Primary Tunnel	Hostname and tunnel ID.
Protect I/F	Interface that is being protected.
BW BPS:Type	Bandwidth bits per second and pool from which bandwidth comes. Valid values are G, global pool; S, subpool.
Backup Tunnel:Label	Backup tunnel ID and label.
State	Status of protection. Valid values are Ready and Active.
Level	Level of bandwidth. Valid values are any and unl (unlimited).
Type	Type of backup tunnel: Nhop (next hop) or NNhop (next-next hop).

Related Commands	Command	Description
	<b>mpls traffic-eng auto-tunnel primary config</b>	Enables IP processing without an explicit address.
	<b>mpls traffic-eng auto-tunnel primary config mpls ip</b>	Enables LDP on primary autotunnels.
	<b>mpls traffic-eng auto-tunnel primary onehop</b>	Automatically creates primary tunnels to all next-hops.
	<b>mpls traffic-eng auto-tunnel primary timers</b>	Configures how many seconds after a failure primary autotunnels are removed.
	<b>mpls traffic-eng auto-tunnel primary tunnel-num</b>	Configures the range of tunnel interface numbers for primary autotunnels.

# show ip rsvp hello

To display hello status and statistics for Fast Reroute, reroute (hello state timer), and graceful restart, use the **show ip rsvp hello** command in user EXEC or privileged EXEC mode.

## show ip rsvp hello

### Syntax Description

This command has no arguments or keywords.

### Command Modes

User EXEC  
Privileged EXEC

### Command History

Release	Modification
12.0(22)S	This command was introduced.
12.0(29)S	The command output was modified to include graceful restart, reroute (hello state timer), and Fast Reroute information.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	The command output was modified to show whether graceful restart is configured and full mode was added.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

### Examples

The following is sample output from the **show ip rsvp hello** command:

```
Router# show ip rsvp hello

Hello:
  Fast-Reroute/Reroute: Enabled
    Statistics: Disabled
  GracefulRestart: Enabled, mode: full
```

[Table 75](#) describes the significant fields shown in the display. The fields describe the processes for which hello is enabled or disabled.

**Table 75**      *show ip rsvp hello Field Descriptions*

<b>Field</b>	<b>Description</b>
Fast-Reroute/Reroute	Status of fast reroute/reroute. Values are as follows: <ul style="list-style-type: none"> <li>• Enabled—Fast reroute and reroute (hello for state timer) are activated (enabled).</li> <li>• Disabled—Fast reroute and reroute (hello for state timer) are not activated (disabled).</li> </ul>
Statistics	Status of hello statistics. Valid values are as follows: <ul style="list-style-type: none"> <li>• Enabled—Statistics are configured. Hello packets are time-stamped when they arrive in the hello input queue for the purpose of recording the time required until they are processed.</li> <li>• Disabled—Hello statistics are not configured.</li> <li>• Shutdown—Hello statistics are configured but not operational. The input queue is too long (that is, more than 10,000 packets are queued).</li> </ul>
GracefulRestart	Restart capability: <ul style="list-style-type: none"> <li>• Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor).</li> <li>• Disabled—Restart capability is not activated.</li> </ul>

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello (configuration)</b>	Enables hello globally on the router.
<b>ip rsvp signalling hello statistics</b>	Enables hello statistics on the router.
<b>show ip rsvp hello statistics</b>	Displays how long hello packets have been in the hello input queue.

# show ip rsvp hello client lsp detail

To display detailed information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for label-switched paths (LSPs), use the **show ip rsvp hello client lsp detail** command in user EXEC or privileged EXEC mode.

## show ip rsvp hello client lsp detail

### Syntax Description

This command has no arguments or keywords.

### Command Modes

User EXEC  
Privileged EXEC

### Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

### Usage Guidelines

Use the **show ip rsvp hello client lsp detail** command to display information about the LSPs, including IP addresses and their types.

### Examples

The following is sample output from the **show ip rsvp hello client lsp detail** command:

```
Router# show ip rsvp hello client lsp detail

Hello Client LSPs (all lsp tree)

  Tun Dest: 10.0.1.1  Tun ID: 14  Ext Tun ID: 172.16.1.1
  Tun Sender: 172.16.1.1  LSP ID: 31
    Lsp flags: 0x32
    Lsp GR DN nbr: 192.168.1.1
    Lsp RR DN nbr: 10.0.0.3 HST
```

[Table 76](#) describes the significant fields shown in the display.

**Table 76** *show ip rsvp hello client lsp detail* Field Descriptions

Field	Description
Hello Client LSPs	Current clients include graceful restart (GR), reroute (RR) (hello state timer), and fast reroute (FRR).
Tun Dest	IP address of the destination tunnel.
Tun ID	Identification number of the tunnel.
Ext Tun ID	Extended identification number of the tunnel. Usually, this is the same as the source address.

**Table 76** *show ip rsvp hello client lsp detail Field Descriptions (continued)*

Field	Description
Tun Sender	IP address of the tunnel sender.
LSP ID	Identification number of the LSP.
Lsp flags	LSP database information.
Lsp GR DN nbr	IP address of the LSP graceful restart downstream neighbor.
Lsp RR DN nbr	IP address LSP reroute downstream neighbor; HST—hello state timer.

**Related Commands**

Command	Description
<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

# show ip rsvp hello client lsp summary

To display summary information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for label-switched paths (LSPs), use the **show ip rsvp hello client lsp summary** command in user EXEC or privileged EXEC mode.

**show ip rsvp hello client lsp summary**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **show ip rsvp hello client lsp summary** command to display information about the LSPs, including IP addresses and identification numbers.

## Examples

The following is sample output from the **show ip rsvp hello client lsp summary** command:

```
Router# show ip rsvp hello client lsp summary

Local          Remote          tun_id  lsp_id  FLAGS
10.1.1.1       172.16.1.1     14      31     0x32
```

[Table 77](#) describes the significant fields shown in the display.

**Table 77** *show ip rsvp hello client lsp summary* Field Descriptions

Field	Description
Local	IP address of the tunnel sender.
Remote	IP address of the tunnel destination.
tun_id	Identification number of the tunnel.
lsp_id	Identification number of the LSP.
FLAGS	Database information.

■ show ip rsvp hello client lsp summary

Related Commands	Command	Description
	<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

# show ip rsvp hello client neighbor detail

To display detailed information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for neighbors, use the **show ip rsvp hello client neighbor detail** command in user EXEC or privileged EXEC mode.

## show ip rsvp hello client neighbor detail

### Syntax Description

This command has no arguments or keywords.

### Command Modes

User EXEC  
Privileged EXEC

### Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

### Usage Guidelines

Use the **show ip rsvp hello client neighbor detail** command to display information about the hello neighbors, including their state and type.

### Examples

The following is sample output from the **show ip rsvp hello client neighbor detail** command:

```
Router# show ip rsvp hello client neighbor detail

Hello Client Neighbors

  Remote addr 10.0.0.1, Local addr 10.0.0.3
  Nbr State: Normal   Type: Reroute
  Nbr Hello State: Up
  LSPs protecting: 1
  I/F: Et1/3

  Remote addr 172.16.1.1, Local addr 192.168.1.1
  Nbr State: Normal   Type: Graceful Restart
  Nbr Hello State: Lost
  LSPs protecting: 1
```

Table 78 describes the significant fields shown in the display. The fields provide information that uniquely identifies the neighbors. Clients can include graceful restart, reroute (hello state timer), and fast reroute.

**Table 78** *show ip rsvp hello client neighbor detail Field Descriptions*

Field	Description
Remote addr	IP address of the remote neighbor. For graceful restart, this is the neighbor router's ID; for fast reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
Local addr	IP address of the local neighbor. For graceful restart, this is the neighbor router's ID; for fast reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
Nbr State	State of the neighbor; values can be the following: <ul style="list-style-type: none"> <li>• Normal = neighbor is functioning normally.</li> <li>• Restarting = neighbor is restarting.</li> <li>• Recover Nodal = neighbor is recovering from node failure.</li> <li>• HST_GR_LOST = HST (hello state timer for reroute) is lost; waiting to see if graceful restart (GR) is also lost.</li> <li>• WAIT PathTear = PathTear message is delayed to allow traffic in the pipeline to be transmitted.</li> </ul>
Type	Type of client; graceful restart, Reroute (hello state timer), or Fast Reroute.
Nbr Hello State	State of hellos for the neighbor. Values are as follows: <ul style="list-style-type: none"> <li>• Up—Node is communicating with its neighbor.</li> <li>• Lost—Communication has been lost.</li> <li>• Init—Communication is being established.</li> </ul>
LSPs protecting	Number of LSPs being protected.
I/F	Interface name and number associated with the hello instance.

#### Related Commands

Command	Description
<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

# show ip rsvp hello client neighbor summary

To display summary information about Resource Reservation Protocol (RSVP) traffic engineering (TE) client hellos for neighbors, use the **show ip rsvp hello client neighbor summary** command in user EXEC or privileged EXEC mode.

## show ip rsvp hello client neighbor summary

### Syntax Description

This command has no arguments or keywords.

### Command Modes

User EXEC  
Privileged EXEC

### Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

### Usage Guidelines

Use the **show ip rsvp hello client neighbor summary** command to display information about the neighbors, including state, type, and hello instance status.

### Examples

The following is sample output from the **show ip rsvp hello client neighbor summary** command:

```
Router# show ip rsvp hello client neighbor summary

LocalRemoteTypeNBR_STATEHI_STATELSPs
10.0.0.110.0.0.3RRNormalUp1
172.16.1.1192.168.1.1GRNormalLost1
```

[Table 79](#) describes the significant fields shown in the display.

**Table 79** *show ip rsvp hello client neighbor summary Field Descriptions*

Field	Description
Local	IP address of the tunnel sender.
Remote	IP address of the tunnel destination.
Type	Type of client; graceful restart (GR), reroute (RR (hello state timer)), or fast reroute (FRR).

**Table 79** *show ip rsvp hello client neighbor summary Field Descriptions (continued)*

Field	Description
NBR_STATE	State of the neighbor; values can be the following: <ul style="list-style-type: none"> <li>• Normal—Neighbor is functioning normally.</li> <li>• Restarting—Neighbor is restarting.</li> <li>• Recover Nodal—Neighbor is recovering from node failure.</li> <li>• HST_GR_LOST—HST (hello state timer for reroute) is lost; waiting to see if graceful restart (GR) is also lost.</li> <li>• WAIT PathTear—PathTear message is delayed to allow traffic in the pipeline to be transmitted.</li> </ul>
HI_STATE	State of hello instances for the neighbor. Values are as follows: <ul style="list-style-type: none"> <li>• Up—Node is communicating with its neighbor.</li> <li>• Lost—Communication has been lost.</li> <li>• Init—Communication is being established.</li> </ul>
LSPs	Number of LSPs going to or coming from the neighbor.

**Related Commands**

Command	Description
<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

# show ip rsvp hello graceful-restart

To display information about Resource Reservation Protocol (RSVP) traffic engineering (TE) graceful restart hellos, use the **show ip rsvp hello graceful-restart** command in user EXEC or privileged EXEC mode.

**show ip rsvp hello graceful-restart**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.0(29)S	This command was introduced.
12.2(33)SRA	The command output was modified to show whether graceful restart is configured and full mode was added.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **show ip rsvp hello graceful-restart** command to display the status of graceful restart and related statistics.

## Examples

The following is sample output from the **show ip rsvp hello graceful-restart** command:

```
Router# show ip rsvp hello graceful-restart

Graceful Restart: Enabled (full mode)
  Refresh interval: 10000 msec
  Refresh misses: 4
  DSCP: 0x30
  Advertised restart time: 30000 msec
  Advertised recovery time: 120000 msec
  Maximum wait for recovery: 3600000 msec
```

[Table 80](#) describes the significant fields shown in the display.

**Table 80** *show ip rsvp hello graceful-restart Field Descriptions*

Field	Description
Graceful Restart	Restart capability: <ul style="list-style-type: none"> <li>Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor).</li> <li>Disabled—Restart capability is not activated.</li> </ul>
Refresh interval	Frequency in milliseconds (ms) with which a node sends a hello message to its neighbor.

**Table 80** *show ip rsvp hello graceful-restart Field Descriptions (continued)*

Field	Description
Refresh misses	Number of missed hello messages that trigger a neighbor down event upon which stateful switchover (SSO) procedures are started.
DSCP	The differentiated services code point (DSCP) value in the IP header of the hello messages.
Advertised restart time	The time, in ms, that is required for the sender to restart the RSVP-TE component and exchange hello messages after a failure.
Advertised recovery time	The time, in ms, within which a recovering node wants its neighbor router to resynchronize the RSVP or Multiprotocol Label Switching (MPLS) forwarding state after SSO.  <b>Note</b> A zero value indicates that the RSVP or MPLS forwarding state is not preserved after SSO.
Maximum wait for recovery	The maximum amount of time, in ms, that the router waits for a neighbor to recover.

**Related Commands**

Command	Description
<b>clear ip rsvp high-availability counters</b>	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
<b>ip rsvp signalling hello graceful-restart mode</b>	Enables RSVP-TE graceful restart support capability on an RP.
<b>ip rsvp signalling hello graceful-restart neighbor</b>	Enables RSVP-TE graceful restart support capability on a neighboring router.
<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.

# show ip rsvp hello instance detail

To display detailed information about a hello instance, use the **show ip rsvp hello instance detail** command in user EXEC or privileged EXEC mode.

**show ip rsvp hello instance detail** [**filter destination** *ip-address*]

<b>Syntax Description</b>	<b>filter destination</b> <i>ip-address</i> (Optional) IP address of the neighbor node.
---------------------------	---

<b>Command Modes</b>	User EXEC Privileged EXEC
----------------------	------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(22)S	This command was introduced.
	12.0(29)S	The command output was modified to include graceful restart, hello state timer (reroute), and fast reroute information.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

<b>Usage Guidelines</b>	Use the <b>show ip rsvp hello instance detail</b> command to display information about the processes (clients) currently configured.
-------------------------	--

**Examples** The following is sample output from the **show ip rsvp hello instance detail** command:

```
Router# show ip rsvp hello instance detail

Neighbor 10.0.0.3 Source 10.0.0.2
  Type: Active (sending requests)
  I/F: Serial2/0
  State: Up (for 2d19h2d19h)
  Clients: ReRoute
  LSPs protecting: 1
  Missed acks: 4, IP DSCP: 0x30
  Refresh Interval (msec)
    Configured: 6000
  Statistics: (from 40722 samples)
    Min: 6000
    Max: 6064
    Average: 6000
    Waverage: 6000 (Weight = 0.8)
    Current: 6000
  Last sent Src_instance: 0xE617C847
  Last rcv nbr's Src_instance: 0xFEC28E95
  Counters:
    Communication with neighbor lost:
      Num times: 0
      Reasons:
```

```
show ip rsvp hello instance detail
```

```

Missed acks:                0
Bad Src_Inst received:     0
Bad Dst_Inst received:     0
I/F went down:             0
Neighbor disabled Hello:   0
Msgs Received:  55590
Sent:           55854
Suppressed:     521

Neighbor 10.0.0.8 Source 10.0.0.7
Type: Passive (responding to requests)
I/F: Serial2/1
Last sent Src_instance: 0xF7A80A52
Last rcv nbr's Src_instance: 0xD2F1B7F7
Counters:
Msgs Received:  199442
Sent:           199442

```

Table 81 describes the significant fields shown in the display.

**Table 81** *show ip rsvp hello instance detail Field Descriptions*

Field	Description
Neighbor	IP address of the adjacent node.
Source	IP address of the node that is sending the hello message.
Type	Values are Active (node is sending a request) and Passive (node is responding to a request).
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.
State	Status of communication. Values are as follows: <ul style="list-style-type: none"> <li>Up—Node is communicating with its neighbor.</li> <li>Lost—Communication has been lost.</li> <li>Init—Communication is being established.</li> </ul>
Clients	Clients that created this hello instance; they include graceful restart, ReRoute (hello state timer), and Fast Reroute.
LSPs protecting	Number of LSPs that are being protected by this hello instance.
Missed acks	Number of times that communication was lost due to missed acknowledgments (ACKs).
IP DSCP	IP differentiated services code point (DSCP) value used in the hello IP header.
Refresh Interval (msec)	The frequency (in milliseconds) with which a node generates a hello message containing a Hello Request object for each neighbor whose status is being tracked.
Configured	Configured refresh interval.
Statistics	Refresh interval statistics from a specified number of samples (packets).
Min	Minimum refresh interval.
Max	Maximum refresh interval.
Average	Average refresh interval.

**Table 81** *show ip rsvp hello instance detail Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Waverage	Weighted average refresh interval.
Current	Current refresh interval.
Last sent Src_instance	The last source instance sent to a neighbor.
Last rcv nbr's Src_instance	The last source instance field value received from a neighbor. (0 means none received.)
Counters	Incremental information relating to communication with a neighbor.
Num times	Total number of times that communication with a neighbor was lost.
Reasons	Subsequent fields designate why communication with a neighbor was lost.
Missed acks	Number of times that communication was lost due to missed ACKs.
Bad Src_Inst received	Number of times that communication was lost due to bad source instance fields.
Bad Dst_Inst received	Number of times that communication was lost due to bad destination instance fields.
I/F went down	Number of times that the interface became unoperational.
Neighbor disabled Hello	Number of times that a neighbor disabled hello messages.
Msgs Received	Number of messages that were received.
Sent	Number of messages that were sent.
Suppressed	Number of messages that were suppressed due to optimization.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello (configuration)</b>	Enables hello globally on the router.
<b>ip rsvp signalling hello statistics</b>	Enables hello statistics on the router.
<b>show ip rsvp hello</b>	Displays hello status and statistics for Fast reroute, reroute (hello state timer), and graceful restart.
<b>show ip rsvp hello instance summary</b>	Displays summary information about a hello instance.

# show ip rsvp hello instance summary

To display summary information about a hello instance, use the **show ip rsvp hello instance summary** command in user EXEC or privileged EXEC mode.

## show ip rsvp hello instance summary

**Syntax Description** This command has no arguments or keywords.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.0(29)S	The command output was modified to include graceful restart, reroute (hello state timer), and fast reroute information.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

**Examples** The following is sample output from the **show ip rsvp hello instance summary** command:

```
Router# show ip rsvp hello instance summary

Active Instances:
  Client  Neighbor      I/F      State    LostCnt  LSPs  Interval
  RR      10.0.0.3      Se2/0    Up       0        1    6000
  GR      10.1.1.1      Any      Up       13       1    10000
  GR      10.1.1.5      Any      Lost     0        1    10000
  GR      10.2.2.1      Any      Init     1        0    5000

Passive Instances:
  Neighbor      I/F
  10.0.0.1      Se2/1
```

Active = Actively tracking neighbor state on behalf of clients:  
RR = ReRoute, FRR = Fast ReRoute, or GR = Graceful Restart  
Passive = Responding to hello requests from neighbor

[Table 82](#) describes the significant fields shown in the display.

**Table 82** *show ip rsvp hello instance summary Field Descriptions*

Field	Description
Active Instances	Active nodes that are sending hello requests.
Client	Clients on behalf of which hellos are sent; they include GR (graceful restart), RR (reroute = hello state timer), and FRR (Fast Reroute).

**Table 82** *show ip rsvp hello instance summary Field Descriptions (continued)*

Field	Description
Neighbor	IP address of the adjacent node. For graceful restart, this is the neighbor router's ID; for Fast Reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.
State	Status of communication. Values are as follows: <ul style="list-style-type: none"> <li>• Up—Node is communicating with its neighbor.</li> <li>• Lost—Communication has been lost.</li> <li>• Init—Communication is being established.</li> </ul>
LostCnt	Number of times that communication was lost with the neighbor.
LSPs	Number of label-switched paths (LSPs) protected by this hello instance.
Interval	Hello refresh interval in milliseconds.
Passive Instances	Passive nodes that are responding to hello requests.
Neighbor	IP address of adjacent node. For graceful restart, this is the neighbor router's ID; for Fast Reroute and hello state timer (reroute), this is one of the neighbor's interface addresses.
I/F	Interface from which hellos are sent for this instance. Any means that the hellos can be sent out any interface.

**Related Commands**

Command	Description
<b>ip rsvp signalling hello (configuration)</b>	Enables hello globally on the router.
<b>ip rsvp signalling hello statistics</b>	Enables hello statistics on the router.
<b>show ip rsvp hello</b>	Displays hello status and statistics for fast reroute, reroute (hello state timer), and graceful restart.
<b>show ip rsvp hello instance detail</b>	Displays detailed information about a hello instance.

# show ip rsvp hello statistics

To display how long hello packets have been in the Hello input queue, use the **show ip rsvp hello statistics** command in privileged EXEC mode.

**show ip rsvp hello statistics**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Information about how long hello packets have been in the Hello input queue is not displayed.

**Command Modes** Privileged EXEC

## Command History

Release	Modification
12.0(22)S	This command was introduced.
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

## Usage Guidelines

You can use this command to determine if the Hello refresh interval is too small. If the interval is too small, communication may falsely be declared as lost.

## Examples

The following is sample output from the **show ip rsvp hello statistics** command:

```
Router# show ip rsvp hello statistics

Status: Enabled
Packet arrival queue:
  Wait times (msec)
    Current:0
    Average:0
    Weighted Average:0 (weight = 0.8)
    Max:4
  Current length: 0 (max:500)
  Number of samples taken: 2398525
```

[Table 83](#) describes the significant fields shown in the display.

**Table 83** *show ip rsvp hello statistics Field Descriptions*

Field	Description
Status	Indicator of whether Hello has been enabled globally on the router.
Current	Amount of time, in milliseconds, that the current hello packet has been in the Hello input queue.

**Table 83** *show ip rsvp hello statistics Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Average	Average amount of time, in milliseconds, that hello packets are in the Hello input queue.
Max	Maximum amount of time, in milliseconds, that hello packets have been in the Hello input queue.
Current length	Current amount of time, in milliseconds, that hello packets have been in the Hello input queue.
Number of samples taken	Number of packets for which these statistics were compiled.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear ip rsvp hello instance statistics</b>	Clears Hello statistics for an instance.
<b>clear ip rsvp hello statistics</b>	Globally clears Hello statistics.
<b>ip rsvp signalling hello refresh interval</b>	Configures the Hello request interval.
<b>ip rsvp signalling hello statistics</b>	Enables Hello statistics on the router.

# show ip rsvp high-availability counters

To display all Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) counters that are being maintained by a Route Processor (RP), use the **show ip rsvp high-availability counters** command in user EXEC or privileged EXEC mode.

**show ip rsvp high-availability counters**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** User EXEC  
Privileged EXEC

Command History	Release	Modification
	12.2(33)SRA	This command was introduced.
	12.2(33)SRB	Support for In-Service Software Upgrade (ISSU) was added.
	12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines** Use the **show ip rsvp high-availability counters** command to display the HA counters, which include state, ISSU, checkpoint messages, resource failures, and errors.

The command output differs depending on whether the RP is active or standby. (See the “Examples” section for more information.)

Use the **clear ip rsvp high-availability counters** command to clear all counters.

**Examples** The following is sample output from the **show ip rsvp high-availability counters** command on the active RP:

```
Router# show ip rsvp high-availability counters

State: Active

Bulk sync
  initiated: 3

Send timer
  started: 1

Checkpoint Messages (Items) Sent
  Succeeded:      3 (6)
  Acks accepted: 3 (6)
  Acks ignored:   (0)
  Nacks:          0 (0)
  Failed:         0 (0)
  Buffer alloc:    3
  Buffer freed:    3
```

```

ISSU:
Checkpoint Messages Transformed:
  On Send:
    Succeeded:      3
    Failed:         0
    Transformations: 0
  On Recv:
    Succeeded:      0
    Failed:         0
    Transformations: 0

Negotiation:
  Started:         3
  Finished:        3
  Failed to Start: 0
  Messages:
    Sent:
      Send succeeded: 21
      Send failed:   0
      Buffer allocated: 21
      Buffer freed:   0
      Buffer alloc failed: 0
    Received:
      Succeeded:    15
      Failed:       0
      Buffer freed:  15

Init:
  Succeeded:      1
  Failed:         0

Session Registration:
  Succeeded:      2
  Failed:         0

Session Unregistration:
  Succeeded:      2
  Failed:         0

Errors:
  None

```

Table 84 describes the significant fields shown in the display.

**Table 84** *show ip rsvp high-availability counters—Active RP Field Descriptions*

Field	Description
State	The RP state: <ul style="list-style-type: none"> <li>Active—Active RP.</li> </ul>
Bulk sync	The number of requests made by the standby RP to the active RP to resend all write database entries: <ul style="list-style-type: none"> <li>Initiated—The number of bulk sync operations initiated by the standby RP since reboot.</li> </ul>
Send timer	The write database timer.
Checkpoint Messages (Items) Sent	The details of the bundle messages or items sent since booting.

**Table 84** *show ip rsvp high-availability counters—Active RP Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Succeeded	The number of bundle messages or items sent from the active RP to the standby RP since booting. Values are the following: <ul style="list-style-type: none"> <li>Acks accepted—The number of bundle messages or items sent from the active RP to the standby RP.</li> <li>Acks ignored—The number of bundle messages or items sent by the active RP, but rejected by the standby RP.</li> <li>Nacks—The number of bundle messages or items given to the checkpointing facility (CF) on the active RP for transmitting to the standby RP, but failed to transmit.</li> </ul>
Failed	The number of bundle messages or items the active RP attempted to send the standby RP when the send timer updated, but received an error back from CF.
Buffer alloc	Storage space allocated.
Buffer freed	Storage space available.
ISSU	In-Service Software Upgrade (ISSU) counters.
Checkpoint Messages Transformed	The details of the bundle messages or items transformed (upgraded or downgraded for compatibility) since booting so that the active RP and the standby RP can interoperate.
On Send	The number of messages sent by the active RP that succeeded, failed, or were transformations.
On Recv	The number of messages received by the active RP that succeeded, failed, or were transformations.
Negotiation	The number of times that the active RP and the standby RP have negotiated their interoperability parameters.
Started	The number of negotiations started.
Finished	The number of negotiations finished.
Failed to Start	The number of negotiations that failed to start.
Messages	The number of negotiation messages sent and received. These messages can be succeeded or failed. <ul style="list-style-type: none"> <li>Send succeeded—Number of messages sent successfully.</li> <li>Send failed—Number of messages sent unsuccessfully.</li> <li>Buffer allocated—Storage space allowed.</li> <li>Buffer freed—Storage space available.</li> <li>Buffer alloc failed—No storage space available.</li> </ul>
Init	The number of times the RSVP ISSU client has successfully and unsuccessfully (failed) initialized.
Session Registration	The number of session registrations, succeeded and failed, performed by the active RP whenever the standby RP reboots.

**Table 84** *show ip rsvp high-availability counters—Active RP Field Descriptions (continued)*

Field	Description
Session Unregistration	The number of session unregistrations, succeeded and failed, before the standby RP resets.
Errors	The details of errors or caveats.

The following is sample output from the **show ip rsvp high-availability counters** command on the standby RP:

```
Router# show ip rsvp high-availability counters
```

```
State: Standby
```

```
Checkpoint Messages (Items) Received
```

```
Valid:      1 (2)
Invalid:    0 (0)
Buffer freed: 1
```

```
ISSU:
```

```
Checkpoint Messages Transformed:
```

```
On Send:
Succeeded:      0
Failed:         0
Transformations: 0
On Recv:
Succeeded:      1
Failed:         0
Transformations: 0
```

```
Negotiation:
```

```
Started:        1
Finished:       1
Failed to Start: 0
```

```
Messages:
```

```
Sent:
Send succeeded:  5
Send failed:    0
Buffer allocated: 5
Buffer freed:   0
Buffer alloc failed: 0
```

```
Received:
Succeeded:      7
Failed:         0
Buffer freed:   7
```

```
Init:
```

```
Succeeded:      1
Failed:         0
```

```
Session Registration:
```

```
Succeeded:      0
Failed:         0
```

```
Session Unregistration:
```

```
Succeeded:      0
Failed:         0
```

```
Errors:
```

```
None
```

Table 85 describes the significant fields shown in the display.

**Table 85** *show ip rsvp high-availability counters—Standby RP Field Descriptions*

Field	Description
State	The RP state: <ul style="list-style-type: none"> <li>Standby—Standby (backup) RP.</li> </ul>
Checkpoint Messages (Items) Received	The details of the messages or items received by the standby RP. Values are the following: <ul style="list-style-type: none"> <li>Valid—The number of valid messages or items received by the standby RP.</li> <li>Invalid—The number of invalid messages or items received by the standby RP.</li> <li>Buffer freed—Amount of storage space available.</li> </ul>
ISSU	ISSU counters. <b>Note</b> For descriptions of the ISSU fields, see <a href="#">Table 84</a> .
Errors	The details of errors or caveats.

#### Related Commands

Command	Description
<b>clear ip rsvp high-availability counters</b>	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
<b>show ip rsvp high-availability database</b>	Displays the contents of the RSVP-TE HA read and write databases used in TE SSO.
<b>show ip rsvp high-availability summary</b>	Displays summary information for an RSVP-TE HA RP.

# show ip rsvp high-availability database

To display the contents of the Resource Reservation Protocol (RSVP) high availability (HA) read and write databases used in traffic engineering (TE), use the **show ip rsvp high-availability database** command in user EXEC or privileged EXEC mode.

```
show ip rsvp high-availability database { hello | link-management { interfaces | system } | lsp
[filter destination ip-address | filter lsp-id lsp-id | filter source ip-address | filter tunnel-id
tunnel-id] | lsp-head [filter number] | summary }
```

Syntax Description		
<b>hello</b>		Displays information about the hello entries in the read and write databases.
<b>link-management</b>		Displays information about the link-management entries in the read and write databases.
<b>interfaces</b>		Displays information about the link-management interfaces in the read and write databases.
<b>system</b>		Displays information about the link-management system in the read and write databases.
<b>lsp</b>		Displays information about the label-switched path (LSP) entries in the read and write databases.
<b>filter destination</b> <i>ip-address</i>	(Optional)	Displays filtered information on the IP address of the destination (tunnel tail).
<b>filter lsp-id</b> <i>lsp-id</i>	(Optional)	Displays filtered information on a specific LSP ID designated by a number from 0 to 65535.
<b>filter source</b> <i>ip-address</i>	(Optional)	Displays filtered information on the IP address of the source (tunnel head).
<b>filter tunnel-id</b> <i>tunnel-id</i>	(Optional)	Displays filtered information on a specific tunnel ID designated by a number from 0 to 65535.
<b>lsp-head</b>		Displays information about the LSP-headend entries in the read and write databases.
<b>filter</b> <i>number</i>	(Optional)	Displays filtered information on a specific LSP-head router designated by a number from 0 to 65535.
<b>summary</b>		Displays cumulative information about the entries in the read and write databases.

**Command Default** Information displays for the database selected.

**Command Modes** User EXEC  
Privileged EXEC

**Command History**

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SRB	The command output was modified to display the result of a loose hop expansion performed on the router.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

**Usage Guidelines**

Use the **show ip rsvp high-availability database** command to display information about the entries in the read and write databases.

Use the **show ip rsvp high-availability database lsp** command to display loose hop information. A loose hop expansion can be performed on a router when the router processes the explicit router object (ERO) for an incoming path message. After the router removes all local IP addresses from the incoming ERO, it finds the next hop. If the ERO specifies that the next hop is loose instead of strict, the router consults the TE topology database and routing to determine the next hop and output interface to forward the path message. The result of the calculation is a list of hops; that list is placed in the outgoing ERO and checkpointed with the LSP data as the loose hop information.

Use the **show ip rsvp high-availability database lsp-head** command on a headend router only. On other routers, this command gives no information.

**Examples****Hello Example on Active RP**

The following is sample output from the **show ip rsvp high-availability database hello** command on an active Route Processor (RP):

```
Router# show ip rsvp high-availability database hello

HELLO WRITE DB
Header:
  State: Checkpointed      Action: Add
  Seq #: 1                  Flags: 0x0
Data:
  Last sent Src_instance: 0xDE435865

HELLO READ DB
```

[Table 86](#) describes the significant fields shown in the displays.

**Table 86** *show ip rsvp high-availability database hello—Active RP Field Descriptions*

Field	Description
HELLO WRITE DB	Storage area for active RP hello data consisting of checkpointed RSVP-TE information that is sent to the standby RP when it becomes the active RP and needs to recover LSPs. This field is blank on a standby RP.
Header	Header information.

**Table 86** *show ip rsvp high-availability database hello—Active RP Field Descriptions*

Field	Description
State	Status of an entry. Values are as follows: <ul style="list-style-type: none"> <li>• Ack-Pending—Entries have been sent, but not acknowledged.</li> <li>• Checkpointed—Entries have been sent and acknowledged by the standby RP.</li> <li>• Send-Pending—Entries are waiting to be sent.</li> </ul>
Action	Action taken. Values are as follows: <ul style="list-style-type: none"> <li>• Add—Adding an item to the standby RP.</li> <li>• Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an acknowledgment (ack) of the delete operation.</li> <li>• Modify—Modifying an item on the standby RP.</li> <li>• Remove—Removing an item from the standby RP.</li> </ul>
Seq #	Numbers used by the active and standby RPs to synchronize message acks and negative acknowledgments (nacks) to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
Last sent SRC_instance	Last source instance identifier sent.
HELLO READ DB	Storage area for standby RP hello data. This field is blank on an active RP except when it is in recovery mode.

**Hello Example on Standby RP**

The following is sample output from the **show ip rsvp high-availability database hello command on a standby RP**:

```
Router# show ip rsvp high-availability database hello

HELLO WRITE DB

HELLO READ DB
  Header:
    State: Checkpointed      Action: Add
    Seq #: 1                 Flags: 0x0
  Data:
    Last sent Src_instance: 0xDE435865
```

These fields are the same as those for the active RP described in [Table 86](#) except they are now in the read database for the standby RP.

**Link-Management Interfaces Example on an Active RP**

The following is sample output from the **show ip rsvp high-availability database link-management interfaces command on an active RP**:

```
Router# show ip rsvp high-availability database link-management interfaces
```

## show ip rsvp high-availability database

```

TE LINK WRITE DB
Flooding Protocol: ospf  IGP Area ID: 0  Link ID: 0 (GigabitEthernet3/2)
Header:
  State: Checkpointed      Action: Add
  Seq #: 4                  Flags: 0x0
Data:
  Ifnumber: 5  Link Valid Flags: 0x193B
  Link Subnet Type: Broadcast
  Local Intfc ID: 0  Neighbor Intf ID: 0
  Link IP Address: 172.16.3.1
  Neighbor IGP System ID: 172.16.3.2  Neighbor IP Address: 10.0.0.0
  IGP Metric: 1  TE Metric: 1
  Physical Bandwidth: 1000000 kbits/sec
  Res. Global BW: 3000 kbits/sec
  Res. Sub BW: 0 kbits/sec
  Upstream::
                                Global Pool  Sub Pool
                                -----
Reservable Bandwidth[0]:          0          0 kbits/sec
Reservable Bandwidth[1]:          0          0 kbits/sec
Reservable Bandwidth[2]:          0          0 kbits/sec
Reservable Bandwidth[3]:          0          0 kbits/sec
Reservable Bandwidth[4]:          0          0 kbits/sec
Reservable Bandwidth[5]:          0          0 kbits/sec
Reservable Bandwidth[6]:          0          0 kbits/sec
Reservable Bandwidth[7]:          0          0 kbits/sec
  Downstream::
                                Global Pool  Sub Pool
                                -----
Reservable Bandwidth[0]:         3000          0 kbits/sec
Reservable Bandwidth[1]:         3000          0 kbits/sec
Reservable Bandwidth[2]:         3000          0 kbits/sec
Reservable Bandwidth[3]:         3000          0 kbits/sec
Reservable Bandwidth[4]:         3000          0 kbits/sec
Reservable Bandwidth[5]:         3000          0 kbits/sec
Reservable Bandwidth[6]:         3000          0 kbits/sec
Reservable Bandwidth[7]:         2900          0 kbits/sec
  Affinity Bits: 0x0
  Protection Type: Capability 0, Working Priority 0
  Number of TLVs: 0

```

Table 87 describes the significant fields shown in the display.

**Table 87** *show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions*

Field	Description
TE LINK WRITE DB	Storage area for active TE RP link data. This field is blank on a standby RP.
Flooding Protocol	Protocol that is flooding information for this area. ospf = Open Shortest Path First.
IGP Area ID	Interior Gateway Protocol (IGP) identifier for the area being flooded.
Link ID	Link identifier and interface for the area being flooded.
Header	Header information.

**Table 87** *show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions (continued)*

Field	Description
State	Status of an entry. Values are as follows: <ul style="list-style-type: none"> <li>• Ack-Pending—Entries have been sent, but not acknowledged.</li> <li>• Checkpointed—Entries have been sent and acknowledged by the standby RP.</li> <li>• Send-Pending—Entries are waiting to be sent.</li> </ul>
Action	Action taken. Values are as follows: <ul style="list-style-type: none"> <li>• Add—Adding an item to the standby RP.</li> <li>• Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.</li> <li>• Modify—Modifying an item on the standby RP.</li> <li>• Remove—Removing an item from the standby RP.</li> </ul>
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
Ifnumber	Interface number.
Link Valid Flags	Attributes used to identify or track links.
Link Subnet Type	Subnet type of the link. Values are as follows: <ul style="list-style-type: none"> <li>• Broadcast—Data for multiple recipients.</li> <li>• Nonbroadcast Multiaccess—A network in which data is transmitted directly from one computer to another over a virtual circuit or across a switching fabric.</li> <li>• Point-to-Multipoint—Unidirectional connection in which a single source end system (known as a root node) connects to multiple destination end systems (known as leaves).</li> <li>• Point-to-Point—Unidirectional or bidirectional connection between two end systems.</li> <li>• Unknown subnet type—Subnet type not identified.</li> </ul>
Local Intfc ID	Local interface identifier.
Neighbor Intf ID	Neighbor's interface identifier.
Link IP Address	IP address of the link.
Neighbor IGP System ID	Neighbor system identifier configured using IGP.
Neighbor IP Address	Neighbor's IP address.
IGP Metric	Metric value for the TE link configured using IGP.

**Table 87** *show ip rsvp high-availability database link-management interfaces—Active RP Field Descriptions (continued)*

Field	Description
TE Metric	Metric value for the TE link configured using Multiprotocol Label Switching (MPLS) TE.
Physical Bandwidth	Link bandwidth capacity (in kilobits per second).
Res. Global BW	Amount of reservable global pool bandwidth (in kilobits per second) on this link.
Res. Sub BW	Amount of reservable subpool bandwidth (in kilobits per second) on this link.
Upstream	Header for the following section of bandwidth values.
Global Pool	Global pool bandwidth (in kilobits per second) on this link.
Sub Pool	Subpool bandwidth (in kilobits per second) on this link.
Reservable Bandwidth [1]	Amount of bandwidth (in kilobits per second) available for reservations in the global TE topology and subpools.
Downstream	Header for the following section of bandwidth values.
Affinity Bits	Link attributes required in tunnels.
Protection Type	LSPs protected by fast reroute (FRR). Capability = LSPs capable of using FRR. Working Priority = LSPs actually using FRR.
Number of TLVs	Number of type, length, values (TLVs).

The fields for a standby RP are the same as those described in [Table 87](#) except they are now in the TE link read database instead of the TE link write database that is used by an active RP.

#### Link-Management System Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database link-management system command on an active RP**:

```
Router# show ip rsvp high-availability database link-management system
```

```
TE SYSTEM WRITE DB
Flooding Protocol: OSPF  IGP Area ID: 0
Header:
  State: Checkpointed    Action: Modify
  Seq #: 4                Flags: 0x0
Data:
  LM Flood Data::
  LSA Valid flags: 0x0  Node LSA flag: 0x0
  IGP System ID: 172.16.3.1  MPLS TE Router ID: 10.0.0.3
  Flooded links: 1  TLV length: 0 (bytes)
  Fragment id: 0
```

```
TE SYSTEM READ DB
```

Table 88 describes the significant fields shown in the display.

**Table 88** *show ip rsvp high-availability database link-management system—Active RP Field Descriptions*

Field	Description
TE SYSTEM WRITE DB	Storage area for active TE RP system data. This field is blank on a standby RP.
Flooding Protocol	Protocol that is flooding information for this area. OSPF = Open Shortest Path First.
IGP Area ID	IGP identifier for the area being flooded.
Header	Header information.
State	Status of an entry. Values are as follows: <ul style="list-style-type: none"> <li>Ack-Pending—Entries have been sent, but not acknowledged.</li> <li>Checkpointed—Entries have been sent and acknowledged by the standby RP.</li> <li>Send-Pending—Entries are waiting to be sent.</li> </ul>
Action	Action taken. Values are as follows: <ul style="list-style-type: none"> <li>Add—Adding an item to the standby RP.</li> <li>Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.</li> <li>Modify—Modifying an item on the standby RP.</li> <li>Remove—Removing an item from the standby RP.</li> </ul>
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
LM Flood Data	Link management (LM) flood data.
LSA Valid flags	Link-state advertisement (LSA) attributes.
Node LSA flag	LSA attributes used by a router.
IGP System ID	Identification (IP address) that IGP flooding uses in this area to identify this node.
MPLS TE Router ID	MPLS TE router identifier (IP address).
Flooded links	Number of flooded links.
TLV length	TLV length in bytes.
Fragment id	Fragment identifier for this link.
TE SYSTEM READ DB	Storage area for standby TE RP system data. This field is blank on a standby RP.

The fields for a standby RP are the same as those described in Table 88 except they are now in the TE system read database instead of the TE system write database that is used by an active RP.

**LSP Example on an Active RP**

The following is sample output from the **show ip rsvp high-availability database lsp** command on an active RP:

```
Router# show ip rsvp high-availability database lsp
```

```
LSP WRITE DB
Tun ID: 10   LSP ID: 8
  Dest:   10.0.0.9
  Sender: 10.0.0.3   Ext. Tun ID: 10.0.0.3
  Header:
    State: Checkpointed   Action: Add
    Seq #: 3               Flags: 0x0
  Data:
    InLabel: -
    Out I/F: Gi3/2
    Next-Hop: 172.16.3.1
    OutLabel: 17
```

```
Loose hop info:
10.0.0.2 10.10.2.2 10.10.2.3 10.1.1.1
```

```
LSP READ DB
```

[Table 89](#) describes the significant fields shown in the display.

**Table 89** *show ip rsvp high-availability database lsp—Active RP Field Descriptions*

Field	Description
LSP WRITE DB	Storage area for active RP LSP data. This field is blank on a standby RP.
Tun ID	Tunnel identifier.
LSP ID	LSP identifier.
Dest	Tunnel destination IP address.
Sender	Tunnel sender IP address.
Ext. Tun ID	Extended tunnel identifier; usually set to 0 or the sender's IP address.
Header	Header information.
State	Status of an entry. Values are as follows: <ul style="list-style-type: none"> <li>Ack-Pending—Entries have been sent, but not acknowledged.</li> <li>Checkpointed—Entries have been sent and acknowledged by the standby RP.</li> <li>Send-Pending—Entries are waiting to be sent.</li> </ul>

**Table 89** *show ip rsvp high-availability database lsp—Active RP Field Descriptions (continued)*

Field	Description
Action	Action taken. Values are as follows: <ul style="list-style-type: none"> <li>• Add—Adding an item to the standby RP.</li> <li>• Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.</li> <li>• Modify—Modifying an item on the standby RP.</li> <li>• Remove—Removing an item from the standby RP.</li> </ul>
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
InLabel	Incoming label identifier.
Out I/F	Outgoing interface.
Next-Hop	Next hop IP address.
OutLabel	Outgoing label identifier.
Loose hop info	Lists the loose hop expansions performed on the router, or specifies None.
LSP READ DB	Storage area for standby RP LSP data. This field is blank on an active RP.

The fields for a standby RP are the same as those described in [Table 89](#) except they are now in the LSP read database instead of the LSP write database that is used by an active RP.

#### LSP-Head Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database lsp-head** command on an active RP:

```
Router# show ip rsvp high-availability database lsp-head

LSP_HEAD WRITE DB
  Tun ID: 10
  Header:
    State: Checkpointed      Action: Add
    Seq #: 3                  Flags: 0x0
  Data:
    lsp_id: 8, bandwidth: 100, thead_flags: 0x1, popt: 1
    output_if_num: 5, output_nhop: 172.16.3.2
    RRR path setup info
      Destination: 10.0.0.9, Id: 10.0.0.9 Router Node (ospf) flag:0x0
      IGP: ospf, IGP area: 0, Number of hops: 5, metric: 2
      Hop 0: 172.16.3.1, Id: 172.16.3.1 Router Node (ospf), flag:0x0
      Hop 1: 172.16.3.2, Id: 10.0.0.7 Router Node (ospf), flag:0x0
      Hop 2: 172.16.6.1, Id: 10.0.0.7 Router Node (ospf), flag:0x0
      Hop 3: 172.16.6.2, Id: 10.0.0.9 Router Node (ospf), flag:0x0
      Hop 4: 10.0.0.9, Id: 10.0.0.9 Router Node (ospf), flag:0x0

LSP_HEAD READ DB
```

Table 90 describes the significant fields shown in the display.

**Table 90** *show ip rsvp high-availability database lsp-head—Active RP Field Descriptions*

Field	Description
LSP_HEAD WRITE DB	Storage area for active RP LSP-head data. This field is blank on a standby RP.
Tun ID	Tunnel identifier.
Header	Header information.
State	Status of an entry. Values are as follows: <ul style="list-style-type: none"> <li>Ack-Pending—Entries have been sent, but not acknowledged.</li> <li>Checkpointed—Entries have been sent and acknowledged by the standby RP.</li> <li>Send-Pending—Entries are waiting to be sent.</li> </ul>
Action	Action taken. Values are as follows: <ul style="list-style-type: none"> <li>Add—Adding an item to the standby RP.</li> <li>Delete—Deleting an item from the standby RP. This action appears temporarily while the active RP awaits an ack of the delete operation.</li> <li>Modify—Modifying an item on the standby RP.</li> <li>Remove—Removing an item from the standby RP.</li> </ul>
Seq #	Numbers used by the active and standby RPs to synchronize message acks and nacks to messages sent.
Flags	Attribute used to identify or track data.
Data	Information.
lsp_id	LSP identifier.
bandwidth	Bandwidth on the LSP.(kbps)
thead_flags	Tunnel head attribute used to identify or track data.
popt	Parsing option number.
output_if_num	Output interface number.
output_nhop	Output next hop IP address.
RRR path setup info	Routing with Resource Reservation (RRR) path information.
Destination	Destination IP address.
Id	IP address and protocol of the routing node. Values are the following: <ul style="list-style-type: none"> <li>isis = Intermediate System-to-Intermediate System.</li> <li>ospf = Open Shortest Path First.</li> </ul>
flag	Attribute used to track data.
IGP	Interior Gateway Protocol. ospf = Open Shortest Path First.
IGP area	IGP area identifier.

**Table 90** *show ip rsvp high-availability database lsp-head—Active RP Field Descriptions*

Field	Description
Number of hops	Number of connections or routers.
metric	Routing cost.
Hop	Hop's number and IP address.
Id	IP address and protocol of the routing node. Values are the following: <ul style="list-style-type: none"> <li>isis = Intermediate System-to-Intermediate System.</li> <li>ospf = Open Shortest Path First.</li> </ul>
flag	Attribute used to track data.
LSP_HEAD READ DB	Storage area for standby RP LSP-head data. This field is blank on an active RP.

The fields for a standby RP are the same as those described in [Table 90](#) except they are now in the LSP\_head read database instead of the LSP\_head write database that is used by an active RP.

#### Summary Example on an Active RP

The following is sample output from the **show ip rsvp high-availability database summary command on an active RP:**

```
Router# show ip rsvp high-availability database summary
```

```
Write DB:
  Send-Pending:    0
  Ack-Pending :    0
  Checkpointed:   10
  Total           :   10
```

```
Read DB:
  Total           :    0
```

[Table 91](#) describes the significant fields shown in the display.

**Table 91** *show ip rsvp high-availability database summary—Active RP Field Descriptions*

Field	Description
Write DB	Storage area for active RP summary data. This field is blank on a standby RP.
Send-Pending	Entries are waiting to be sent.
Ack-Pending	Entries have been sent, but are waiting to be acknowledged.
Checkpointed	Entries have been sent and acknowledged.
Total	Total number of entries in the write DB.
Read DB	Storage area for standby RP summary data. This field is blank on an active RP.
Total	Total number of entries in the read DB.

**Summary Example on a Standby RP**

The following is sample output from the **show ip rsvp high-availability database summary** command on a standby RP:

```
Router# show ip rsvp high-availability database summary
```

```
Write DB:
  Send-Pending:    0
  Ack-Pending :    0
  Checkpointed:   0
  Total           :    0
```

```
Read DB:
  Total           :    10
```

[Table 92](#) describes the significant fields shown in the display.

**Table 92** *show ip rsvp high-availability database summary—Standby RP Field Descriptions*

Field	Description
Write DB	Storage area for active RP summary data.
Send-Pending	Entries are waiting to be sent.
Ack-Pending	Entries have been sent, but are waiting to be acknowledged.
Checkpointed	Entries have been sent and acknowledged.
Total	Total number of entries in the write DB.
Read DB	Storage area for standby RP summary data. This field is blank on an active RP.
Total	Total number of entries in the read DB.

**Related Commands**

Command	Description
<b>show ip rsvp high-availability counters</b>	Displays all RSVP HA counters that are being maintained by an RP.
<b>show ip rsvp high-availability summary</b>	Displays summary information for an RSVP HA RP.

# show ip rsvp high-availability summary

To display summary information for a Resource Reservation Protocol (RSVP) traffic engineering (TE) high availability (HA) Route Processor (RP), use the **show ip rsvp high-availability summary** command in user EXEC or privileged EXEC mode.

**show ip rsvp high-availability summary**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

Use the **show ip rsvp high-availability summary** command to display information about the HA parameters currently configured on an RP.

The command output differs depending on whether the RP is active or standby.

## Examples

The following is sample output from the **show ip rsvp high-availability summary** command on an active RP:

```
Router# show ip rsvp high-availability summary

State:
  Graceful-Restart: Enabled, mode: full
  HA state: Active
Checkpointing: Allowed
Messages:
  Send timer: not running (Interval: 1000 msec)
  Items sent per Interval: 200
  CF buffer size used: 2000
```



### Note

On a standby RP, only the first three lines of the output are displayed. On an active RP, all lines are displayed.

Table 93 describes the significant fields shown in the display.

**Table 93** *show ip rsvp high-availability summary Field Descriptions*

Field	Description
State	Status of graceful restart and HA.
Graceful Restart	Restart capability: <ul style="list-style-type: none"> <li>Enabled—Restart capability is activated for a router (full mode) or its neighbor (help-neighbor).</li> <li>Disabled—Restart capability is not activated.</li> </ul>
HA state	The RP state, which is the following: <ul style="list-style-type: none"> <li>Active—Active RP.</li> <li>Standby—Standby (backup) RP.</li> <li>Recovering—The active RP is in recovery period.</li> </ul>
Checkpointing	The function that copies state information (write database entries) from the active RP to the standby RP. Values are the following: <ul style="list-style-type: none"> <li>Allowed—Functioning normally.</li> <li>Not Allowed—Checkpointing is not allowed. Reasons may be that the RP is not present or not ready.</li> </ul>
Messages	The checkpointed messages that the active RP sends to the standby RP during a specified interval.
Send timer	The write database timer. Values are the following: <ul style="list-style-type: none"> <li>running—Entries are in the write database in the send-pending state and checkpointing is allowed.</li> <li>not running—Checkpointing is not allowed or the write database is empty.</li> </ul> <p><b>Note</b> Entries in the write database can be in the following states:</p> <ul style="list-style-type: none"> <li>Send-Pending—The entry has not been sent to the standby RP yet.</li> <li>Ack-Pending—The entry was sent to the standby RP, but no acknowledgment was received from the standby RP yet.</li> <li>Checkpointed—The checkpointing facility (CF) message has been acknowledged by the standby RP, which notifies the active RP.</li> </ul>
Interval	Time, in milliseconds (ms), when the active RP sends messages to the standby RP.

**Table 93** *show ip rsvp high-availability summary Field Descriptions (continued)*

Field	Description
Items sent per Interval	The number of database entries (data that has been taken from the write database and packed into bundle message for transmitting to the standby RP), which the active RP sends to the standby RP each time the write database timer activates.
CF buffer size used	Amount of storage space, in bytes, used by the checkpointing facility.

In some cases, the checkpointing field displays Not Allowed. Here is an excerpt from sample output:

```
Checkpointing: Not Allowed
  Peer RP Present : No
  RF Comm. Up : No
  Flow Control On : No
  CF Comm. Up : No
  RF Ready to Recv: No
```

**Note**

If checkpointing is allowed, the attributes displayed in the sample output do not appear. Refer to the **show ip rsvp high-availability summary** command output on an active RP for more details.

[Table 94](#) describes the significant fields shown in the display.

**Table 94** *show ip rsvp high-availability summary—Checkpointing Field Descriptions*

Field	Description
Peer RP Present : No	The active RP cannot communicate with any peer RP. <b>Note</b> This can happen if the standby RP is removed, or if it is temporarily unavailable, such as during a restart.
RF Comm. Up : No	The redundant facility (RF) on the active RP is unable to communicate with the RF on the standby RP.
Flow Control On : No	The active RP cannot send Internet Protocol communications (IPC) messages (using checkpointing) to the standby RP because flow control is off.
CF Comm. Up : No	The TE CF client on the active RP is unable to communicate with the TE CF client on the standby RP.
RF Ready to Recv : No	The RF on the standby RP is not ready to receive checkpoint messages.

The following is sample output from the **show ip rsvp high-availability summary** command after a stateful switchover (SSO) has occurred.

```
Router# show ip rsvp high-availability summary
```

```
State:
  Graceful-Restart: Enabled
  HA state: active
Checkpointing: Allowed
```

## show ip rsvp high-availability summary

```

Recovery Time (msec)
  Advertised:      120000 msec
  Last recorded:  75012 msec
Messages:
  Send timer: not running (Interval:1000)
  Items sent per Interval: 200

```

Table 95 describes the significant fields shown in the display

**Table 95** *show ip rsvp high-availability summary—After an SSO Field Descriptions*

Field	Description
Advertised	The advertised recovery time, in milliseconds.
Last recorded	The last recorded recovery time, in milliseconds.

### Related Commands

Command	Description
<b>clear ip rsvp high-availability counters</b>	Clears (sets to zero) the RSVP-TE HA counters that are being maintained by an RP.
<b>show ip rsvp high-availability counters</b>	Displays the RSVP-TE HA counters that are being maintained by an RP.
<b>show ip rsvp high-availability database</b>	Displays the contents of the RSVP-TE HA read and write databases used in TE SSO.

# show ip rsvp host

To display specific information for a Resource Reservation Protocol (RSVP) host, use the **show ip rsvp host** command in user EXEC or privileged EXEC mode.

```
show ip rsvp host {senders | receivers} [group-name | group-address]
```

## Syntax Description

<b>senders</b>	RSVP-related sender information currently in the database.
<b>receivers</b>	RSVP-related receiver information currently in the database.
<i>group-name</i>	(Optional) Hostname of the source or destination.
<i>group-address</i>	(Optional) IP address of the source or destination.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.0(3)T	This command was introduced.
12.4(6)T	The command output was modified to display RSVP identity information when configured.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

Use the **show ip rsvp host** command to display static RSVP senders and receivers. If a router has any local host receivers or senders that have RSVP identities configured, the application IDs that they use are also displayed.

## Examples

In the following example from the **show ip rsvp host senders** command, no RSVP identities are configured for the local sender:

```
Router# show ip rsvp host senders

To          From          Pro DPort Sport Prev Hop      I/F      BPS
192.168.104.3 192.168.104.1 UDP 1          1          1          10K
Mode(s): Host CLI
```

[Table 96](#) describes the significant fields shown in the display.

**Table 96** *show ip rsvp host senders (No RSVP Identities Configured) Field Descriptions*

Field	Description
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. IP protocol such as TCP or UDP.

**Table 96** *show ip rsvp host senders (No RSVP Identities Configured) Field Descriptions*

Field	Description
DPort	Destination port number. Code 1 indicates IP protocol such as TCP or UDP.
Sport	Source port number. Code 1 indicates IP protocol such as TCP or UDP.
Prev Hop	IP address of the previous hop. Blank means no previous hop.
I/F	Interface of the previous hop.
BPS	Reservation rate, in bits per second (bps).
Mode(s)	Any of the following strings: <ul style="list-style-type: none"> <li>• Host—The router is acting as the host system or RSVP endpoint for this reservation.</li> <li>• LSP-Tunnel—The reservation is for a Traffic Engineering (TE) tunnel.</li> <li>• MIB—The reservation was created via an SNMP SET directive from a remote management station.</li> <li>• CLI—The reservation was created via a local RSVP CLI command.</li> <li>• Host CLI—A combination of the host and CLI strings meaning that the static sender being displayed was created by the <b>ip rsvp sender-host</b> CLI command.</li> </ul>

In the following example from the **show ip rsvp host senders** command, an RSVP identity is configured for the local sender and more information displays:

```
Router# show ip rsvp host senders

To          From          Pro DPort Sport Prev Hop      I/F      BPS
192.168.104.3 192.168.104.1 UDP 1      1          10K
Mode(s): Host CLI
Identity: voice100
Locator: GUID=www.cisco.com,APP=voice,VER=100.0
ID Type: Application
```

Table 97 describes the significant fields shown in the display.

**Table 97** *show ip rsvp host senders (RSVP Identity Configured) Field Descriptions*

Field	Description
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. IP protocol such as TCP or UDP.
DPort	Destination port number. Code 1 indicates IP protocol such as TCP or UDP.
Sport	Source port number. Code 1 indicates IP protocol such as TCP or UDP.
Prev Hop	IP address of the previous hop. Blank means no previous hop.

**Table 97** *show ip rsvp host senders (RSVP Identity Configured) Field Descriptions (continued)*

Field	Description
I/F	Interface of the previous hop.
BPS	Reservation rate in bits per second (bps).
Mode(s)	Any of the following strings: <ul style="list-style-type: none"> <li>• Host—The router is acting as the host system or RSVP endpoint for this reservation.</li> <li>• LSP-Tunnel—The reservation is for a Traffic Engineering (TE) tunnel.</li> <li>• MIB—The reservation was created via an SNMP SET directive from a remote management station.</li> <li>• CLI—The reservation was created via a local RSVP CLI command.</li> <li>• Host CLI—A combination of the host and CLI strings meaning that the static sender being displayed was created by the <b>ip rsvp sender-host</b> CLI command.</li> </ul>
Identity	The alias string for the RSVP application ID.
Locator	The application ID that is being signaled in the RSVP PATH message for this statically-configured sender.
ID Type	Types of identities. RSVP defines two types: application IDs (Application) and user IDs (User). Cisco IOS software currently supports Application only.

**Related Commands**

Command	Description
<b>ip rsvp sender-host</b>	Enables a router to simulate a host generating an RSVP PATH message.

# show ip rsvp installed

To display Resource Reservation Protocol (RSVP)-related installed filters and corresponding bandwidth information, use the **show ip rsvp installed** command in user EXEC or privileged EXEC mode.

**show ip rsvp installed** [*interface-type interface-number*] [**detail**]

## Syntax Description

<i>interface-type</i>	(Optional) Type of the interface.
<i>interface-number</i>	(Optional) Number of the interface.
<b>detail</b>	(Optional) Displays additional information about interfaces and their reservations.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
11.2	This command was introduced.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(15)T	The command output was modified to display the resources required for a traffic control state block (TCSB) after compression has been taken into account.
12.2(18)SXF2	This command was integrated into Cisco IOS Release 12.2(18)SXF2.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRC	The command output was modified to display RSVP aggregation information.

## Usage Guidelines

The **show ip rsvp installed** command displays information about interfaces and their reservations. Enter the optional **detail** keyword for additional information, including the reservation's traffic parameters, downstream hop, compression, and resources used by RSVP to ensure quality of service (QoS) for this reservation.

## Examples

### show ip rsvp installed Example

The following is sample output from the **show ip rsvp installed** command:

```
Router# show ip rsvp installed

RSVP: Ethernet1: has no installed reservations
RSVP: Serial0:
  kbps  To          From          Protocol DPort  Sport  Weight  Conversation
  ----  -
  0     192.168.0.0    172.16.2.28   UDP 20    30     128     270
  150   192.168.0.1    172.16.2.1    UDP 20    30     128     268
  100   192.168.0.1    172.16.1.1    UDP 20    30     128     267
  200   192.168.0.1    172.16.1.25   UDP 20    30     256     265
```

```

200 192.168.0.2 172.16.1.25 UDP 20 30 128 271
0 192.168.0.2 172.16.2.28 UDP 20 30 128 269
150 192.168.0.2 172.16.2.1 UDP 20 30 128 266
350 192.168.0.3 172.16.0.0 UDP 20 30 128 26

```

Table 98 describes the significant fields shown in the display.

**Table 98** *show ip rsvp installed Field Descriptions*

Field	Description
kbps	Reserved rate in kilobits per second.
To	IP address of the source device.
From	IP address of the destination device.
Protocol	Protocol code. Code indicates IP protocol such as TCP or User Datagram Protocol (UDP).
DPort	Destination port number.
Sport	Source port number.
Weight	Weight used in Weighted Fair Queueing (WFQ).
Conversation	WFQ conversation number.  <b>Note</b> If WFQ is not configured on the interface, weight and conversation will be zero.

### RSVP Compression Method Prediction Examples

The following sample output from the **show ip rsvp installed detail** command shows the compression parameters, including the compression method, the compression context ID, and the bytes saved per packet, on serial interface 3/0 in effect:

```

Router# show ip rsvp installed detail

RSVP:Ethernet2/1 has no installed reservations

RSVP:Serial3/0 has the following installed reservations
RSVP Reservation. Destination is 10.1.1.2. Source is 10.1.1.1,
  Protocol is UDP, Destination port is 18054, Source port is 19156
  Compression:(method rtp, context ID = 1, 37.98 bytes-saved/pkt avg)
  Admitted flowspec:
    Reserved bandwidth:65600 bits/sec, Maximum burst:328 bytes, Peak rate:80K bits/sec
    Min Policed Unit:164 bytes, Max Pkt Size:164 bytes
  Admitted flowspec (as required if compression were not applied):
    Reserved bandwidth:80K bits/sec, Maximum burst:400 bytes, Peak rate:80K bits/sec
    Min Policed Unit:200 bytes, Max Pkt Size:200 bytes
  Resource provider for this flow:
    WFQ on FR PVC dlci 101 on Se3/0: PRIORITY queue 24. Weight:0, BW 66 kbps
  Conversation supports 1 reservations [0x1000405]
  Data given reserved service:3963 packets (642085 bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 80 seconds
  Long-term average bitrate (bits/sec):64901 reserved, 0 best-effort
  Policy:INSTALL. Policy source(s):Default

```

The following sample output from the **show ip rsvp installed detail** command shows that compression is not predicted on the serial3/0 interface because no compression context IDs are available:

```
Router# show ip rsvp installed detail

RSVP:Ethernet2/1 has no installed reservations

RSVP:Serial3/0 has the following installed reservations
RSVP Reservation. Destination is 10.1.1.2. Source is 10.1.1.1,
  Protocol is UDP, Destination port is 18116, Source port is 16594
  Compression:(rtp compression not predicted:no contexts available)
  Admitted flowspec:
    Reserved bandwidth:80K bits/sec, Maximum burst:400 bytes, Peak rate:80K bits/sec
    Min Policed Unit:200 bytes, Max Pkt Size:200 bytes
  Resource provider for this flow:
    WFQ on FR PVC dlc1 101 on Se3/0: PRIORITY queue 24. Weight:0, BW 80 kbps
  Conversation supports 1 reservations [0x2000420]
  Data given reserved service:11306 packets (2261200 bytes)
  Data given best-effort service:0 packets (0 bytes)
  Reserved traffic classified for 226 seconds
  Long-term average bitrate (bits/sec):79951 reserved, 0 best-effort
  Policy:INSTALL. Policy source(s):Default
```

**Note**

When no compression context IDs are available, use the **ip rtp compression-connections number** command to increase the pool of compression context IDs.

**RSVP Aggregation Example**

The following is sample output from the **show ip rsvp installed** command when RSVP aggregation is configured:

```
Router# show ip rsvp installed

RSVP: Ethernet0/0 has no installed reservations
RSVP: Serial1/0
BPS   To           From           Protoc DPort  Sport
300K  192.168.50.1   192.168.40.1   0      46     0
RSVP: RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46)
BPS   To           From           Protoc DPort  Sport
80K   192.168.5.1   192.168.2.1   TCP    222    222
80K   192.168.6.1   192.168.2.1   TCP    223    223
```

[Table 99](#) describes the significant fields shown in the display.

**Table 99** show ip rsvp installed Field Descriptions

Field	Description
RSVP	Reservation information for a specified interface.
BPS	Reserved rate in bits per second (BPS).
To	IP address of the source device.
From	IP address of the destination device.
Protoc	Protocol code. <ul style="list-style-type: none"> <li>Code indicates IP protocol such as TCP or User Datagram Protocol (UDP) for end-to-end (E2E) reservations.</li> <li>Code is 0 for aggregate reservations.</li> </ul>

**Table 99** *show ip rsvp installed Field Descriptions (continued)*

Field	Description
DPort	Destination port number. <ul style="list-style-type: none"> <li>Number indicates protocol destination port for E2E reservations.</li> <li>Number indicates differentiated services code point (DSCP) for aggregate reservations.</li> </ul>
Sport	Source port number. <ul style="list-style-type: none"> <li>Number indicates protocol source port for E2E reservations.</li> <li>Number is 0 for aggregate reservations.</li> </ul>
RSVP	Individual E2E reservations mapped onto an aggregate. Information includes the following: <ul style="list-style-type: none"> <li>IP address of the aggregate source.</li> <li>IP address of the aggregate destination.</li> <li>Differentiated services code point (DSCP) value.</li> </ul>

**Detailed RSVP Aggregation Example**

The following is sample output from the **show ip rsvp installed detail** command when RSVP aggregation is configured and one E2E reservation that is mapped across an aggregate reservation as seen at the aggregator exists:

```
Router# show ip rsvp installed detail
```

```
RSVP: Ethernet0/0 has no installed reservations
```

```
RSVP: Serial1/0 has the following installed reservations
```

```
RSVP Reservation. Destination is 192.168.50.1. Source is 192.168.40.1,
  Protocol is 0 , Destination port is 46, Source port is 0
  Traffic Control ID handle: 35000403
  Created: 20:27:14 EST Thu Nov 29 2007
  Admitted flowspec:
    Reserved bandwidth: 300K bits/sec, Maximum burst: 300K bytes, Peak rate: 300K bits/sec
    Min Policed Unit: 20 bytes, Max Pkt Size: 0 bytes
  Resource provider for this flow: None
  Conversation supports 1 reservations [0x3000408]
  Data given reserved service: 0 packets (0 bytes)
  Data given best-effort service: 0 packets (0 bytes)
  Reserved traffic classified for 24558 seconds
  Long-term average bitrate (bits/sec): 0 reserved, 0 best-effort
  Policy: INSTALL. Policy source(s): Default
```

## ■ show ip rsvp installed

RSVP: RSVP 3175 AggResv 192.168.40.1->192.168.50.1\_ef(46) has the following installed reservations

RSVP Reservation. Destination is 192.168.5.1. Source is 192.168.2.1,  
Protocol is TCP, Destination port is 222, Source port is 222  
Traffic Control ID handle: 0500040B  
Created: 20:27:14 EST Thu Nov 29 2007  
Admitted flowspec:  
    Reserved bandwidth: 80K bits/sec, Maximum burst: 5K bytes, Peak rate: 80K bits/sec  
    Min Policed Unit: 0 bytes, Max Pkt Size: 0 bytes  
Resource provider for this flow:  
    QBM  
Conversation supports 1 reservations [0x600040A]  
Data given reserved service: 0 packets (0 bytes)  
Data given best-effort service: 0 packets (0 bytes)  
Reserved traffic classified for 24558 seconds  
Long-term average bitrate (bits/sec): 0 reserved, 0 best-effort  
Policy: INSTALL. Policy source(s):

Table 100 describes the significant fields shown in the display.

**Table 100** *show ip rsvp installed detailed Field Descriptions*

Field	Description
RSVP	Reservation information for a specified interface.
RSVP Reservation	<p>Reservation information for the serial 1/0 interface that includes the following:</p> <ul style="list-style-type: none"> <li>• Destination IP address. <ul style="list-style-type: none"> <li>– Deaggregator for aggregate reservations.</li> </ul> </li> <li>• Source IP address. <ul style="list-style-type: none"> <li>– Aggregator for aggregate reservations.</li> </ul> </li> <li>• Protocol used. <ul style="list-style-type: none"> <li>– 0 for aggregate reservations.</li> <li>– TCP/UDP or protocol for E2E reservations.</li> </ul> </li> <li>• Destination port. <ul style="list-style-type: none"> <li>– Differentiated services code (DSCP) for aggregate reservations.</li> <li>– Protocol port number for E2E reservations.</li> </ul> </li> <li>• Source port. <ul style="list-style-type: none"> <li>– 0 for aggregate reservations.</li> <li>– Protocol port number for E2E reservations.</li> </ul> </li> <li>• Traffic control identifier assigned by RSVP for bookkeeping purposes.</li> <li>• Creation date.</li> <li>• Flowspec information that includes bandwidth, maximum burst, peak rate, policed unit size, and maximum packet size.</li> <li>• Resource provider information. <ul style="list-style-type: none"> <li>– None for aggregate reservations.</li> <li>– QoS bandwidth manager (BM) for E2E reservations.</li> </ul> </li> <li>• Type of service provided—reserved and best effort (always 0 packets in an RSVP/DiffServ node).</li> <li>• Length of time traffic is classified. <ul style="list-style-type: none"> <li>– Bitrate (always 0 on an RSVP/DiffServ node)</li> </ul> </li> <li>• Policies.</li> </ul>
RSVP	<p>Aggregate information that includes the following:</p> <ul style="list-style-type: none"> <li>• IP address of the aggregate source.</li> <li>• IP address of the aggregate destination.</li> <li>• DSCP.</li> </ul> <p><b>Note</b> The remaining fields describe the aggregate's E2E reservations with values explained in preceding fields.</p>

## ■ show ip rsvp installed

Related Commands	Command	Description
	<b>ip rtp compression-connections</b>	Specifies the total number of RTP header compression connections that can exist on an interface.
	<b>show ip rsvp interface</b>	Displays RSVP-related information.
	<b>show queueing interface</b>	Displays interface queueing statistics for dataplane information.

# show ip rsvp interface

To display Resource Reservation Protocol (RSVP)-related information, use the **show ip rsvp interface** command in user EXEC or privileged EXEC mode.

**show ip rsvp interface** [**detail**] [*interface-type interface-number*]

## Syntax Description

<b>detail</b>	(Optional) Displays additional information about interfaces.
<i>interface-type</i>	(Optional) Type of the interface.
<i>interface-number</i>	(Optional) Number of the interface.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
11.2	This command was introduced.
12.2(2)T	The optional <b>detail</b> keyword was added.
12.2(4)T	This command was implemented on the Cisco 7500 series and the ATM permanent virtual circuit (PVC) interface.
12.0(22)S	The command output was modified to display hello message information.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(13)T	The following modifications were made to this command: <ul style="list-style-type: none"> <li>Rate-limiting and refresh-reduction information was added to the output display.</li> <li>RSVP global settings display when no keywords or arguments are entered.</li> </ul>
12.2(15)T	The following modifications were made to this command: <ul style="list-style-type: none"> <li>The effects of compression on admission control and the RSVP bandwidth limit counter were added to the display.</li> <li>Cryptographic authentication parameters were added to the display.</li> </ul>
12.2(18)SFX2	This command was integrated into Cisco IOS Release 12.2(18)SFX2.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The command output was modified to display fast local repair (FLR) information.
12.2(33)SRC	The command output was modified to display RSVP aggregation information.

**Usage Guidelines**

Use the **show ip rsvp interface** command to display information about interfaces on which RSVP is enabled, including the current allocation budget and maximum available bandwidth. Enter the optional **detail** keyword for additional information, including bandwidth and signaling parameters and blockade state.

Use the **show ip rsvp interface detail** command to display information about the RSVP parameters associated with an interface. These parameters include the following:

- Total RSVP bandwidth.
- RSVP bandwidth allocated to existing flows.
- Maximum RSVP bandwidth that can be allocated to a single flow.
- The type of admission control supported (header compression methods).
- The compression methods supported by RSVP compression prediction.
- RSVP aggregation.

**Examples**

The following sample output from the **show ip rsvp interface** command shows information for each interface on which RSVP is enabled:

```
Router# show ip rsvp interface

interface   allocated  i/f max  flow max  sub max
PO0/0      0          200M    200M     0
PO1/0      0          50M     50M      0
PO1/1      0          50M     50M      0
PO1/2      0          50M     50M      0
PO1/3      0          50M     50M      0
Lo0        0          200M    200M     0
```

Table 101 describes the fields shown in the display.

**Table 101** show ip rsvp interface Field Descriptions

Field	Description
interface	Interface name.
allocated	Current allocation budget.
i/f max	Maximum allocatable bandwidth.
flow max	Largest single flow allocatable on this interface.
sub max	Largest subpool value allowed on this interface.

**Detailed RSVP Information Example**

The following sample output from the **show ip rsvp interface detail** command shows detailed RSVP information for each interface on which RSVP is enabled:

```
Router# show ip rsvp interface detail

PO0/0:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):200M bits/sec
    Max. allowed (per flow):200M bits/sec
    Max. allowed for LSP tunnels using sub-pools:0 bits/sec
    Set aside by policy (total):0 bits/sec
```

```
Signalling:
  DSCP value used in RSVP msgs:0x3F
  Number of refresh intervals to enforce blockade state:4
  Number of missed refresh messages:4
  Refresh interval:30

PO1/0:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):50M bits/sec
    Max. allowed (per flow):50M bits/sec
    Max. allowed for LSP tunnels using sub-pools:0 bits/sec
    Set aside by policy (total):0 bits/sec
  Signalling:
    DSCP value used in RSVP msgs:0x3F
    Number of refresh intervals to enforce blockade state:4
    Number of missed refresh messages:4
    Refresh interval:30

PO1/1:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):50M bits/sec
    Max. allowed (per flow):50M bits/sec
    Max. allowed for LSP tunnels using sub-pools:0 bits/sec
    Set aside by policy (total):0 bits/sec
  Signalling:
    DSCP value used in RSVP msgs:0x3F
    Number of refresh intervals to enforce blockade state:4
    Number of missed refresh messages:4
    Refresh interval:30

PO1/2:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):50M bits/sec
    Max. allowed (per flow):50M bits/secMax. allowed for LSP tunnels using sub-pools:0
bits/sec
    Set aside by policy (total):0 bits/sec
  Signalling:
    DSCP value used in RSVP msgs:0x3F
    Number of refresh intervals to enforce blockade state:4
    Number of missed refresh messages:4
    Refresh interval:30

PO1/3:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):50M bits/sec
    Max. allowed (per flow):50M bits/sec
    Max. allowed for LSP tunnels using sub-pools:0 bits/sec
    Set aside by policy (total):0 bits/sec
  Signalling:
    DSCP value used in RSVP msgs:0x3F
    Number of refresh intervals to enforce blockade state:4
    Number of missed refresh messages:4
    Refresh interval:30

Lo0:
  Bandwidth:
    Curr allocated:0 bits/sec
    Max. allowed (total):200M bits/sec
    Max. allowed (per flow):200M bits/sec
    Max. allowed for LSP tunnels using sub-pools:0 bits/sec
```

```

Set aside by policy (total):0 bits/sec
Signalling:
DSCP value used in RSVP msgs:0x3F
Number of refresh intervals to enforce blockade state:4
Number of missed refresh messages:4
Refresh interval:30

```

Table 102 describes the significant fields shown in the detailed display for PO interface 0/0. The fields for the other interfaces are similar.

**Table 102** *show ip rsvp interface detail Field Descriptions—Detailed RSVP Information Example*

Field	Description
PO0/0	Interface name.
Bandwidth	<p>The RSVP bandwidth parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• Curr allocated—Amount of bandwidth currently allocated, in bits per second.</li> <li>• Max. allowed (total)—Maximum amount of bandwidth allowed, in bits per second.</li> <li>• Max. allowed (per flow)—Maximum amount of bandwidth allowed per flow, in bits per second.</li> <li>• Max. allowed for LSP tunnels using sub-pools—Maximum amount of bandwidth allowed for label switched path (LSP) tunnels, in bits per second.</li> <li>• Set aside by policy (total)—The amount of bandwidth set aside by the local policy, in bits per second.</li> </ul>
Signalling	<p>The RSVP signalling parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• DSCP value used in RSVP msgs—Differentiated services code point (DSCP) used in RSVP messages.</li> <li>• Number of refresh intervals to enforce blockade state—How long, in milliseconds, before the blockade takes effect.</li> <li>• Number of missed refresh messages—How many refresh messages until the router state expires.</li> <li>• Refresh interval—How long, in milliseconds, until a refresh message is sent.</li> </ul>

### RSVP Compression Method Prediction Example

The following sample output from the **show ip rsvp interface detail** command shows the RSVP compression method prediction configuration for each interface on which RSVP is configured:

```

Router# show ip rsvp interface detail

Et2/1:
Bandwidth:
  Curr allocated:0 bits/sec
  Max. allowed (total):1158K bits/sec
  Max. allowed (per flow):128K bits/sec
  Max. allowed for LSP tunnels using sub-pools:0 bits/sec
  Set aside by policy (total):0 bits/sec
Admission Control:
  Header Compression methods supported:

```

```

    rtp (36 bytes-saved), udp (20 bytes-saved)
Neighbors:
  Using IP encap:0.  Using UDP encap:0
Signalling:
  Refresh reduction:disabled
  Authentication:disabled

Se3/0:
Bandwidth:
  Curr allocated:0 bits/sec
  Max. allowed (total):1158K bits/sec
  Max. allowed (per flow):128K bits/sec
  Max. allowed for LSP tunnels using sub-pools:0 bits/sec
  Set aside by policy (total):0 bits/sec
Admission Control:
  Header Compression methods supported:
    rtp (36 bytes-saved), udp (20 bytes-saved)
Neighbors:
  Using IP encap:1.  Using UDP encap:0
Signalling:
  Refresh reduction:disabled
  Authentication:disabled

```

[Table 103](#) describes the significant fields shown in the display for Ethernet interface 2/1. The fields for serial interface 3/0 are similar.

**Table 103** *show ip rsvp interface detail Field Descriptions—RSVP Compression Method Prediction Example*

Field	Description
Et2/1	Interface name and number.
Bandwidth	The RSVP bandwidth parameters in effect are as follows: <ul style="list-style-type: none"> <li>• Curr allocated—Amount of bandwidth currently allocated, in bits per second.</li> <li>• Max. allowed (total)—Maximum amount of bandwidth allowed, in bits per second.</li> <li>• Max. allowed (per flow)—Maximum amount of bandwidth allowed per flow, in bits per second.</li> <li>• Max. allowed for LSP tunnels using sub-pools—Maximum amount of bandwidth allowed for LSP tunnels, in bits per second.</li> <li>• Set aside by policy (total)—The amount of bandwidth set aside by the local policy, in bits per second.</li> </ul>
Admission Control	The type of admission control in effect is as follows: <ul style="list-style-type: none"> <li>• Header Compression methods supported: <ul style="list-style-type: none"> <li>– Real-Time Transport Protocol (RTP) or User Data Protocol (UDP) compression schemes and the number of bytes saved per packet.</li> </ul> </li> </ul>
Neighbors	The number of neighbors using IP and UDP encapsulation.
Signalling	The type of signaling in effect; Refresh reduction is either enabled (active) or disabled (inactive).
Authentication	Authentication is either enabled (active) or disabled (inactive).

### Cryptographic Authentication Example

The following sample output from the **show ip rsvp interface detail** command displays detailed information, including the cryptographic authentication parameters, for all RSVP-configured interfaces on the router:

```
Router# show ip rsvp interface detail

Et0/0:
  Bandwidth:
    Curr allocated: 0 bits/sec
    Max. allowed (total): 7500K bits/sec
    Max. allowed (per flow): 7500K bits/sec
    Max. allowed for LSP tunnels using sub-pools: 0 bits/sec
    Set aside by policy (total):0 bits/sec
  Neighbors:
    Using IP encap: 0. Using UDP encap: 0
  Signalling:
    Refresh reduction: disabled
  Authentication: enabled
    Key: 11223344
    Type: sha-1
    Window size: 2
    Challenge: enabled
```

Table 104 describes the significant fields shown in the display.

**Table 104** *show ip rsvp interface detail Field Descriptions—Cryptographic Authentication Example*

Field	Description
Et0/0	Interface name and number.
Bandwidth	The RSVP bandwidth parameters in effect are as follows: <ul style="list-style-type: none"> <li>• Curr allocated—Amount of bandwidth currently allocated, in bits per second.</li> <li>• Max. allowed (total)—Maximum amount of bandwidth allowed, in bits per second.</li> <li>• Max. allowed (per flow)—Maximum amount of bandwidth allowed per flow, in bits per second.</li> <li>• Max. allowed for LSP tunnels using sub-pools—Maximum amount of bandwidth allowed for LSP tunnels, in bits per second.</li> <li>• Set aside by policy (total)—The amount of bandwidth set aside by the local policy, in bits per second.</li> </ul>
Neighbors	The number of neighbors using IP and UDP encapsulation.
Signalling	The type of signaling in effect; Refresh reduction is either enabled (active) or disabled (inactive).

**Table 104** *show ip rsvp interface detail Field Descriptions—Cryptographic Authentication Example (continued)*

Field	Description
Authentication	<p>Authentication is either enabled (active) or disabled (inactive). The parameters are as follows:</p> <ul style="list-style-type: none"> <li>• <b>Key</b>—The key (string) for the RSVP authentication algorithm displayed in clear text (for example, 11223344) or &lt;encrypted&gt;.</li> <li>• <b>Type</b>—The algorithm to generate cryptographic signatures in RSVP messages; possible values are md5 and sha-1.</li> <li>• <b>Window size</b>—Maximum number of RSVP authenticated messages that can be received out of order.</li> <li>• <b>Challenge</b>—The challenge-response handshake performed with any new RSVP neighbors that are discovered on a network; possible values are enabled (active) or disabled (inactive).</li> </ul>

**RSVP FLR Example**

The following sample output from the **show ip rsvp interface detail** command displays detailed information for the Ethernet 1/0 interface on which FLR is enabled:

```
Router# show ip rsvp interface detail ethernet1/0

Et1/0:
  RSVP: Enabled
  Interface State: Up
  Bandwidth:
    Curr allocated: 9K bits/sec
    Max. allowed (total): 300K bits/sec
    Max. allowed (per flow): 300K bits/sec
    Max. allowed for LSP tunnels using sub-pools (pool 1): 0 bits/sec
    Set aside by policy (total): 0 bits/sec
  Traffic Control:
    RSVP Data Packet Classification is ON via CEF callbacks
  Signalling:
    DSCP value used in RSVP msgs: 0x30
    Number of refresh intervals to enforce blockade state: 4
  FLR Wait Time (IPv4 flows):
    Repair is delayed by 500 msec.
  Authentication: disabled
    Key chain: <none>
    Type:      md5
    Window size: 1
    Challenge: disabled
  Hello Extension:
    State: Disabled
```

Table 105 describes the significant fields shown in the display.

**Table 105** *show ip rsvp interface detail Field Descriptions—FLR Example*

Field	Description
Et1/0	Interface name and number.
RSVP	Enabled means active; disabled means inactive.

**Table 105** show ip rsvp interface detail Field Descriptions—FLR Example (continued)

Field	Description
Interface State	Up means that the interface is configured; down means that the interface is not configured.
Bandwidth	The RSVP bandwidth parameters in effect are as follows: <ul style="list-style-type: none"> <li>• Curr allocated—Amount of bandwidth currently allocated, in bits per second.</li> <li>• Max. allowed (total)—Maximum amount of bandwidth allowed, in bits per second.</li> <li>• Max. allowed (per flow)—Maximum amount of bandwidth allowed per flow, in bits per second.</li> <li>• Max. allowed for LSP tunnels using sub-pools—Maximum amount of bandwidth allowed for LSP tunnels, in bits per second.</li> <li>• Set aside by policy (total)—The amount of bandwidth set aside by the local policy, in bits per second.</li> </ul>
Traffic Control	RSVP Data Packet Classification is ON via CEF callbacks means that RSVP is not processing every packet; therefore, excess overhead is avoided and network performance is improved.
Signalling	The signaling parameters in effect are as follows: <ul style="list-style-type: none"> <li>• DSCP value used in RSVP msgs—Differentiated services code point (DSCP) value used in RSVP messages.</li> <li>• Number of refresh intervals to enforce blockade state—How long, in milliseconds, before the blockade takes effect.</li> </ul>
FLR Wait Time (IPv4 flows)	Repair is delayed by 500 msec represents the amount of time, in milliseconds, before the FLR procedure begins on the specified interface.
Authentication	Authentication is either enabled (active) or disabled (inactive). The parameters are as follows: <ul style="list-style-type: none"> <li>• Key chain—The key (string) for the RSVP authentication algorithm displayed in clear text (for example, 11223344) or &lt;encrypted&gt;.</li> <li>• Type—The algorithm to generate cryptographic signatures in RSVP messages; possible values are md5 and sha-1.</li> <li>• Window size—Maximum number of RSVP authenticated messages that can be received out of order.</li> <li>• Challenge—The challenge-response handshake performed with any new RSVP neighbors that are discovered on a network; possible values are enabled (active) or disabled (inactive).</li> </ul>
Hello Extension	Enables RSVP nodes to detect when a neighboring node is not reachable. The state is either enabled (active) or disabled (inactive).

**RSVP Aggregation Example**

The following sample output from the **show ip rsvp interface detail** command displays the aggregation parameters for each interface on which RSVP is configured:

```
Router# show ip rsvp interface detail

Se1/0:
```

```

RSVP: Enabled
Interface State: Up
Bandwidth:
  Curr allocated: 300K bits/sec
  Max. allowed (total): 400K bits/sec
  Max. allowed (per flow): 400K bits/sec
  Max. allowed for LSP tunnels using sub-pools (pool 1): 0 bits/sec
  Set aside by policy (total): 0 bits/sec
Traffic Control:
  RSVP Data Packet Classification is OFF
  RSVP resource provider is: none
Signalling:
  DSCP value used in RSVP msgs: 0x3F
  Number of refresh intervals to enforce blockade state: 4
Authentication: disabled
  Key chain: <none>
  Type:      md5
  Window size: 1
  Challenge: disabled
FRR Extension:
  Backup Path: Not Configured
BFD Extension:
  State: Disabled
  Interval: Not Configured
RSVP Hello Extension:
  State: Disabled
RFC 3175 Aggregation: Enabled
  Role: interior

```

Table 106 describes the significant fields shown in the display.

**Table 106** *show ip rsvp interface detail* Field Descriptions—RSVP Aggregation Example

Field	Description
Se1/0	Interface name and number.
RSVP	Enabled means active; disabled means inactive.
Interface State	Up means that the interface is configured; down means that the interface is not configured.
Bandwidth	<p>The RSVP bandwidth parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• Curr allocated—Amount of bandwidth currently allocated, in bits per second.</li> <li>• Max. allowed (total)—Maximum amount of bandwidth allowed, in bits per second.</li> <li>• Max. allowed (per flow)—Maximum amount of bandwidth allowed per flow, in bits per second.</li> <li>• Max. allowed for LSP tunnels using sub-pools—Maximum amount of bandwidth allowed for LSP tunnels, in bits per second.</li> <li>• Set aside by policy (total)—The amount of bandwidth set aside by the local policy, in bits per second.</li> </ul>

**Table 106** show ip rsvp interface detail Field Descriptions—RSVP Aggregation Example (continued)

Field	Description
Traffic Control	<p>RSVP Data Packet Classification Is OFF—Disabling data packet classification instructs RSVP not to process every packet, but to perform admission control only.</p> <p>RSVP Resource Provider is None—Setting the resource provider to <b>none</b> instructs RSVP to not associate any resources, such as weighted fair queuing (WFQ) queues or bandwidth, with a reservation.</p> <p><b>Note</b> These settings are necessary because RSVP aggregation uses RSVP Scalability Enhancements for control plane aggregation only. Traffic control is performed by Class-Based Weighted Fair Queuing (CBWFQ).</p>
Signalling	<p>The signaling parameters in effect are as follows:</p> <ul style="list-style-type: none"> <li>• DSCP value used in RSVP msgs—Differentiated services code point (DSCP) value used in RSVP messages IP headers.</li> <li>• Number of refresh intervals to enforce blockade state—How long, in milliseconds, before the blockade takes effect.</li> </ul>
Authentication	<p>Authentication is either enabled (active) or disabled (inactive). The parameters are as follows:</p> <ul style="list-style-type: none"> <li>• Key chain—The key (string) for the RSVP authentication algorithm displayed in clear text (for example, 11223344) or &lt;encrypted&gt;.</li> <li>• Type—The algorithm to generate cryptographic signatures in RSVP messages; possible values are md5 and sha-1.</li> <li>• Window size—Maximum number of RSVP authenticated messages that can be received out of order.</li> <li>• Challenge—The challenge-response handshake performed with any new RSVP neighbors that are discovered on a network; possible values are enabled (active) or disabled (inactive).</li> </ul>
FRR Extension	Fast Reroute backup path is configured or not configured.
BFD Extension	<p>Bidirectional Forwarding Detection; values are the following:</p> <ul style="list-style-type: none"> <li>• State—Enabled (active) or disabled (inactive).</li> <li>• Interval—Configured with a value or Not Configured.</li> </ul>
RSVP Hello Extension	Enables RSVP nodes to detect when a neighboring node is not reachable. The state is either enabled (active) or disabled (inactive).
RFC 3175 Aggregation	<p>The state of aggregation as defined in RFC 3175, <i>Aggregation of RSVP for IPv4 and IPv6 Reservations</i>; values are the following:</p> <ul style="list-style-type: none"> <li>• Enabled—Active.</li> <li>• Disabled—Inactive.</li> </ul> <p>Role</p> <ul style="list-style-type: none"> <li>• Interior—Interface is facing an aggregation region.</li> <li>• Exterior—Interface is facing a classic RSVP region.</li> </ul>

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show ip rsvp installed</b>	Displays RSVP-related installed filters and corresponding bandwidth information.
<b>show ip rsvp neighbor</b>	Displays current RSVP neighbors.

# show ip rsvp interface detail

To display the interface configuration for Hello, use the **show ip rsvp interface detail** command in privileged EXEC mode.

```
show ip rsvp interface detail [interface]
```

<b>Syntax Description</b>	<i>interface</i> (Optional) Interface for which you want to show the Hello configuration.
---------------------------	---

<b>Command Default</b>	The interface configuration for Hello is not displayed.
------------------------	---

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

Command History	Release	Modification
	12.0(22)S	This command was introduced.
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.

<b>Examples</b>	The following is sample output from the <b>show ip rsvp interface detail</b> command:
-----------------	---

```
Router# show ip rsvp interface detail ethernet1/2

Et1/2:
  Bandwidth:
    Curr allocated: 0G bits/sec
    Max. allowed (total): 7500K bits/sec
    Max. allowed (per flow): 7500K bits/sec
    Max. allowed for LSP tunnels using sub-pools: 0G bits/sec
  Neighbors:
    Using IP encap: 1. Using UDP encap: 0
    DSCP value used in RSVP msgs: 0x0
  Hello:
    State: Enabled
    Refresh Interval: 500
    Missed Acks: 4
    DSCP value used in HELLO msgs: 0
```

[Table 107](#) describes the significant fields shown in the display.

**Table 107** *show ip rsvp interface detail Field Descriptions*

Field	Description
Curr allocated	Amount of bandwidth currently allocated.
Max. allowed (total)	Total maximum amount of bandwidth allowed.
Max. allowed (per flow)	Maximum amount of bandwidth allowed per flow.

**Table 107** *show ip rsvp interface detail Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Max. allowed for LSP tunnels using sub-pools	Maximum amount of bandwidth permitted for label-switched path (LSP) tunnels that obtain their bandwidth from subpools.
Using IP encap	Number of neighbors using IP encapsulation.
Using UDP encap	Number of neighbors using User Data Protocol (UDP) encapsulation.
DSCP value used in RSVP msgs	The differentiated services code point (DSCP) value that is in Resource Reservation Protocol (RSVP) messages.
State	State (Enabled or Disabled) of Hello.
Refresh Interval	Frequency with which a node sends a hello message to its neighbor.
Missed Acks	Number of sequential acknowledgments that the node did not receive.
DSCP value used in HELLO msgs	The DSCP value that is in hello messages.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rsvp signalling hello (interface)</b>	Enables Hello on an interface where you need Fast Reroute protection.
<b>ip rsvp signalling hello dscp</b>	Sets the DSCP value that is in the IP header of the hello message sent out from an interface.
<b>ip rsvp signalling hello refresh interval</b>	Configures the Hello request interval.

# show ip rsvp listeners

To display the Resource Reservation Protocol (RSVP) listeners for a specified port or protocol, use the **show ip rsvp listeners** command in EXEC mode.

```
show ip rsvp listeners [dst | any] [udp | tcp | any | protocol] [dst-port | any]
```

Syntax Description		
<i>dst</i>   <b>any</b>	(Optional) A particular destination or any destination for an RSVP message.	
<b>udp</b>   <b>tcp</b>   <b>any</b>   <i>protocol</i>	(Optional) User Datagram Protocol (UDP), TCP, or any protocol to be used on the receiving interface and the UDP or TCP source port number.	<b>Note</b> If you select <i>protocol</i> , the range is 0 to 255 and the protocol is IP.
<i>dst-port</i>   <b>any</b>	(Optional) A particular destination port from 0 to 65535 or any destination for an RSVP message.	

## Defaults

If you enter **show ip rsvp listeners** command without a keyword or an argument, the command displays all the listeners that were sent and received for each interface on which RSVP is configured.

## Command Modes

EXEC

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Usage Guidelines

Use the **show ip rsvp listeners** command to display the number of listeners that were sent and received for each interface on which RSVP is configured.

## Examples

The following command shows the current listeners:

```
Router# show ip rsvp listeners
```

```
To          Protocol  DPort   Description      Action
10.0.2.1    any       any     RSVP Proxy      reply
```

[Table 108](#) describes the fields shown in the display.

**Table 108** show ip rsvp listeners Command Field Descriptions

Field	Description
To	IP address of the receiving interface.
Protocol	Protocol used.

**Table 108** *show ip rsvp listeners Command Field Descriptions (continued)*

Field	Description
DPort	Destination port on the receiving router.
Description	Cisco IOS component that requested RSVP to do the listening; for example, RSVP proxy and label-switched path (LSP) tunnel signaling.
Action	Action taken when a flow arrives at its destination. The choices include: <ul style="list-style-type: none"> <li>• Announce—The arrival of the flow is announced.</li> <li>• Reply—After the flow arrives at its destination, the sender receives a reply.</li> </ul>

**Related Commands**

Command	Description
<b>ip rsvp listener</b>	Configures an RSVP router to listen for Path messages.

# show ip rsvp neighbor

To display current Resource Reservation Protocol (RSVP) neighbors, use the **show ip rsvp neighbor** command in user EXEC or privileged EXEC mode.

**show ip rsvp neighbor [detail]**

<b>Syntax Description</b>	<b>detail</b>	(Optional) Displays additional information about RSVP neighbors.
---------------------------	---------------	--

<b>Command Modes</b>	User EXEC Privileged EXEC
----------------------	------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.2	This command was introduced.
	12.2(13)T	The <i>interface-type interface-number</i> arguments were deleted. The <b>detail</b> keyword was added to the command, and rate-limiting and refresh-reduction information was added to the output.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

<b>Usage Guidelines</b>	Use the <b>show ip rsvp neighbor</b> command to show the IP addresses for the current RSVP neighbors. Enter the <b>detail</b> keyword to display rate-limiting and refresh-reduction parameters for the RSVP neighbors.
-------------------------	---

<b>Examples</b>	The following command shows the current RSVP neighbors:
-----------------	---

```
Router# show ip rsvp neighbor

10.0.0.1      RSVP
10.0.0.2      RSVP
```

[Table 109](#) describes the fields shown in the display.

**Table 109** show ip rsvp neighbor Command Field Descriptions

<b>Field</b>	<b>Description</b>
10.0.0.1	IP address of neighboring router.
RSVP	Type of encapsulation being used.

The following command shows the rate-limiting and refresh-reduction parameters for the current RSVP neighbors:

```
Router# show ip rsvp neighbor detail

Neighbor:10.0.0.1
  Encapsulation:RSVP
  Rate-Limiting:
    Dropped messages:0
  Refresh Reduction:
    Remote epoch:0x1BFEA5
    Out of order messages:0
    Retransmitted messages:0
    Highest rcvd message id:1059
    Last rcvd message:00:00:04

Neighbor:10.0.0.2
  Encapsulation:RSVP
  Rate-Limiting:
    Dropped messages:0
  Refresh Reduction:
    Remote epoch:0xB26B1
    Out of order messages:0
    Retransmitted messages:0
    Highest rcvd message id:945
    Last rcvd message:00:00:05
```

Table 110 describes the fields shown in the display.

**Table 110** *show ip rsvp neighbor detail Command Field Descriptions*

Field	Description
Neighbor	IP address of the neighboring router.
Encapsulation	Type of encapsulation being used.  <b>Note</b> Unknown displays if an RSVP message has been sent to an IP address, but no RSVP message has been received from that IP address. This is not an error condition; it simply means that the router does not yet know what RSVP encapsulation (IP or User Data Protocol (UDP)) is preferred and should be used to send RSVP messages.
Rate-Limiting	The rate-limiting parameters in effect are as follows: <ul style="list-style-type: none"> <li>Dropped messages = number of messages dropped by the neighbor.</li> </ul>
Refresh Reduction	The refresh-reduction parameters in effect are as follows: <ul style="list-style-type: none"> <li>Remote epoch = the RSVP message number space identifier (ID); randomly generated whenever the node reboots or the RSVP process restarts.</li> <li>Out of order messages = messages that were dropped because they are out of sequential order.</li> <li>Retransmitted messages = number of messages retransmitted to the neighbor.</li> <li>Highest rcvd message id = highest message ID number sent by the neighbor.</li> <li>Last rcvd message= time delta in hours, minutes, and seconds when last message was received by the neighbor.</li> </ul>

■ show ip rsvp neighbor

---

**Related Commands**

Command	Description
<b>show ip rsvp interface</b>	Displays RSVP-related interface information.

---

# show ip rsvp policy

To display the policies currently configured, use the **show ip rsvp policy** command in EXEC mode.

```
show ip rsvp policy [cops | local [acl]]
```

Syntax Description	Parameter	Description
	<b>cops   local</b>	(Optional) Displays either the configured Common Open Policy Service (COPS) servers or the local policies.
	<i>acl</i>	(Optional) Displays the access control lists (ACLs) whose sessions are governed by COPS servers or the local policies.

**Command Modes** EXEC

Command History	Release	Modification
	12.1(1)T	This command was introduced as <b>show ip rsvp policy cops</b> .
	12.2(13)T	This command was modified to include the <b>local keyword</b> . This command replaces the <b>show ip rsvp policy cops</b> command.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** Use the **show ip rsvp policy** command to display current local policies, configured COPS servers, default policies, and the preemption parameter (disabled or enabled).

**Examples** The following is sample output from the **show ip rsvp policy** command:

```
Router# show ip rsvp policy

Local policy:

    A=Accept    F=Forward

    Path:-- Resv:-- PathErr:-- ResvErr:-- ACL:104
    Path:-- Resv:-- PathErr:-- ResvErr:-- ACL:None [Default policy]

COPS:

Generic policy settings:
  Default policy: Accept all
  Preemption:     Disabled
```

Table 111 describes the fields shown in the display.

**Table 111** *show ip rsvp policy Command Field Descriptions*

Field	Description
Local policy	The local policy currently configured. A = Accept the message. F = Forward the message. Blank (--) means messages of the specified type are neither accepted or forwarded.
COPS	The COPS servers currently in effect.
Generic policy settings	Policy settings that are not specific to COPS or the local policy. Default policy: Accept all means all RSVP messages are accepted and forwarded. Reject all means all RSVP messages are rejected. Preemption: Disabled means that RSVP should not implement any preemption decisions required by a particular local or remote policy. Enabled means that RSVP should implement any preemption decisions required by a particular local or remote policy.

#### Related Commands

Command	Description
<b>ip rsvp signalling</b> <b>initial-retransmit-delay</b>	Creates a local procedure that determines the use of RSVP resources in a network.

# show ip rsvp policy cops

The **show ip rsvp policy cops** command is replaced by the **show ip rsvp policy** command. See the **show ip rsvp policy** command for more information.

# show ip rsvp policy identity

To display selected Resource Reservation Protocol (RSVP) identities in a router configuration, use the **show ip rsvp policy identity** command in user EXEC or privileged EXEC mode.

**show ip rsvp policy identity** [*regular-expression*]

<b>Syntax Description</b>	<i>regular-expression</i>	(Optional) String of text that allows pattern matching on the alias strings of the RSVP identities to be displayed.
---------------------------	---------------------------	---

**Command Default** All configured RSVP identities are displayed.

**Command Modes** User EXEC  
Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.4(6)T	This command was introduced.
	12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

**Usage Guidelines** Use the **show ip rsvp policy identity** command with the optional *regular-expression* argument to perform pattern matching on the alias strings of the RSVP identities to be displayed. Use this filtering capability to search for a small subset of RSVP identities in a configuration with a large number of identities.

Omit the *regular-expression* argument to display all the configured identities.

**Examples** In the following example from the **show ip rsvp policy identity** command, all the configured identities are displayed:

```
Router# show ip rsvp policy identity

Alias: voice1
  Type:    Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=1.0
Alias: voice10
  Type:    Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=10.0
Alias: voice100
  Type:    Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=100.0
Alias: voice1000
  Type:    Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=1000.0
```

Table 112 describes the significant fields shown in the display.

**Table 112** *show ip rsvp policy identity Field Descriptions*

Field	Description
Alias	Name of the alias string. The string can have as many as 64 printable characters (in the range 0x20 to 0x7E).  The string has no maximum length and must contain printable characters (in the range 0x20 to 0x7E).  <b>Note</b> If you use the “ ” or ? characters as part of the string itself, you must type the CTRL/V key sequence before entering the embedded “ ” or ? characters. The alias is never transmitted to other routers.
Type	Types of identities. RSVP defines two types: application IDs and user IDs. Cisco IOS software currently supports application IDs only.
Locator	Information used by a router to find the correct policy to apply to RSVP messages that contain application IDs.

In the following example from the **show ip rsvp policy identity** command, all the identities whose aliases contain voice100 display:

```
Router# show ip rsvp policy identity voice100

Alias: voice100
  Type:   Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=100.0
Alias: voice1000
  Type:   Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=1000.0
```

In the following example from the **show ip rsvp policy identity** command, all the identities whose aliases contain an exact match on voice100 are displayed:

```
Router# show ip rsvp policy identity ^voice100$

Alias: voice100
  Type:   Application ID
  Locator: GUID=www.cisco.com,APP=voice,VER=100.0
```

#### Related Commands

Command	Description
<b>ip rsvp listener</b>	Configures an RSVP router to listen for PATH messages.
<b>ip rsvp policy identity</b>	Defines RSVP application IDs.
<b>ip rsvp policy local</b>	Determines how to perform authorization on RSVP requests.
<b>ip rsvp reservation</b>	Enables a router to simulate receiving RSVP RESV messages.
<b>ip rsvp sender</b>	Enables a router to simulate receiving RSVP PATH messages.

# show ip rsvp policy local

To display the local policies that are currently configured, use the **show ip rsvp policy local** command in user EXEC or privileged EXEC mode.

```
show ip rsvp policy local [detail] [interface type number] [acl acl | dscp-ip value | default |
identity alias | origin-as as]
```

## Syntax Description

<b>detail</b>	(Optional) Displays additional information about the configured local policies including preempt-priority and local-override.
<b>interface</b> <i>type number</i>	(Optional) Specifies an interface.
<b>acl</b> <i>acl</i>	(Optional) Specifies an access control list (ACL). Values are 1 to 199.
<b>dscp-ip</b> <i>value</i>	(Optional) Specifies a differentiated services code point (DSCP) for aggregate reservations. Values can be the following: <ul style="list-style-type: none"> <li>0 to 63—Numerical DSCP values. The default value is 0.</li> <li>af11 to af43—Assured forwarding (AF) DSCP values.</li> <li>cs1 to cs7—Type of service (ToS) precedence values.</li> <li>default—Default DSCP value.</li> <li>ef—Expedited forwarding (EF) DSCP values.</li> </ul>
<b>default</b>	(Optional) Displays information about the default policy.
<b>identity</b> <i>alias</i>	(Optional) Specifies an application identity (ID) alias.
<b>origin-as</b> <i>as</i>	(Optional) Specifies an autonomous system. Values are 1 to 65535.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(29)S	The <b>origin-as</b> <i>as</i> keyword and argument combination was added, and the <i>acl</i> argument became optional.
12.4(6)T	The <b>identity</b> <i>alias</i> and the <b>interface</b> <i>type number</i> keyword and argument combinations were added, and the output was modified to include application ID information.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	The <b>dscp-ip</b> <i>value</i> keyword and argument combination was added, and the output was modified to include RSVP aggregation information.

**Usage Guidelines**

Use the **show ip rsvp policy local** command to display information about the selected local policies that are currently configured. You can use the **default** keyword and/or the **interface type number** keyword and argument combination with one or more of the match criteria.

If you omit the **acl acl**, the **origin-as as**, the **identity alias**, or the **dscp-ip value** keyword and argument combinations, all local policies currently configured appear.

If you use the ACL, the autonomous system, the application-ID, or the DSCP options as match criteria, you can specify only one. However, that parameter can be any ACL, autonomous system, application ID, or DSCP of any local policy that you have created. If you have multiple local policies with a common match criteria, using that parameter displays all local policies that meet the match criteria. On the other hand, if you have created local policies each with multiple ACLs, autonomous systems, application IDs, or DSCPs as the match criteria, you cannot use that parameter to show only a specific policy. You must omit the match criteria and show all the local policies.

**Examples****Application IDs Local Policy Example**

The following sample output from the **show ip rsvp policy local** command displays global and per-interface local policies based on RSVP identities (application IDs) that have been configured:

```
Router# show ip rsvp policy local

A=Accept    F=Forward

Global:
  Path:AF Resv:AF PathErr:AF ResvErr:AF ACL(s):101
  Path:AF Resv:AF PathErr:AF ResvErr:AF AS(es):3
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:voice
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:video

Serial2/0/0:
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:voice
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:video

Serial2/0/1:
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:conference
  Path:AF Resv:AF PathErr:AF ResvErr:AF ID:iptv
  Path:-- Resv:-- PathErr:-- ResvErr:-- Default

Generic policy settings:
  Default policy: Accept all
  Preemption:     Disabled
```

[Table 113](#) describes the significant fields shown in the display.

**Table 113** *show ip rsvp policy local* Field Descriptions

Field	Description
A=Accept	State of RSVP messages.
F=Forward	<ul style="list-style-type: none"> <li>Accept—Messages being accepted.</li> <li>Forward—Messages being forwarded.</li> </ul>
Global	Location of the local policy. Global—Local policy configured for the entire router.

**Table 113** *show ip rsvp policy local Field Descriptions (continued)*

Field	Description
Path, Resv, PathErr, ResvErr, ACL(s), AS(es), ID, Default	Types of RSVP messages being accepted and forwarded and the match criteria for the local policies configured. Blank (--) means that messages of the specified type are neither accepted nor forwarded.
Interface	Location of the local policy. Serial2/0/0—Local policy configured for a specific interface on the router.
Path, Resv, PathErr, ResvErr, ACL(s), AS(es), ID	Types of RSVP messages being accepted and forwarded and the types of local policies configured. Blank (--) means that messages of the specified type are neither accepted nor forwarded.
Generic policy settings	Policy settings that are not specific to any local or remote policy. <ul style="list-style-type: none"> <li>• Default policy: Accept all means that all RSVP messages are accepted and forwarded. Reject all means that all RSVP messages are rejected.</li> <li>• Preemption: Disabled means that RSVP should not implement any preemption decisions required by a particular local or remote policy. Enabled means that RSVP should implement any preemption decisions required by a particular local or remote policy.</li> </ul>

**DSCP-IP Local Policy Example**

The following sample output from the **show ip rsvp policy local** command displays a global local policy based on a DSCP EF that has been configured:

```
Router# show ip rsvp policy local dscp-ip ef

A=Accept    F=Forward

Global:
  Path:AF Resv:AF PathErr:AF ResvErr:AF DSCP(s): ef

Generic policy settings:
  Default policy: Accept all
  Preemption:      Enabled
```

See [Table 114](#) for a description of the preceding fields.

**show ip rsvp policy local detail Example**

The following sample output from the **show ip rsvp policy local detail** command shows the location of the local policy (such as whether the policy is configured globally or for a specific interface, and the settings for preemption scope and maximum bandwidth. Preemption priorities and sender and receiver limits also appear even if they are set to their defaults.

```
Router# show ip rsvp policy local detail

Global:
  Policy for ID: voice

  Preemption Scope: Unrestricted.
  Local Override:   Disabled.
```

```

Fast ReRoute:    Accept.
Handle:          02000409.

                Accept          Forward
Path:            Yes            Yes
Resv:            Yes            Yes
PathError:      Yes            Yes
ResvError:      Yes            Yes

                Setup Priority   Hold Priority
TE:              N/A            N/A
Non-TE:          N/A            N/A

                Current          Limit
Senders:         0              40
Receivers:       0              N/A
Conversations:   0              N/A
Group bandwidth (bps): 0        200K
Per-flow b/w (bps): N/A        10M

```

## Policy for ID: video

```

Preemption Scope: Unrestricted.
Local Override:   Disabled.
Fast ReRoute:    Accept.
Handle:          0200040A.

                Accept          Forward
Path:            Yes            Yes
Resv:            Yes            Yes
PathError:      Yes            Yes
ResvError:      Yes            Yes

                Setup Priority   Hold Priority
TE:              2              2
Non-TE:          5              4

                Current          Limit
Senders:         2              10
Receivers:       2              10
Conversations:   2              10
Group bandwidth (bps): 100K    200K
Per-flow b/w (bps): N/A        10M

```

## Ethernet2/1:

## Policy for ID: voice

```

Preemption Scope: Unrestricted.
Local Override:   Disabled.
Fast ReRoute:    Accept.
Handle:          0200040B.

                Accept          Forward
Path:            Yes            Yes
Resv:            Yes            Yes
PathError:      Yes            Yes
ResvError:      Yes            Yes

                Setup Priority   Hold Priority
TE:              2              2
Non-TE:          5              4

```

## ■ show ip rsvp policy local

	Current	Limit
Senders:	2	10
Receivers:	2	10
Conversations:	2	10
Group bandwidth (bps):	100K	200K
Per-flow b/w (bps):	N/A	10M

Generic policy settings:  
 Default policy: Accept all  
 Preemption: Disabled

Table 114 describes the significant fields shown in the display.

**Table 114** show ip rsvp policy local detail Field Descriptions

Field	Description
Global	Location of the local policy. Global—Local policy configured for the entire router.
Policy for ID	A global local policy defined for an application ID alias named voice.
Preemption Scope	Describes which classes of RSVP quality of service (QoS) reservations can be preempted by other classes of RSVP QoS reservations on the same interface.  Unrestricted means that a reservation using an application ID such as voice can preempt any other class of reservation on the same interface as that reservation, even other nonvoice reservations.
Local Override	Overrides any remote policy by enforcing the local policy in effect. <ul style="list-style-type: none"> <li>• Disabled—Not active.</li> <li>• Enabled—Active.</li> </ul>
Fast ReRoute	State of Fast ReRoute for Multiprotocol Label Switching (MPLS)/Traffic Engineering (TE) label switched paths (LSPs). <ul style="list-style-type: none"> <li>• Accept—Messages being accepted.</li> <li>• Do not accept—Messages requesting Fast Reroute service are not being accepted.</li> </ul>
Handle	Internal database ID assigned to the security association by RSVP for bookkeeping purposes.
Accept, Forward	State of RSVP messages.
Path, Resv, PathError, ResvError	Types of RSVP messages being accepted and forwarded. <ul style="list-style-type: none"> <li>• Yes—Messages are being accepted and forwarded.</li> <li>• No—Messages are not being accepted or forwarded.</li> </ul>
Setup Priority, Hold Priority	Preemption priorities. Setup Priority indicates the priority of a reservation when it is initially installed. Hold Priority indicates the priority of a reservation after it has been installed.  N/A means preemption priorities are not configured.

**Table 114** *show ip rsvp policy local detail Field Descriptions (continued)*

Field	Description
TE	The preemption priority of TE reservations. Values for Setup Priority and Hold Priority range from 0 to 7 where 0 is considered the highest priority.
Non-TE	The preemption priority of non-TE reservations. Values for Setup Priority and Hold Priority range from 0 to 65535 where 65535 is considered the highest priority.
Current, Limit	The present number and the highest number of these parameters allowed.
Senders	The number of current PATH states accepted and/or approved by this policy.
Receivers	The number of current RESV states accepted by this policy.
Conversations	The number of active bandwidth requests approved by the local policy.
Group bandwidth (bps)	Amount of bandwidth configured for a class of reservations in bits per second (bps).
Per-flow b/w (bps)	Amount of bandwidth configured for each reservation in bits per second (bps).
Ethernet2/1	Local policy configured for a specific interface on the router.
Generic policy settings	Policy settings that are not specific to the local policy. <ul style="list-style-type: none"> <li>• Default policy: Accept all means that all RSVP messages are accepted and forwarded. Reject all means that all RSVP messages are rejected.</li> <li>• Preemption: Disabled means that RSVP should not implement any preemption decisions required by a particular local or remote policy. Enabled means that RSVP should implement any preemption decisions required by a particular local or remote policy.</li> </ul>

**Related Commands**

Command	Description
<b>ip rsvp policy local</b>	Determines how to perform authorization on RSVP requests.

# show ip rsvp request

To display Resource Reservation Protocol (RSVP)-related request information currently in the database, use the **show ip rsvp request** command in user EXEC or privileged EXEC mode.

```
show ip rsvp request [detail] [filter [destination ip-address | hostname] [dst-port port-number]
[source ip-address | hostname] [src-port port-number]]
```

## Syntax Description

<b>detail</b>	(Optional) Specifies additional receiver information.
<b>filter</b>	(Optional) Specifies a subset of the receivers to display.
<b>destination</b> <i>ip-address</i>	(Optional) Specifies the destination IP address of the receiver.
<i>hostname</i>	(Optional) Hostname of the receiver.
<b>dst-port</b> <i>port-number</i>	(Optional) Specifies the destination port number. Valid destination port numbers can be in the range of 0 to 65535.
<b>source</b> <i>ip-address</i>	(Optional) Specifies the source IP address of the receiver.
<i>hostname</i>	(Optional) Hostname of the receiver.
<b>src-port</b> <i>port-number</i>	(Optional) Specifies the source port number. Valid source port numbers can be in the range of 0 to 65535.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
11.2	This command was introduced.
12.2	This command was integrated into Cisco IOS Release 12.2. The <b>detail</b> keyword was added to display additional request information.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S. This command was enhanced to show Fast Reroute information when a link-state packet (LSP) is actively using a backup tunnel that terminates at this node (that is, when a node is the merge point [MP].) The command is supported on the Cisco 10000 series Edge Services Router (ESR).
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRC	The command output was modified to display RSVP aggregation information.

## Usage Guidelines

Use the **show ip rsvp request** command to display the RSVP reservations currently being requested upstream for a specified interface or all interfaces. The received reservations may differ from requests because of aggregated or refused reservations. If desired, information for only a single tunnel or a subset of tunnels can be displayed.

### Limiting the Display

When hundreds or thousands of tunnels exist and you are interested in only a few, you can display the output for only a single tunnel or a subset of tunnels. To request a limited display, enter the **show ip rsvp request** command with the appropriate keyword (called an output filter): **destination**, **dst-port**, **source**, and **src-port**. You can enter any or all of the output filters, and you can enter them whether or not you specify the **detail** keyword.

## Examples

### RSVP Aggregation Example 1

The following is sample output from the **show ip rsvp request** command when RSVP aggregation is configured:

```
Router# show ip rsvp request
```

```
To          From          Pro DPort Sport Next Hop      I/F      Fi Serv BPS
192.168.5.1  192.168.2.1   TCP 222  222  192.168.40.1  Se1/0    FF RATE 80K
192.168.50.1 192.168.40.1 0   46   0    10.10.10.4   Se1/0    FF LOAD 300K
```

Table 115 describes the significant fields shown in the display.

**Table 115** *show ip rsvp request Field Descriptions*

Field	Description
To	IP address of the end-to-end (E2E) receiver or deaggregator.
From	IP address of the E2E sender or aggregator.
Pro	Protocol code. <ul style="list-style-type: none"> <li>TCP indicates Transmission Control Protocol.</li> <li>Code 0 indicates an aggregate reservation.</li> </ul>
DPort	Destination port number. <ul style="list-style-type: none"> <li>DSCP for aggregate reservations.</li> </ul>
Sport	Source port number. <ul style="list-style-type: none"> <li>0 for aggregate reservations.</li> </ul>
Next Hop	IP address of the next hop. <ul style="list-style-type: none"> <li>Aggregator for E2E reservations mapped onto aggregates.</li> <li>Next hop RSVP node for aggregate or E2E reservations onto an interface.</li> </ul>
I/F	Interface of the next hop.
Fi	Filter (Wildcard Filter, Shared Explicit, or Fixed Filter).
Serv	Service (value can be rate or load).
BPS	The rate, in bits per second, in the RSVP reservation request for a reservation. <p><b>Note</b> In the example, the top one is the E2E reservation signaled at 80 bps and the corresponding aggregate request at 300 bps.</p>

## RSVP Aggregation Example 2

The following is sample output from the **show ip rsvp request detail** command when RSVP aggregation is configured:

```
Router# show ip rsvp request detail

RSVP Reservation. Destination is 192.168.5.1, Source is 192.168.2.1,
  Protocol is TCP, Destination port is 222, Source port is 222
  Prev Hop: 192.168.40.1 on Serial1/0
  Reservation Style is Fixed-Filter, QoS Service is Guaranteed-Rate
  Average Bitrate is 80K bits/sec, Maximum Burst is 5K bytes
  Request ID handle: 0100040E.
  Policy: Forwarding. Policy source(s): Default
  Priorities - preempt: 0, defend: 0
  PSB Handle List [1 elements]: [0x19000407]
  RSB Handle List [1 elements]: [0x17000409]
  3175 Aggregation: RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46)

RSVP Reservation. Destination is 192.168.50.1, Source is 192.168.40.1,
  Protocol is 0 , Destination port is 46, Source port is 0
  Prev Hop: 10.10.10.4 on Serial1/0
  Reservation Style is Fixed-Filter, QoS Service is Controlled-Load
  Average Bitrate is 300K bits/sec, Maximum Burst is 300K bytes
  Request ID handle: 0100040B.
  Policy: Forwarding. Policy source(s): Default
  Priorities - preempt: 0, defend: 0
  PSB Handle List [1 elements]: [0x9000408]
  RSB Handle List [1 elements]: [0x100040A]
```

Table 116 describes the significant fields shown in the display.

**Table 116** *show ip rsvp request detail Field Descriptions*

Field	Description
RSVP Reservation	Destination—Receiver's IP address of the E2E RESV message. Source—Sender's IP address of the E2E RESV message.
Protocol	Protocol—IP protocol used; TCP—Transmission Control Protocol. <ul style="list-style-type: none"> <li>0 for aggregate reservations.</li> </ul>
Destination port	Receiver's port number. <ul style="list-style-type: none"> <li>DSCP for aggregate reservations.</li> </ul>
Source port	Sender's port number. <ul style="list-style-type: none"> <li>0 for aggregate reservations.</li> </ul>
Previous Hop	IP address of the previous hop on the specified interface. <b>Note</b> This is the aggregator's IP address in the case of an E2E reservation mapped onto an aggregate as seen at the deaggregator.
Reservation Style	Multi-reservations sharing of bandwidth; values include Fixed-Filter, Shared-Explicit, and Wildcard-Filter.
QoS Service	Type of quality of service (QoS) configured; values include Guaranteed-Rate and Controlled-Load.
Average Bitrate	Average rate requested, in bits per second, for the data.
Maximum Burst	Largest amount of data allowed in kilobytes.

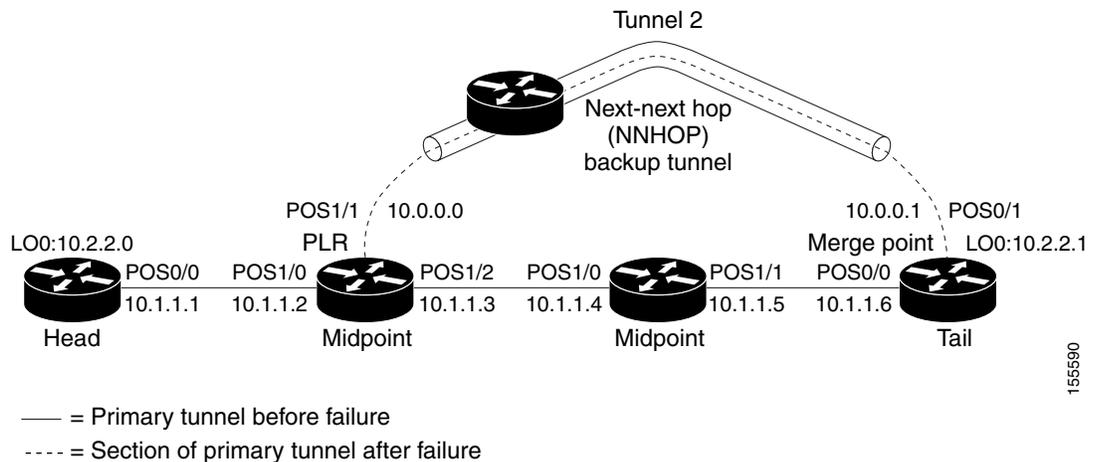
**Table 116** *show ip rsvp request detail Field Descriptions (continued)*

Field	Description
Request ID handle	Internal database ID assigned to the request by RSVP for bookkeeping purposes.
Policy	Policy status: Forwarding—RSVP RESV messages are being accepted and forwarded.
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Priorities	RSVP preemption and hold priorities of the reservation; default is 0.
PSB Handle List	Path state block (PSB) internal database identifier assigned by RSVP for bookkeeping purposes.
RSB Handle List	Reservation state block (RSB) internal database identifier assigned by RSVP for bookkeeping purposes.
3175 Aggregation	RSVP aggregation as defined in RFC 3175, <i>Aggregation of RSVP for IPv4 and IPv6 Reservations</i> .  <b>Note</b> This E2E reservation is mapped onto an RSVP aggregate reservation with an aggregator (source) IP address of 192.168.40.1, a destination (deaggregator) IP address of 192.168.50.1, and a DSCP value of expedited forwarding (EF).

**MP Example**

The following is sample output from the **show ip rsvp request detail** command when the command is entered on the midpoint (MP) before and after a failure.

Figure 5 illustrates the network topology for the RSVP configuration example.

**Figure 5** *Network Topology for the RSVP Configuration Example*

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**Example 1: The command is entered on the MP before a failure.**

```
Router# show ip rsvp request detail
```

```
RSVP Reservation. Tun Dest: 10.2.2.1 Tun Sender: 10.2.2.0,
  Tun ID: 1 LSP ID: 126
  Next Hop is 10.1.1.5 on POS0/1
  Label is 0
  Reservation Style is Shared-Explicit, QoS Service is Controlled-Load
  Average Bitrate is 0G bits/sec, Maximum Burst is 1K bytes
  RRO:
    Empty
```

**Example 2: The command is entered on the MP after a failure.**

```
Router# show ip rsvp request detail
```

```
RSVP Reservation. Tun Dest: 10.2.2.1 Tun Sender: 10.2.2.0,
  Tun ID: 1 LSP ID: 126
  Next Hop is 10.1.1.5 on POS0/1
  Label is 0
  Reservation Style is Shared-Explicit, QoS Service is Controlled-Load
  Average Bitrate is 0G bits/sec, Maximum Burst is 1K bytes
  RRO:
    Empty
  FRR is in progress (we are Merge Point)
```

```
RSVP Reservation. Tun Dest: 10.2.2.1 Tun Sender: 10.2.2.0,
  Tun ID: 1 LSP ID: 126
  Next Hop is 10.0.0.0 on POS0/1
  Label is 0
  Reservation Style is Shared-Explicit, QoS Service is Controlled-Load
  Average Bitrate is 0G bits/sec, Maximum Burst is 1K bytes
  RRO:
    Empty
  FRR is in progress (we are Merge Point)
```

Notice that after the failure, there are two entries for the rerouted LSP.

The first entry continues to show the pre-failure information (that is, RESV messages are being sent to 10.1.1.5 on POS0/1). This state is for the RESV being sent upstream before the failure, in response to path messages sent before the failure. This state may time out quickly, or it may continue to be refreshed for a few minutes if, for example, an upstream node is unaware of the failure.

The second entry shows the post-failure information (that is, RESV messages are being sent to 10.0.0.0 on POS0/1). This state is for the RESV messages being sent upstream after the failure (to the point of local repair [PLR]), and will remain and be refreshed as long as the LSP is rerouted.

In example 2, the MP is also the tail of the LSP. There is no record route object (RRO) information because there are no nodes downstream.

**Related Commands**

Command	Description
<b>show ip rsvp reservation</b>	Displays RSVP PATH-related receiver information currently in the database.
<b>show ip rsvp sender</b>	Displays RSVP RESV-related receiver information currently in the database.

# show ip rsvp reservation

To display Resource Reservation Protocol (RSVP)-related receiver information currently in the database, use the **show ip rsvp reservation** command in user EXEC or privileged EXEC mode.

## Syntax for T Releases

```
show ip rsvp reservation [ip-address | hostname] [detail]
```

## Syntax for 12.0S and 12.2S Releases

```
show ip rsvp reservation [detail] [filter [destination ip-address | hostname]  
[dst-port port-number] [source ip-address | hostname] [src-port port-number]]
```

Syntax Description	
<i>ip-address</i>	(Optional) Destination IP address.
<i>hostname</i>	(Optional) Hostname of the receiver.
<b>detail</b>	(Optional) Specifies additional receiver information.
<b>filter</b>	(Optional) Specifies a subset of the receivers to display.
<b>destination</b> <i>ip-address</i>	(Optional) Specifies the destination IP address of the receiver.
<i>hostname</i>	(Optional) Hostname of the receiver.
<b>dst-port</b> <i>port-number</i>	(Optional) Specifies the destination port number. The destination port number range is from 0 to 65535.
<b>source</b> <i>ip-address</i>	(Optional) Specifies the source IP address of the receiver.
<i>hostname</i>	(Optional) Hostname of the receiver.
<b>src-port</b> <i>port-number</i>	(Optional) Specifies the source port number. The source port number range is from 0 to 65535.

Command Modes	
	User EXEC (>)
	Privileged EXEC (#)

Command History	Release	Modification
	11.2	This command was introduced.
	12.2	This command was integrated into Cisco IOS Release 12.2. The <b>detail</b> keyword was added to display additional reservation information.
	12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S. The command displays Fast Reroute information when a link-state packet (LSP) is actively using a backup tunnel at this node (that is, when a node is the Point of Local Repair [PLR]). If desired, information for only a single tunnel or a subset of tunnels can be displayed. The command is supported on the Cisco 10000 series Edge Services Router (ESR).
	12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
	12.4(4)T	This command was integrated into Cisco IOS Release 12.4(4)T, and its output was modified to display application ID information.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRC	The command output was modified to display tunnel-based admission control (TBAC) and RSVP aggregation information.

### Usage Guidelines

Use the **show ip rsvp reservation** command to display the current receiver (RESV) information in the database for a specified interface or all interfaces. This information includes reservations aggregated and forwarded from other RSVP routers.

### Limiting the Display

When hundreds or thousands of tunnels exist and you are interested in only a few, you can display the output for only a single tunnel or a subset of tunnels. To request a limited display, enter the **show ip rsvp reservation** command with the appropriate keyword (called an output filter): **destination**, **dst-port**, **source**, and **src-port**. You can enter any or all of the output filters, and you can enter them whether or not you specify the **detail** keyword.

### Examples

#### show ip rsvp reservation Example

The following is sample output from the **show ip rsvp reservation** command:

```
Router# show ip rsvp reservation
```

```
To          From          Pro DPort Sport Next Hop      I/F  Fi Serv
172.16.1.49  172.16.4.53   1  0    0    172.16.1.49  Se1  FF LOAD
```

[Table 117](#) describes the significant fields shown in the display.

**Table 117** show ip rsvp reservation Field Descriptions

Field	Descriptions
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. UDP = User Data Protocol.
DPort	Destination port number.
Sport	Source port number.
Next Hop	IP address of the next hop.
I/F	Interface of the next hop.
Fi	Filter (Wildcard Filter, Shared-Explicit, or Fixed-Filter).
Serv	Service (value can be RATE or LOAD).

#### Application ID Example

The following is sample output from the **show ip rsvp reservation detail** command with application ID information:

```
Router# show ip rsvp reservation detail
```

```
RSVP Reservation. Destination is 192.168.104.3, Source is 192.168.104.1,
  Protocol is UDP, Destination port is 4444, Source port is 4444
```

```

Next Hop is 192.168.106.2, Interface is ATM1/0.1
Reservation Style is Fixed-Filter, QoS Service is Guaranteed-Rate
Resv ID handle: 0A00040B.
Created: 12:18:32 UTC Sat Dec 4 2004
Average Bitrate is 5K bits/sec, Maximum Burst is 1K bytes
Min Policed Unit: 0 bytes, Max Pkt Size: 0 bytes
Status:
Policy: Forwarding. Policy source(s): Default
  Priorities - preempt: 5, defend: 2
  Application ID: 'GUID=www.cisco.com, VER=1.1.1.2, APP=voice, SAPP=h323'
                '/usr/local/bin/CallManager'

```

Table 118 describes the significant fields shown in the display.

**Table 118** *show ip rsvp reservation detail—Application ID Field Descriptions*

Field	Descriptions
RSVP Reservation	Destination—Receiver's IP address of the RSVP message. Source—Sender's IP address of the RSVP message.
Protocol	Protocol—IP protocol used; UDP—User Data Protocol.
Destination port	Receiver's port number.
Source port	Sender's port number.
Next Hop	IP address of the next hop.
Interface	Interface type of the next hop.
Reservation Style	Multireservations sharing of bandwidth; values include Fixed-Filter, Shared-Explicit, and Wildcard-Filter.
QoS Service	Type of quality of service (QoS) configured; values include Guaranteed-Rate and Controlled Load.
Resv ID handle	Internal database ID assigned to the RSVP message by RSVP for bookkeeping purposes.
Created	Time and date when the reservation was created.
Average Bitrate	Average rate, in bits per second, for the data.
Maximum Burst	Largest amount of data allowed in kilobytes.
Min Policed Unit	Size of the smallest packet generated by the application in bytes, including the application data and all protocol headers at or above the IP level.
Max Pkt Size	Largest packet allowed in bytes.
Status	Status of the local policy; values are Proxied and Proxy-terminated. <b>Note</b> A blank status field means you issued the command on a midpoint for that reservation.
Policy	Policy status: Forwarding—RSVP RSVP messages are being accepted and forwarded.
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.

**Table 118** *show ip rsvp reservation detail—Application ID Field Descriptions (continued)*

Field	Descriptions
Priorities	Preemption priorities in effect. <ul style="list-style-type: none"> <li>preempt: the startup priority; values are 0 to 7 for traffic engineering (TE) reservations with 0 being the highest. Values are 0 to 65535 for non-TE reservations with 0 being the lowest.</li> <li>defend: the hold priority; values are the same as preempt.</li> </ul>
Application ID	A quotable string that identifies the sender application and can be used to match on local policies. The string includes the policy locator in the X.500 Distinguished Name format and the application or filename of the sender application.

**TBAC Example**

The following is sample output from the **show ip rsvp reservation detail** command when TBAC is configured:

```
Router# show ip rsvp reservation detail

RSVP Reservation. Destination is 10.4.0.1, Source is 10.1.0.1,
  Protocol is UDP, Destination port is 100, Source port is 100
  Next Hop: 10.4.0.1 on Tunnel1, out of band
  Reservation Style is Fixed-Filter, QoS Service is Guaranteed-Rate
  Resv ID handle: 0100040D.
  Created: 11:59:53 IST Tue Mar 20 2007
  Average Bitrate is 10K bits/sec, Maximum Burst is 1K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size: 0 bytes
  Status:
  Policy: Forwarding. Policy source(s): Default
```

Table 119 describes the significant fields shown in the display.

**Table 119** *show ip rsvp reservation detail—TBAC Field Descriptions*

Field	Descriptions
RSVP Reservation	Destination—Receiver's IP address of the RESV message. Source—Sender's IP address of the RESV message.
Protocol	Protocol—IP protocol used; UDP—User Data Protocol.
Destination port	Receiver's port number.
Source port	Sender's port number.
Next Hop	IP address of the next hop on tunnel interface with out-of-band signaling.
Reservation Style	Multireservations sharing of bandwidth; values include Fixed-Filter, Shared-Explicit, and Wildcard-Filter.
QoS Service	Type of QoS configured; values include Guaranteed-Rate and Controlled Load.
Resv ID handle	Internal database ID assigned to the RESV message by RSVP for bookkeeping purposes.
Created	Time and date when the reservation was created.
Average Bitrate	Average rate, in bits per second, for the data.

**Table 119** *show ip rsvp reservation detail—TBAC Field Descriptions (continued)*

Field	Descriptions
Maximum Burst	Largest amount of data allowed in kilobytes.
Min Policed Unit	Size of the smallest packet generated by the application in bytes, including the application data and all protocol headers at or above the IP level.
Max Pkt Size	Largest packet allowed in bytes.
Status	Status of the local policy; values are Proxied and Proxy-terminated.  <b>Note</b> A blank status field means you issued the command on a midpoint for that reservation.
Policy	Policy status: Forwarding—RSVP RESV messages are being accepted and forwarded.
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.

**RSVP Aggregation Example**

The following is sample output from the **show ip rsvp reservation detail** command when RSVP aggregation is configured:

```
Router# show ip rsvp reservation detail

RSVP Reservation. Destination is 192.168.5.1, Source is 192.168.2.1,
  Protocol is TCP, Destination port is 222, Source port is 222
  Next Hop: 192.168.50.1 on Serial1/0
  Reservation Style is Fixed-Filter, QoS Service is Guaranteed-Rate
  Resv ID handle: 0600040A.
  Created: 20:27:58 EST Thu Nov 29 2007
  Average Bitrate is 80K bits/sec, Maximum Burst is 5K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size: 0 bytes
  DiffServ Integration: DSCPs: 46
  Status:
  Policy: Forwarding. Policy source(s): Default
  3175 Aggregation: RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46)

RSVP Reservation. Destination is 192.168.50.1, Source is 192.168.40.1,
  Protocol is 0 , Destination port is 46, Source port is 0
  Next Hop: 10.30.1.1 on Serial1/0
  Reservation Style is Fixed-Filter, QoS Service is Controlled-Load
  Resv ID handle: 03000408.
  Created: 20:27:50 EST Thu Nov 29 2007
  Average Bitrate is 300K bits/sec, Maximum Burst is 300K bytes
  Min Policed Unit: 20 bytes, Max Pkt Size: 0 bytes
  Status:
  Policy: Forwarding. Policy source(s): Default
```

[Table 120](#) describes the significant fields shown in the display.

**Table 120** *show ip rsvp reservation detail—RSVP Aggregation Field Descriptions*

Field	Descriptions
RSVP Reservation	Destination—Receiver’s IP address of the RESV message. <ul style="list-style-type: none"> <li>Deaggregator for aggregate reservations.</li> </ul> Source—Sender’s IP address of the RESV message. <ul style="list-style-type: none"> <li>Aggregator for aggregate reservations.</li> </ul>
Protocol	Protocol—IP protocol used; TCP—Transmission Control Protocol. <ul style="list-style-type: none"> <li>0 for aggregate reservations.</li> </ul>
Destination port	Receiver’s port number. <ul style="list-style-type: none"> <li>DSCP for aggregate reservations.</li> </ul>
Source port	Sender’s port number. <ul style="list-style-type: none"> <li>0 for aggregate reservations.</li> </ul>
Next Hop	IP address of the next hop on a specified interface. <ul style="list-style-type: none"> <li>Deaggregator IP address for E2E reservations mapped onto an aggregate as seen at the aggregator.</li> <li>None for aggregate reservations as seen at the deaggregator.</li> </ul>
Reservation Style	Multireservations sharing of bandwidth; values include Fixed-Filter, Shared-Explicit, and Wildcard-Filter.
QoS Service	Type of QoS Service configured; values include Guaranteed-Rate and Controlled Load.
Resv ID handle	Internal database ID assigned to the RESV message by RSVP for bookkeeping purposes.
Created	Time and date when the reservation was created.
Average Bitrate	Average rate requested, in bits per second, for the data.
Maximum Burst	Largest amount of data allowed in kilobytes.
Min Policed Unit	Size of the smallest packet generated by the application in bytes, including the application data and all protocol headers at or above the IP level. <ul style="list-style-type: none"> <li>Always 0 or 20 on a node configured for RSVP aggregation.</li> </ul>
Max Pkt Size	Largest packet allowed in bytes. <ul style="list-style-type: none"> <li>Always 0 on a node configured for RSVP aggregation.</li> </ul>
Status	Status of the local policy; policy source and preemption values. <p><b>Note</b> A blank status field means you issued the command on a midpoint for that reservation.</p> <p><b>Note</b> Preemption values are shown only if RSVP preemption is enabled on the router.</p>
Policy	Policy status: Forwarding—RSVP RESV messages are being accepted and forwarded.

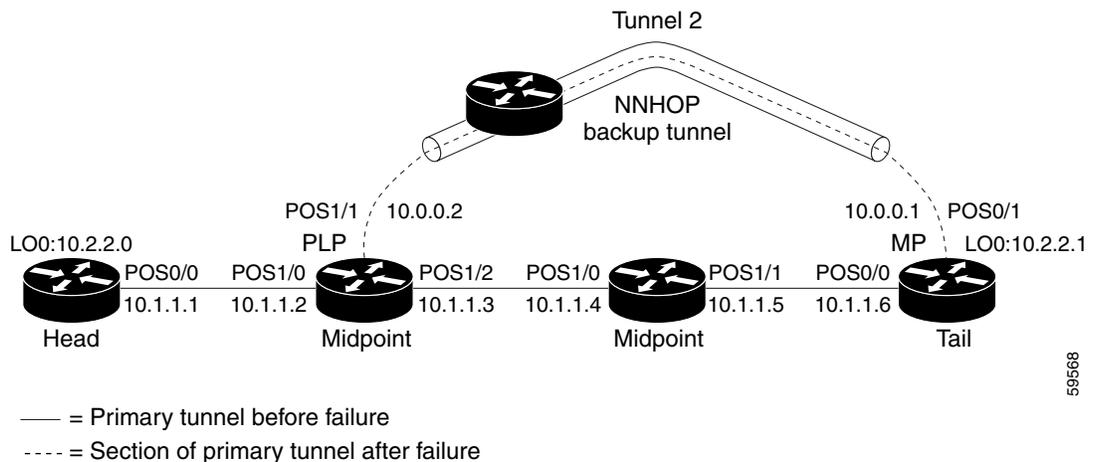
**Table 120** *show ip rsvp reservation detail—RSVP Aggregation Field Descriptions (continued)*

Field	Descriptions
Policy source(s)	Type of local policy in effect; values include default, local, and Multiprotocol Label Switching (MPLS)/Traffic Engineering (TE).
3175 Aggregation: agg_info	Aggregated reservation on which this E2E reservation is mapped with source (aggregator) and destination (deaggregator) endpoints, IP addresses, and aggregate reservation DSCP.

**PLR Examples**

The following is sample output from the **show ip rsvp reservation detail** command when the command is entered on the PLR before and after a failure.

Figure 6 illustrates the network topology for the RSVP configuration example.

**Figure 6** *Network Topology for the RSVP Configuration Example*

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**Example 1: The command is entered on the PLR before a failure.**

```
Router# show ip rsvp reservation detail
```

```
RSVP Reservation. Tun Dest: 10.2.2.1 Tun Sender: 10.2.2.0,
  Tun ID: 1 LSP ID: 126
  Next Hop is 10.1.1.4 on POS1/2
  Label is 18
  Reservation Style is Shared-Explicit, QoS Service is Controlled-Load
  Average Bitrate is 0G bits/sec, Maximum Burst is 1K bytes
  RRO:
    10.1.1.5/32, Flags:0x0 (No Local Protection)
    Label record: Flags 0x1, ctype 1, incoming label 18
    10.1.1.6/32, Flags:0x0 (No Local Protection)
    Label record: Flags 0x1, ctype 1, incoming label 0
```

**Example 2: The command is entered on the PLR after a failure.**

```
Router# show ip rsvp reservation detail
```

```
RSVP Reservation. Tun Dest: 10.2.2.1 Tun Sender: 10.2.2.0,
  Tun ID: 1 LSP ID: 126
  FRR is in progress: (we are PLR)
```

## show ip rsvp reservation

```

Bkup Next Hop is 10.0.0.1 on POS1/1
Label is 0
Orig Next Hop was 10.1.1.4 on POS1/2
Label was 18
Reservation Style is Shared-Explicit, QoS Service is Controlled-Load
Average Bitrate is 0G bits/sec, Maximum Burst is 1K bytes
RRO:
10.2.2.1/32, Flags:0x0 (No Local Protection)
Label record: Flags 0x1, ctype 1, incoming label 0

```

Notice the following (see italicized text) in Examples 1 and 2:

- At the PLR, you see “Fast Reroute (FRR) is in progress (we are PLR)” when an LSP has been rerouted (that is, it is actively using a backup tunnel).
- RESV messages arrive on a different interface and from a different next hop after a failure. The pre-failure display shows the original NHOP and arriving interface; the post-failure display shows both the original and the new (Bkup) NHOP and arriving interface. The label is also shown.
- The Record Route Object (RRO) in arriving RESV messages changes after the failure, given that the RESV messages will avoid the failure (that is, it will traverse different links or hops).

### Related Commands

Command	Description
<b>clear ip rsvp hello instance counters</b>	Clears (refreshes) the values for Hello instance counters.
<b>ip rsvp reservation</b>	Enables a router to simulate RSVP RESV message reception from the sender.
<b>show ip rsvp sender</b>	Displays RSVP RESV-related receiver information currently in the database.

# show ip rsvp sbm

To display information about a Subnetwork Bandwidth Manager (SBM) configured for a specific Resource Reservation Protocol (RSVP)-enabled interface or for all RSVP-enabled interfaces on the router, use the **show ip rsvp sbm** command in EXEC mode.

**show ip rsvp sbm** [**detail**] [*interface-type interface-number*]

Syntax Description	detail	(Optional) Detailed SBM configuration information, including values for the NonResvSendLimit object.
	<i>interface-type</i>	(Optional) Interface name and interface type for which you want to display SBM configuration information.
	<i>interface-number</i>	

**Command Modes** EXEC

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.1(1)T	The <b>detail</b> keyword was added.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

To obtain SBM configuration information about a specific interface configured to use RSVP, specify the interface name with the **show ip rsvp sbm** command. To obtain information about all interfaces enabled for RSVP on the router, use the **show ip rsvp sbm** command without specifying an interface name.

To view the values for the NonResvSendLimit object, use the **detail** keyword.

## Examples

The following example displays information for the RSVP-enabled Ethernet interfaces 1 and 2 on router1:

```
Router# show ip rsvp sbm
```

```
Interface DSBM Addr      DSBM Priority   DSBM Candidate  My Priority
Et1      10.0.0.0        70              yes              70
Et2      10.2.2.150     100             yes              100
```

The following example displays information about the RSVP-enabled Ethernet interface e2 on router1:

```
Router# show ip rsvp sbm e2
```

```
Interface DSBM Addr      DSBM Priority   DSBM candidate  My Priority
e2        10.2.2.150     100             yes              100
```

Table 121 describes the significant fields shown in the display.

**Table 121** *show ip rsvp sbm Field Descriptions*

Field	Description
Interface	Name of the Designated Subnetwork Bandwidth Manager (DSBM) candidate interface on the router.
DSBM Addr	IP address of the DSBM.
DSBM Priority	Priority of the DSBM.
DSBM Candidate	Yes if the <b>ip rsvp dsbm candidate</b> command was issued for this SBM to configure it as a DSBM candidate. No if it was not so configured.
My Priority	Priority configured for this interface.

The following example displays information about the RSVP-enabled Ethernet interface 2 on router1. In the left column, the local SBM configuration is shown; in the right column, the corresponding information for the current DSBM is shown. In this example, the information is the same because the DSBM won election.

```
Router# show ip rsvp sbm detail
```

```

Interface:Ethernet2
Local Configuration                               Current DSBM
IP Address:10.2.2.150                             IP Address:10.2.2.150
DSBM candidate:yes                               I Am DSBM:yes
Priority:100                                       Priority:100
Non Resv Send Limit                               Non Resv Send Limit
  Rate:500 Kbytes/sec                             Rate:500 Kbytes/sec
  Burst:1000 Kbytes                               Burst:1000 Kbytes
  Peak:500 Kbytes/sec                             Peak:500 Kbytes/sec
  Min Unit:unlimited                               Min Unit:unlimited
  Max Unit:unlimited                               Max Unit:unlimited

```

Table 122 describes the significant fields shown in the display.

**Table 122** *show ip rsvp sbm detail Field Descriptions*

Field	Description
Local Configuration	The local DSBM candidate configuration.
Current DSBM	The current DSBM configuration.
Interface	Name of the DSBM candidate interface on the router.
IP Address	IP address of the local DSBM candidate or the current DSBM.
DSBM candidate	Yes if the <b>ip rsvp dsbm candidate</b> command was issued for this SBM to configure it as a DSBM candidate. No if it was not so configured.
I am DSBM	Yes if the local candidate is the DSBM. No if the local candidate is not the DSBM.
Priority	Priority configured for the local DSBM candidate or the current SBM.
Rate	The average rate, in kbps, for the DSBM candidate.

**Table 122** *show ip rsvp sbm detail Field Descriptions (continued)*

Field	Description
Burst	The maximum burst size, in KB, for the DSBM candidate.
Peak	The peak rate, in kbps, for the DSBM candidate.
Min Unit	The minimum policed unit, in bytes, for the DSBM candidate.
Max Unit	The maximum packet size, in bytes, for the DSBM candidate.

**Related Commands**

Command	Description
<b>debug ip rsvp</b>	Displays information about SBM message processing, the DSBM election process, and standard RSVP enabled message processing information.
<b>debug ip rsvp detail</b>	Displays detailed information about RSVP and SBM.
<b>debug ip rsvp detail sbm</b>	Displays detailed information about SBM messages only, and SBM and DSBM state transitions.
<b>ip rsvp dsbm candidate</b>	Configures an interface as a DSBM candidate.
<b>ip rsvp dsbm non-resv-send-limit</b>	Configures the NonResvSendLimit object parameters.

# show ip rsvp sender

To display Resource Reservation Protocol (RSVP) PATH-related sender information currently in the database, use the **show ip rsvp sender** command in user EXEC or privileged EXEC mode.

## Syntax for T Releases

```
show ip rsvp sender [ip-address | hostname] [detail]
```

## Syntax for 12.0S and 12.2S Releases

```
show ip rsvp sender [detail] [filter [destination ip-address | hostname]  
[dst-port port-number] [source ip-address | hostname] [src-port port-number]]
```

## Syntax Description

<i>ip-address</i>	(Optional) Destination IP address.
<i>hostname</i>	(Optional) Hostname of the sender.
<b>detail</b>	(Optional) Specifies additional sender information.
<b>filter</b>	(Optional) Specifies a subset of the senders to display.
<b>destination</b> <i>ip-address</i>	(Optional) Specifies the destination IP address of the sender.
<i>hostname</i>	(Optional) Hostname of the sender.
<b>dst-port</b> <i>port-number</i>	(Optional) Specifies the destination port number. The range is from 0 to 65535.
<b>source</b> <i>ip-address</i>	(Optional) Specifies the source IP address of the sender.
<i>hostname</i>	(Optional) Hostname of the sender.
<b>src-port</b> <i>port-number</i>	(Optional) Specifies the source port number. The range is from 0 to 65535.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
11.2	This command was introduced.
12.0(22)S	The command output was modified to display Fast Reroute information, and support was introduced for the Cisco 10000 series Edge Services Router (ESR).
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.4(4)T	The command output was modified to display application ID information.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRB	The command output was modified to display fast local repair (FLR) information.
12.2(33)SRC	The command output was modified to display tunnel-based admission control (TBAC) and RSVP aggregation information.

**Usage Guidelines**

Use the **show ip rsvp sender** command to display the RSVP sender (PATH) information currently in the database for a specified interface or for all interfaces.

The **show ip rsvp sender** command is very useful for determining the state of RSVP signaling both before and after a label-switched packet (LSP) has been fast rerouted. The **show ip rsvp sender** command is especially useful when used at the point of local repair (PLR) or at the merge point (MP).

**Limiting the Display**

When hundreds or thousands of tunnels exist and you are interested in only a few, you can display output for only a single tunnel or a subset of tunnels. To request a limited display, enter the **show ip rsvp sender** command with the appropriate keyword (called an output filter): **destination**, **dst-port**, **source**, and **src-port**. You can enter any or all of the output filters, and you can enter them whether or not you specify the **detail** keyword.

**Fast Local Repair (FLR) Statistics**

Use the **show ip rsvp sender detail** command to display FLR statistics before, during, and after an FLR procedure. This command shows when a path state block (PSB) was repaired and can be used to determine when the cleanup began after the FLR procedure has finished. However, this command does not display old PLR or MP segments.

**Examples****show ip rsvp sender Example**

The following is sample output from the **show ip rsvp sender** command:

```
Router# show ip rsvp sender

To          From          Pro  DPort  Sport  Prev Hop      I/F      BPS
172.16.1.49 172.16.4.53   1    0      0      172.16.3.53  Et1      80K
172.16.2.51 172.16.5.54   1    0      0      172.16.3.54  Et1      80K
192.168.50.1 192.168.40.1 0     46     0      none         none     17179868160
```

[Table 123](#) describes the significant fields shown in the display.

**Table 123** *show ip rsvp sender Field Descriptions*

Field	Description
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. <ul style="list-style-type: none"> <li>Code 1 indicates an IP protocol such as TCP or UDP.</li> <li>Code 0 indicates an aggregate reservation.</li> </ul>
DPort	Destination port number. <ul style="list-style-type: none"> <li>The DSCP for an aggregate reservation.</li> </ul>
Sport	Source port number. <ul style="list-style-type: none"> <li>0 for an aggregate reservation.</li> </ul>
Prev Hop	IP address of the previous hop. <ul style="list-style-type: none"> <li>None if the node is an aggregator for this reservation.</li> </ul>

**Table 123** show ip rsvp sender Field Descriptions (continued)

Field	Description
I/F	Interface of the previous hop. <ul style="list-style-type: none"> <li>None if the node is an aggregator for this reservation.</li> </ul>
BPS	As specified in the sender_tspec characteristics of the sender data flow—specified bit rate, in bits per second. <ul style="list-style-type: none"> <li>Always 17179868160 for an aggregate reservation.</li> </ul>

**Application ID Example**

The following is sample output from the **show ip rsvp sender detail** command with application IDs configured:

```
Router# show ip rsvp sender detail

PATH Session address: 192.168.104.3, port: 4444. Protocol: UDP
  Sender address: 192.168.104.1, port: 4444
    Inbound from: 192.168.104.1 on interface:
      Traffic params - Rate: 5K bits/sec, Max. burst: 1K bytes
        Min Policed Unit: 0 bytes, Max Pkt Size 4294967295 bytes
      Path ID handle: 09000408.
      Incoming policy: Accepted. Policy source(s): Default
        Priorities - preempt: 5, defend: 2
        Application ID: 'GUID=www.cisco.com, VER=10.1.1.2, APP=voice, SAPP=h323'
          '/usr/local/bin/CallManager'

Status: Proxied
Output on ATM1/0.1. Policy status: Forwarding. Handle: 04000409
  Policy source(s): Default
```

Table 124 describes the significant fields shown in the display.

**Table 124** show ip rsvp sender detail Field Descriptions

Field	Descriptions
PATH Session address	Destination IP address of the PATH message. <ul style="list-style-type: none"> <li>port—Number of the destination port.</li> <li>Protocol—IP protocol used.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>port—Number of the source port.</li> </ul>
Inbound from	IP address of the sender and the interface name. <p><b>Note</b> A blank interface field means that the PATH message originated at the router on which the <b>show</b> command is being executed (the headend router). A specified interface means that the PATH message originated at an upstream router.</p>

**Table 124** show ip rsvp sender detail Field Descriptions (continued)

Field	Descriptions
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed in bytes.</li> </ul>
PATH ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Priorities	Preemption priorities in effect: <ul style="list-style-type: none"> <li>• preempt—The startup priority; values are 0 to 7 for traffic engineering (TE) reservations with 0 being the highest. Values are 0 to 65535 for non-TE reservations with 0 being the lowest.</li> <li>• defend—The hold priority; values are the same as for preempt.</li> </ul>
Application ID	A quotable string that identifies the sender application and can be used to match on local policies. The string includes the policy locator in the X.500 Distinguished Name format and the application or filename of the sender application.
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul>
Output on <i>interface</i>	Policy status (on the outbound interface): <ul style="list-style-type: none"> <li>• Forwarding—Inbound PATH messages are being forwarded.</li> <li>• Not Forwarding—Outbound PATH messages are being rejected.</li> <li>• Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.

**Before FLR Example**

The following is sample output from the **show ip rsvp sender detail** command before FLR has occurred:

```
Router# show ip rsvp sender detail
```

```
PATH:
```

```

Destination 192.168.101.21, Protocol_Id 17, Don't Police , DstPort 1
Sender address: 10.10.10.10, port: 1
Path refreshes:
  arriving: from PHOP 172.16.31.34 on Et0/0 every 30000 msecs
Traffic params - Rate: 9K bits/sec, Max. burst: 9K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
Path ID handle: 01000401.
Incoming policy: Accepted. Policy source(s): Default
Status:
Output on Ethernet1/0. Policy status: Forwarding. Handle: 02000400
  Policy source(s): Default
Path FLR: Never repaired

```

Table 125 describes the significant fields shown in the display.

**Table 125** *show ip rsvp sender detail Field Descriptions—Before FLR*

Field	Descriptions
PATH	PATH message information: <ul style="list-style-type: none"> <li>• Destination IP address.</li> <li>• Protocol ID number.</li> <li>• Policing.</li> <li>• Destination port number.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>• port—Number of the source port.</li> </ul>
Path refreshes	Refresh information: <ul style="list-style-type: none"> <li>• IP address of the source (previous hop [PHOP]).</li> <li>• Interface name and number.</li> <li>• Frequency, in milliseconds (msec).</li> </ul>
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
PATH ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.

**Table 125** *show ip rsvp sender detail Field Descriptions—Before FLR (continued)*

Field	Descriptions
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <b>Note</b> A blank field means none of the above.
Output on <i>interface</i>	Policy status (on the outbound interface): <ul style="list-style-type: none"> <li>• Forwarding—Inbound PATH messages are being forwarded.</li> <li>• Not Forwarding—Outbound PATH messages are being rejected.</li> <li>• Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Path FLR	Never repaired—Indicates that the node has never been a point of local repair (PLR) and, therefore, has never repaired the PSB.

**At the PLR During FLR Example****Note**

A node that initiates an FLR procedure is the point of local repair or PLR.

The following is sample output from the **show ip rsvp sender detail** command at the PLR during an FLR procedure:

```
Router# show ip rsvp sender detail

PATH:
  Destination 192.168.101.21, Protocol_Id 17, Don't Police , DstPort 1
  Sender address: 10.10.10.10, port: 1
  Path refreshes:
    arriving: from PHOP 172.16.31.34 on Et0/0 every 30000 msecs
  Traffic params - Rate: 9K bits/sec, Max. burst: 9K bytes
    Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
  Path ID handle: 01000401.
  Incoming policy: Accepted. Policy source(s): Default
  Status:
  Path FLR: PSB is currently being repaired...try later
  PLR - Old Segments: 1
  Output on Ethernet1/0, nhop 172.16.36.34
  Time before expiry: 2 refreshes
  Policy status: Forwarding. Handle: 02000400
    Policy source(s): Default
```

Table 126 describes the significant fields shown in the display.

**Table 126** *show ip rsvp sender detail Field Descriptions—at the PLR During FLR*

Field	Descriptions
PATH	PATH message information including the following: <ul style="list-style-type: none"> <li>• Destination IP address.</li> <li>• Protocol ID number.</li> <li>• Policing.</li> <li>• Destination port number.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>• port—Number of the source port.</li> </ul>
Path refreshes	Refresh information: <ul style="list-style-type: none"> <li>• IP address of the source (previous hop [PHOP]).</li> <li>• Interface name and number.</li> <li>• Frequency, in milliseconds (msec).</li> </ul>
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
PATH ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <p><b>Note</b> A blank field means none of the above.</p>

**Table 126** *show ip rsvp sender detail Field Descriptions—at the PLR During FLR (continued)*

Field	Descriptions
Path FLR	PSB is currently being repaired...try later—FLR is in process.
PLR - Old Segments	<p>The number of old segments or interfaces after the PLR initiated the FLR procedure. For each old segment, the following information displays:</p> <ul style="list-style-type: none"> <li>• Output on <i>interface</i>—Outbound interface after the FLR and the next-hop IP address.</li> <li>• Time before expiry—Number of PATH messages sent on a new segment before the old route (segment) expires.</li> <li>• Policy status (on the outbound interface): <ul style="list-style-type: none"> <li>– Forwarding—Inbound PATH messages are being forwarded.</li> <li>– Not Forwarding—Outbound PATH messages are being rejected.</li> <li>– Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul> </li> </ul> <p>Policy source(s)—Type of local policy in effect; values include Default, Local, and MPLS/TE.</p>

**At the MP During an FLR Example****Note**

The node where the old and new paths (also called segments or interfaces) meet is the merge point (MP).

The following is sample output from the **show ip rsvp sender detail** command at the MP during an FLR procedure:

```
Router# show ip rsvp sender detail

PATH:
  Destination 192.168.101.21, Protocol_Id 17, Don't Police , DstPort 1
  Sender address: 10.10.10.10, port: 1
  Path refreshes:
    arriving: from PHOP 172.16.37.35 on Et1/0 every 30000 msecs
Traffic params - Rate: 9K bits/sec, Max. burst: 9K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
  Path ID handle: 09000406.
  Incoming policy: Accepted. Policy source(s): Default
  Status: Proxy-terminated
  Path FLR: Never repaired
  MP - Old Segments: 1
  Input on Serial2/0, phop 172.16.36.35
  Time before expiry: 9 refreshes
```

Table 127 describes the significant fields shown in the display.

**Table 127 show ip rsvp sender detail Field Descriptions—at the MP During FLR**

Field	Descriptions
PATH	PATH message information: <ul style="list-style-type: none"> <li>• Destination IP address.</li> <li>• Protocol ID number.</li> <li>• Policing.</li> <li>• Destination port number.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>• port—Number of the source port.</li> </ul>
Path refreshes	Refresh information: <ul style="list-style-type: none"> <li>• IP address of the source (previous hop [PHOP]).</li> <li>• Interface name and number.</li> <li>• Frequency, in milliseconds (msec).</li> </ul>
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
PATH ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <p><b>Note</b> A blank field means none of the above.</p>

**Table 127** *show ip rsvp sender detail Field Descriptions—at the MP During FLR (continued)*

Field	Descriptions
Path FLR	Never repaired—Indicates that the node has never been a PLR and, therefore, has never repaired the PSB.
MP - Old Segments	The number of old segments or interfaces on the MP before the PLR initiated the FLR procedure. For each old segment, the following information displays: <ul style="list-style-type: none"> <li>Input on <i>interface</i>—Inbound interface and the previous-hop IP address.</li> <li>Time before expiry—Number of PATH messages to be received on other segments before this segment expires.</li> </ul>

**At the PLR After an FLR Example**

The following is sample output from the **show ip rsvp sender detail** command at the PLR after an FLR procedure:

```
Router# show ip rsvp sender detail

PATH:
  Destination 192.168.101.21, Protocol_Id 17, Don't Police , DstPort 1
  Sender address: 10.10.10.10, port: 1
  Path refreshes:
    arriving: from PHOP 172.16.31.34 on Et0/0 every 30000 msecs
  Traffic params - Rate: 9K bits/sec, Max. burst: 9K bytes
    Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
  Path ID handle: 05000401.
  Incoming policy: Accepted. Policy source(s): Default
  Status:
  Output on Serial3/0. Policy status: Forwarding. Handle: 3B000406
    Policy source(s): Default
  Path FLR: Started 12:56:16 EST Thu Nov 16 2006, PSB repaired 532(ms) after.
    Resv/Perr: Received 992(ms) after.
```

[Table 128](#) describes the significant fields shown in the display.

**Table 128** *show ip rsvp sender detail Field Descriptions—at the PLR After FLR*

Field	Descriptions
PATH	PATH message information including the following: <ul style="list-style-type: none"> <li>Destination IP address.</li> <li>Protocol ID number.</li> <li>Policing.</li> <li>Destination port number.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>port—Number of the source port.</li> </ul>
Path refreshes	Refresh information including the following: <ul style="list-style-type: none"> <li>IP address of the source (previous hop [PHOP]).</li> <li>Interface name and number.</li> <li>Frequency, in milliseconds (msec).</li> </ul>

**Table 128** *show ip rsvp sender detail Field Descriptions—at the PLR After FLR (continued)*

Field	Descriptions
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
Path ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <p><b>Note</b> A blank field means none of the above.</p>
Output on <i>interface</i>	Policy status (on the outbound interface): <ul style="list-style-type: none"> <li>• Forwarding—Inbound PATH messages are being forwarded.</li> <li>• Not Forwarding—Outbound PATH messages are being rejected.</li> <li>• Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Path FLR	FLR statistics that show when RSVP received the notification from RIB and how long thereafter the PATH message was sent. This delay can result when the interface on which the PATH message was sent had a wait time configured or when other PSBs were processed before this one or a combination of both. The statistics also show when an associated RESV or PATHERROR message was received. <p><b>Note</b> This delay tells you the time when QoS was not honored for the specified flow.</p>

**TBAC Example**

The following is sample output from the **show ip rsvp sender detail** command when TBAC is configured:

```
Router# show ip rsvp sender detail
```

```
PATH:
```

```

Destination 10.0.0.3, Protocol_Id 17, Don't Police , DstPort 2
Sender address: 10.0.0.1, port: 2
Path refreshes:
  arriving: from PHOP 10.1.1.1 on Et0/0 every 30000 msec. Timeout in 189 sec
Traffic params - Rate: 10K bits/sec, Max. burst: 10K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
Path ID handle: 02000412.
Incoming policy: Accepted. Policy source(s): Default
Status:
Output on Tunnell, out of band. Policy status: Forwarding. Handle: 0800040E
  Policy source(s): Default
Path FLR: Never repaired

```

Table 129 describes the significant fields shown in the display.

**Table 129** *show ip rsvp sender detail Field Descriptions—with TBAC*

Field	Descriptions
PATH	PATH message information: <ul style="list-style-type: none"> <li>• Destination IP address.</li> <li>• Protocol ID number.</li> <li>• Policing.</li> <li>• Destination port number.</li> </ul>
Sender address	Source IP address of the PATH message. <ul style="list-style-type: none"> <li>• port—Number of the source port.</li> </ul>
Path refreshes	Refresh information: <ul style="list-style-type: none"> <li>• IP address of the source (previous hop [PHOP]).</li> <li>• Interface name and number.</li> <li>• Frequency, in milliseconds (msec).</li> </ul> <p><b>Note</b> A blank field means no refreshes have occurred.</p>
Traffic params	Traffic parameters in effect: <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second.</li> <li>• Max. burst—Largest amount of data allowed, in kilobytes.</li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
PATH ID handle	Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.
Incoming policy	State of the incoming policy: <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.

**Table 129** *show ip rsvp sender detail* Field Descriptions—with TBAC (continued)

Field	Descriptions
Status	Status of the local policy: <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <b>Note</b> A blank field means none of the above.
Output on <i>tunnel</i>	Policy status (on the outbound tunnel with out-of-band signaling): <ul style="list-style-type: none"> <li>• Forwarding—Inbound PATH messages are being forwarded.</li> <li>• Not Forwarding—Outbound PATH messages are being rejected.</li> <li>• Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Path FLR	Never repaired—Indicates that the node has never been a point of local repair (PLR) and, therefore, has never repaired the PSB.

**RSVP Aggregation Example**

The following is sample output from the **show ip rsvp sender detail** command when RSVP aggregation is configured:

```
Router# show ip rsvp sender detail
```

```
PATH:
```

```
Destination 10.10.10.21, Protocol_Id 17, Don't Police , DstPort 1
Sender address: 10.10.10.11, port: 1
Path refreshes:
  arriving: from PHOP 10.10.10.34 on Et1/0 every 30000 msec
Traffic params - Rate: 10K bits/sec, Max. burst: 10K bytes
  Min Policed Unit: 0 bytes, Max Pkt Size 2147483647 bytes
Path ID handle: 0F000406.
Incoming policy: Accepted. Policy source(s): Default
Status:
3175 Aggregation: agg_info : AggResv 10.10.10.34->10.10.10.2_46
Output on Serial2/0. Policy status: Forwarding. Handle: 09000405
  Policy source(s): Default
Path FLR: Never repaired
```

```
PATH:
```

```
Deaggregator 10.10.10.2, DSCP 46, Don't Police
Aggregator address: 10.10.10.34
Path refreshes:
  arriving: from PHOP 192.168.34.36 on Et1/0 every 30000 msec
Traffic params - Rate: 17179868160 bits/sec, Max. burst: 536870784 bytes
  Min Policed Unit: 1 bytes, Max Pkt Size 2147483647 bytes
Path ID handle: 1500040A.
Incoming policy: Accepted. Policy source(s): Default
Status: Proxy-terminated
Path FLR: Never repaired
```

Table 130 describes the significant fields shown in the display.

**Table 130** *show ip rsvp sender detail Field Descriptions—with RSVP Aggregation*

Field	Descriptions
PATH	<p>PATH message information for E2e reservations:</p> <ul style="list-style-type: none"> <li>• Destination IP address.</li> <li>• Protocol ID number.</li> <li>• Policing. <ul style="list-style-type: none"> <li>– Always Don't Police.</li> </ul> </li> <li>• Destination port number.</li> </ul>
Sender address	<p>Source IP address of the PATH message.</p> <ul style="list-style-type: none"> <li>• port—Number of the source port.</li> </ul>
Path refreshes	<p>Refresh information:</p> <ul style="list-style-type: none"> <li>• IP address of the source (previous hop [PHOP]).</li> <li>• Interface name and number.</li> <li>• Frequency, in milliseconds (msec).</li> </ul> <p><b>Note</b> A blank field means no refreshes have occurred.</p>
Traffic params	<p>Traffic parameters in effect:</p> <ul style="list-style-type: none"> <li>• Rate—Speed, in kilobits per second. <ul style="list-style-type: none"> <li>– Always MAX rate possible for aggregate reservations.</li> </ul> </li> <li>• Max. burst—Largest amount of data allowed, in kilobytes. <ul style="list-style-type: none"> <li>– Always MAX burst possible for aggregate reservations.</li> </ul> </li> <li>• Min Policed Unit—Size, in bytes, of the smallest packet generated by the application, including the application data and all protocol headers at or above the IP level.</li> <li>• Max Pkt Size—Largest packet allowed, in bytes.</li> </ul>
PATH ID handle	<p>Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</p>
Incoming policy	<p>State of the incoming policy:</p> <ul style="list-style-type: none"> <li>• Accepted—RSVP PATH messages are being accepted, but not forwarded.</li> <li>• Not Accepted—RSVP PATH messages are being rejected.</li> </ul>
Policy source(s)	<p>Type of local policy in effect; values include Default, Local, and MPLS/TE.</p>
Status	<p>Status of the local policy:</p> <ul style="list-style-type: none"> <li>• Proxied—Head.</li> <li>• Proxy-terminated—Tail.</li> <li>• Blockaded—Tail or midpoint and an RESVERROR message has recently been received; therefore, the PSB enters the blockaded state.</li> </ul> <p><b>Note</b> A blank field means none of the above.</p>

**Table 130** show ip rsvp sender detail Field Descriptions—with RSVP Aggregation (continued)

Field	Descriptions
3175 Aggregation: agg_info	IP address of the aggregated reservation on which this E2E reservation is mapped with specified source (aggregator) and destination (deaggregator) endpoints and DSCP.
Output on <i>interface</i>	Policy status (on the outbound interface): <ul style="list-style-type: none"> <li>• Forwarding—Inbound PATH messages are being forwarded.</li> <li>• Not Forwarding—Outbound PATH messages are being rejected.</li> <li>• Handle—Internal database ID assigned to the PATH message by RSVP for bookkeeping purposes.</li> </ul>
Policy source(s)	Type of local policy in effect; values include Default, Local, and MPLS/TE.
Path FLR	Never repaired—Indicates that the node has never been a point of local repair (PLR) and, therefore, has never repaired the PSB.
PATH	PATH message information for aggregate reservations: <ul style="list-style-type: none"> <li>• Deaggregator IP address.</li> <li>• Differentiated Services Code Point (DSCP) value.</li> <li>• Policing. <ul style="list-style-type: none"> <li>– Always Don't Police.</li> </ul> </li> <li>• Aggregator IP address.</li> </ul> <p><b>Note</b> Remaining parameters are defined in the preceding fields.</p>

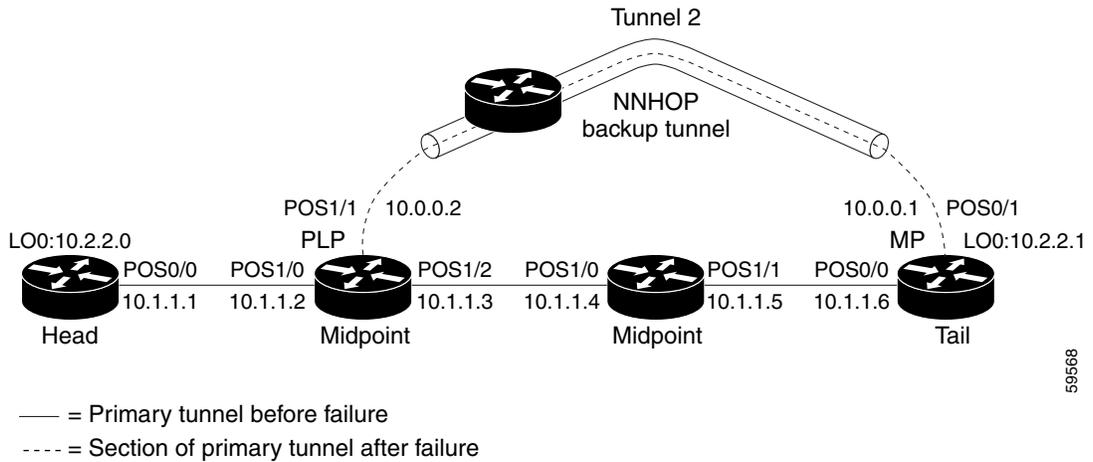
**PLR and MP Examples**

The following is sample output from the **show ip rsvp sender detail** command under these circumstances:

- The command is entered at the point of local repair (PLR) before a failure (Example 1).
- The command is entered at the PLR after a failure (Example 2).
- The command is entered at the merge point (MP) before a failure (Example 3).
- The command is entered at the MP after a failure (Example 4).
- The command output shows all senders (Example 5).
- The command output shows only senders who have a specific destination (Example 6).
- Show more detail about a sender who has a specific destination (Example 7).

Figure 7 illustrates the network topology for the RSVP configuration example.

**Figure 7 Network Topology for the RSVP Configuration Example**



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**Example 1: The command is entered at the PLR before a failure.**

The following is sample output from the **show ip rsvp sender detail** command when it is entered at the PLR before a failure:

```
Router# show ip rsvp sender detail
```

```
PATH:
  Tun Dest: 10.2.2.1 Tun ID: 1 Ext Tun ID: 10.2.2.0
  Tun Sender: 10.2.2.0, LSP ID: 126
  Path refreshes arriving on POS1/0 from PHOP 10.1.1.1
  Path refreshes being sent to NHOP 10.1.1.4 on POS1/1
  Session Attr::
    Setup Prio: 0, Holding Prio: 0
    Flags: Local Prot desired, Label Recording, SE Style
    Session Name:tagsw4500-23_t1
  ERO:
    10.1.1.4 (Strict IPv4 Prefix, 8 bytes, /32)
    10.1.1.5 (Strict IPv4 Prefix, 8 bytes, /32)
    10.1.1.6 (Strict IPv4 Prefix, 8 bytes, /32)
    10.2.2.1 (Strict IPv4 Prefix, 8 bytes, /32)
  Traffic params - Rate: 0G bits/sec, Max. burst: 1K bytes
  Fast-Reroute Backup info:
    Inbound FRR: Not active
    Outbound FRR: Ready -- backup tunnel selected
      Backup Tunnel: Tu2 (label 0)
      Bkup Sender Template:
        Tun Sender: 10.0.0.0, LSP ID: 126
      Bkup FilerSpec:
        Tun Sender: 10.0.0.0, LSP ID 126
```

Table 131 describes the significant fields shown in the display.

**Note**

The Flags field is important for Fast Reroute. For information about flags that must be set, see the Flags field description in Table 131.

**Table 131** show ip rsvp sender detail Field Descriptions—on PLR Before Failure

Field	Description
<b>The first five fields provide information that uniquely identifies the LSP.</b>	
<b>The first three fields identify the LSP's session (that is, the contents of the SESSION object in arriving PATH messages).</b>	
Tun Dest	IP address of the destination of the tunnel.
Tun ID	Tunnel identification number.
Ext Tun ID	Extended tunnel identification number.
<b>The next two fields identify the LSP's sender (SENDER_TEMPLATE object of arriving PATH messages).</b>	
Tun Sender	Tunnel sender.
LSP ID	LSP identification number.
<b>The remaining fields indented under PATH provide additional information about this LSP.</b>	
<b>Session Attr</b> —Session attributes. Refers to information included in the SESSION_ATTRIBUTE object of arriving PATH messages, such as the Setup and Holding Priorities, Flags, and the Session Name.	
Setup Prio	Setup priority.
Holding Prio	Holding priority.
Flags	An LSP must have the “Local protection desired” flag of the SESSION_ATTRIBUTE object set for the LSP to use a backup tunnel (that is, in order to receive local protection). If this flag is not set, you have not enabled Fast Reroute for this tunnel at its headend (by entering the <b>tunnel mpls traffic-eng fast-reroute</b> command). Next-next hop (NNHOP) backup tunnels rely on label recording, so LSPs should have the “label recording desired” flag set too. This flag is set if the tunnel was configured for Fast Reroute.
<b>ERO</b> —Refers to the EXPLICIT_ROUTE Object (ERO) of the PATH messages. This field displays the contents of the ERO at this node. As a PATH message travels from the sender (headend) to the receiver (tailend), each node removes its own IP address from the ERO. The displayed value reflects the remainder of hops between this node and the tail.	
<b>Fast-Reroute Backup info</b> —Information that is relevant to Fast Reroute for this LSP.	
Inbound FRR	If this node is downstream from a rerouted LSP (for example, at a merge point for this LSP), the state is Active.

**Table 131** *show ip rsvp sender detail Field Descriptions—on PLR Before Failure (continued)*

Field	Description
Outbound FRR	<p>If this node is a PLR for an LSP, there are three possible states:</p> <ul style="list-style-type: none"> <li>• Active—This LSP is actively using its backup tunnel, presumably because there has been a downstream failure.</li> <li>• No Backup—This LSP does not have local (Fast Reroute) protection. No backup tunnel has been selected for it to use in case of a failure.</li> <li>• Ready—This LSP is ready to use a backup tunnel in case of a downstream link or node failure. A backup tunnel has been selected for it to use.</li> </ul>
Backup Tunnel	<p>If the Outbound FRR state is Ready or Active, this field indicates the following:</p> <ul style="list-style-type: none"> <li>• Which backup tunnel has been selected for this LSP to use in case of a failure.</li> <li>• The inbound label that will be prepended to the LSP's data packets for acceptance at the backup tunnel tail (the merge point).</li> </ul>
Bkup Sender Template	<p>If the Outbound FRR state is Ready or Active, SENDER_TEMPLATE and FILTERSPEC objects are shown. These objects will be used in RSVP messages sent by the backup tunnel if the LSP starts actively using the backup tunnel. They differ from the original (prefailure) objects only in that the node (the PLR) substitutes its own IP address for that of the original sender. For example, PATH and PATHTEAR messages will contain the new SENDER_TEMPLATE. RESV and RESVTEAR messages will contain the new FILTERSPEC object. If this LSP begins actively using the backup tunnel, the display changes.</p>
Bkup FilerSpec	<p>If the Outbound FRR state is Ready or Active, SENDER_TEMPLATE and FILTERSPEC objects are shown. These objects will be used in RSVP messages sent by the backup tunnel if the LSP starts actively using the backup tunnel. They differ from the original (prefailure) objects only in that the node (the PLR) substitutes its own IP address for that of the original sender. For example, PATH and PATHTEAR messages will contain the new SENDER_TEMPLATE. RESV and RESVTEAR messages will contain the new FILTERSPEC object. If this LSP begins actively using the backup tunnel, the display changes as shown in Example 2.</p>

**Example 2: The command is entered at the PLR after a failure.**

If the LSP begins actively using the backup tunnel and the command is entered at the PLR after a failure, the display changes as shown below.

```
Router# show ip rsvp sender detail

PATH:
  Tun Dest: 10.2.2.1 Tun ID: 1 Ext Tun ID: 10.2.2.0
```

```

Tun Sender: 10.2.2.0, LSP ID: 126
Path refreshes arriving on POS1/0 from PHOP 10.1.1.1
Path refreshes being sent to NHOP 10.2.2.1 on Tunnel2
Session Attr::
  Setup Prio: 0, Holding Prio: 0
  Flags: Local Prot desired, Label Recording, SE Style
  Session Name:tagsw4500-23_t1
ERO:
  10.2.2.1 (Strict IPv4 Prefix, 8 bytes, /32)
  10.2.2.1 (Strict IPv4 Prefix, 8 bytes, /32)
Traffic params - Rate: 0G bits/sec, Max. burst: 1K bytes
Fast-Reroute Backup info:
  Inbound FRR: Not active
  Outbound FRR: Active -- using backup tunnel
    Backup Tunnel: Tu2          (label 0)
    Bkup Sender Template:
      Tun Sender: 10.0.0.0, LSP ID: 126
    Bkup FilerSpec:
      Tun Sender: 10.0.0.0, LSP ID 126
  Orig Output I/F: Et2
  Orig Output ERO:
    10.1.1.4 (Strict IPv4 Prefix, 8 bytes, /32)
    10.1.1.5 (Strict IPv4 Prefix, 8 bytes, /32)
    10.1.1.6 (Strict IPv4 Prefix, 8 bytes, /32)
    10.2.2.1 (Strict IPv4 Prefix, 8 bytes, /32)

```

Once an LSP is actively using a backup tunnel, the following changes occur:

- PATH refreshes are no longer sent to the original NHOP out the original interface. They are sent through the backup tunnel to the node that is the tail of the backup tunnel (NHOP or NNHOP).
- The ERO is modified so that it will be acceptable upon arrival at the NHOP or NNHOP.
- The display shows both the original ERO and the new one that is now being used.
- The display shows the original output interface (that is, the interface from which PATH messages were sent for this LSP before the failure).

**Example 3: The command is entered at the MP before a failure.**

If the same **show ip rsvp sender** command is entered at the merge point (the backup tunnel tail), the display changes from before to after the failure. The following is sample output before a failure:

```

Router# show ip rsvp sender detail

PATH:
  Tun Dest: 10.2.2.1 Tun ID: 1 Ext Tun ID: 10.2.2.0
  Tun Sender: 10.2.2.0, LSP ID: 126
  Path refreshes arriving on POS0/0 from PHOP 10.1.1.5
  Session Attr::
    Setup Prio: 0, Holding Prio: 0
    Flags: Local Prot desired, Label Recording, SE Style
    Session Name:tagsw4500-23_t1
  Traffic params - Rate: 0G bits/sec, Max. burst: 1K bytes
  Fast-Reroute Backup info:
    Inbound FRR: Not active
    Outbound FRR: No backup tunnel selected

```

**Example 4: The command is entered at the MP after a failure.**

After a failure, the following changes occur:

- The interface and previous hop (PHOP) from which PATH messages are received will change.
- The inbound FRR becomes Active.

- The original PHOP and the original input interface are displayed as shown below.

The following is sample output after a failure:

```
Router# show ip rsvp sender detail

PATH:
  Tun Dest: 10.2.2.1 Tun ID: 1 Ext Tun ID: 10.2.2.0
  Tun Sender: 10.2.2.0, LSP ID: 126
  Path refreshes arriving on POS0/1 from PHOP 10.0.0.0 on Loopback0
  Session Attr::
    Setup Prio: 0, Holding Prio: 0
    Flags: Local Prot desired, Label Recording, SE Style
    Session Name:tagsw4500-23_t1
  Traffic params - Rate: 0G bits/sec, Max. burst: 1K bytes
  Fast-Reroute Backup info:
    Inbound FRR: Active
      Orig Input I/F: POS0/0
      Orig PHOP: 10.1.1.5
      Now using Bkup Filterspec w/ sender: 10.0.0.0 LSP ID: 126
    Outbound FRR: No backup tunnel selected
```

Notice the following changes:

- After a failure, PATH refreshes arrive on a different interface and from a different PHOP.
- The original PHOP and input interface are shown under Fast-Reroute Backup information, along with the FILTERSPEC object that will now be used when sending messages (such as RESV and RESVTEAR).

#### Example 5: The command output shows all senders.

In the following example, information about all senders is displayed.

```
Router# show ip rsvp sender

To          From          Pro DPort Sport Prev Hop      I/F  BPS  Bytes
10.2.2.1    10.2.2.0      1   1    59   10.1.1.1      Et1  0G   1K
10.2.2.1    172.31.255.255 1   2    9    10.1.1.1      Et1  0G   1K
10.2.2.1    10.2.2.0      1   3    12   10.1.1.1      Et1  0G   1K
10.2.2.1    172.31.255.255 1   3    20    10.1.1.1      Et1  0G   1K
172.16.0.0  172.31.255.255 1   0    23    10.1.1.1      Et1  0G   1K
172.16.0.0  172.31.255.255 1   1    22    10.1.1.1      Et1  0G   1K
172.16.0.0  172.31.255.255 1  1000  22    10.1.1.1      Et1  0G   1K
```

Table 132 describes the significant fields shown in the display.

**Table 132** show ip rsvp sender Field Descriptions

Field	Description
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol code. Code 1 indicates Internet Control Message Protocol (ICMP).
DPort	Destination port number.
Sport	Source port number.
Prev Hop	IP address of the previous hop.
I/F	Interface of the previous hop.

**Table 132** show ip rsvp sender Field Descriptions (continued)

Field	Description
BPS	Reservation rate, in bits per second, that the application is advertising it might achieve.
Bytes	Bytes of burst size that the application is advertising it might achieve.

**Example 6: The command output shows only senders having a specific destination.**

To show only information about senders having a specific destination, specify the destination filter as shown below. In this example, the destination is 172.16.0.0.

```
Router# show ip rsvp sender filter destination 172.16.0.0
```

```
To          From          Pro DPort Sport Prev Hop    I/F  BPS  Bytes
172.16.0.0  172.31.255    1  0    23                0G   1K
172.16.0.0  172.31.255    1  1    22                0G   1K
172.16.0.0  172.31.255    1 1000  22                0G   1K
```

**Example 7: Show more detail about a sender having a specific destination.**

To show more detail about the sender whose destination port is 1000 (as shown in Example 6), specify the command with the destination port filter:

```
Router# show ip rsvp sender filter detail dst-port 1000
```

```
PATH:
Tun Dest 172.16.0.0 Tun ID 1000 Ext Tun ID 172.31.255.255
Tun Sender: 172.31.255.255, LSP ID: 22
Path refreshes being sent to NHOP 10.1.1.4 on Ethernet2
Session Attr::
  Setup Prio: 7, Holding Prio: 7
  Flags: SE Style
  Session Name:tagsw4500-25_t1000
ERO:
  10.1.1.4 (Strict IPv4 Prefix, 8 bytes, /32)
  172.16.0.0 (Strict IPv4 Prefix, 8 bytes, /32)
Traffic params - Rate: 0G bits/sec, Max. burst: 1K bytes
Fast-Reroute Backup info:
  Inbound FRR: Not active
  Outbound FRR: No backup tunnel selected
```

**Related Commands**

Command	Description
<b>ip rsvp sender</b>	Enables a router to simulate RSVP PATH message reception from the sender.
<b>show ip rsvp reservation</b>	Displays RSVP PATH-related receiver information currently in the database.

# show ip rsvp signalling

To display Resource Reservation Protocol (RSVP) signaling information that optionally includes rate-limiting and refresh-reduction parameters for RSVP messages, use the **show ip rsvp signalling** command in EXEC mode.

**show ip rsvp signalling [rate-limit | refresh reduction]**

Syntax Description	rate-limit	(Optional) Rate-limiting parameters for signalling messages.
	refresh reduction	(Optional) Refresh-reduction parameters and settings.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **show ip rsvp signalling** command with either the **rate-limit** or the **refresh reduction** keyword to display rate-limiting parameters or refresh-reduction parameters, respectively.

**Examples** The following command shows rate-limiting parameters:

```
Router# show ip rsvp signalling rate-limit

Rate Limiting:enabled
  Max msgs per interval:4
  Interval length (msec):20
  Max queue size:500
  Max msgs per second:200
  Max msgs allowed to be sent:37
```

[Table 133](#) describes the fields shown in the display.

**Table 133** *show ip rsvp signalling rate-limit Command Field Descriptions*

Field	Description
Rate Limiting: enabled (active) or disabled (not active)	<p>The RSVP rate-limiting parameters in effect including the following:</p> <ul style="list-style-type: none"> <li>• Max msgs per interval = number of messages allowed to be sent per interval (timeframe).</li> <li>• Interval length (msecs) = interval (timeframe) length in milliseconds.</li> <li>• Max queue size = maximum size of the message queue in bytes.</li> <li>• Max msgs per second = maximum number of messages allowed to be sent per second.</li> </ul>

The following command shows refresh-reduction parameters:

```
Router# show ip rsvp signalling refresh reduction

Refresh Reduction:enabled
  ACK delay (msec):250
  Initial retransmit delay (msec):1000
  Local epoch:0x74D040
  Message IDs:in use 600, total allocated 3732, total freed 3132
```

Table 134 describes the fields shown in the display.

**Table 134** *show ip rsvp signalling refresh reduction Command Field Descriptions*

Field	Description
Refresh Reduction: enabled (active) or disabled (not active)	<p>The RSVP refresh-reduction parameters in effect including the following:</p> <ul style="list-style-type: none"> <li>• ACK delay (msec) = how long in milliseconds before the receiving router sends an acknowledgment (ACK).</li> <li>• Initial retransmit delay (msec) = how long in milliseconds before the sending router retransmits a message.</li> <li>• Local epoch = the RSVP process identifier that defines a local router for refresh reduction and reliable messaging; randomly generated each time a node reboots or the RSVP process restarts.</li> <li>• Message IDs = the number of message identifiers (IDs) in use, the total number allocated, and the total number available (freed).</li> </ul>

#### Related Commands

Command	Description
<b>clear ip rsvp signalling rate-limit</b>	Clears the counters recording dropped messages.
<b>clear ip rsvp signalling refresh reduction</b>	Clears the counters recording retransmissions and out-of-order messages.
<b>debug ip rsvp rate-limit</b>	Displays debug messages for RSVP rate-limiting events.
<b>ip rsvp signalling rate-limit</b>	Controls the transmission rate for RSVP messages sent to a neighboring router during a specified amount of time.
<b>ip rsvp signalling refresh reduction</b>	Enables refresh reduction.

# show ip rsvp signalling blockade

To display the Resource Reservation Protocol (RSVP) sessions that are currently blocked, use the **show ip rsvp signalling blockade** command in EXEC mode.

```
show ip rsvp signalling blockade [detail] [name | address]
```

Syntax Description	detail	(Optional) Additional blockade information.
	<i>name</i>	(Optional) Name of the router being blocked.
	<i>address</i>	(Optional) IP address of the destination of a reservation.

**Defaults** If you enter the **show ip rsvp signalling blockade** command without a keyword or an argument, the command displays all the blocked sessions on the router.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Usage Guidelines** Use the **show ip rsvp signalling blockade** command to display the RSVP sessions that are currently blocked.

An RSVP sender becomes blocked when the corresponding receiver sends a Resv message that fails admission control on a router that has RSVP configured. A ResvError message with an admission control error is sent in reply to the Resv message, causing all routers downstream of the failure to mark the associated sender as blocked. As a result, those routers do not include that contribution to subsequent Resv refreshes for that session until the blockade state times out.

Blockading solves a denial-of-service problem on shared reservations where one receiver can request so much bandwidth as to cause an admission control failure for all the receivers sharing that reservation, even though the other receivers are making requests that are within the limit.

**Examples** The following example shows all the sessions currently blocked:

```
Router# show ip rsvp signalling blockade
```

```

To          From          Pro DPort Sport Time Left Rate
192.168.101.2 192.168.101.1 UDP 1000 1000 27      5K
192.168.101.2 192.168.101.1 UDP 1001 1001 79      5K
192.168.101.2 192.168.101.1 UDP 1002 1002 17      5K
225.1.1.1    192.168.104.1 UDP 2222 2222 48      5K
```

Table 135 describes the fields shown in the display.

**Table 135** *show ip rsvp signalling blockade Command Field Descriptions*

Field	Description
To	IP address of the receiver.
From	IP address of the sender.
Pro	Protocol used.
DPort	Destination port number.
Sport	Source port number.
Time Left	Amount of time, in seconds, before the blockade expires.
Rate	The average rate, in bits per second, for the data.

The following example shows more detail about the sessions currently blocked:

```
Router# show ip rsvp signalling blockade detail

Session address: 192.168.101.2, port: 1000. Protocol: UDP
Sender address: 192.168.101.1, port: 1000
Admission control error location: 192.168.101.1
Flowspec that caused blockade:
  Average bitrate:      5K bits/second
  Maximum burst:       5K bytes
  Peak bitrate:        5K bits/second
  Minimum policed unit: 0 bytes
  Maximum packet size: 0 bytes
  Requested bitrate:   5K bits/second
  Slack:               0 milliseconds
  Blockade ends in:    99 seconds

Session address: 192.168.101.2, port: 1001. Protocol: UDP
Sender address: 192.168.101.1, port: 1001
Admission control error location: 192.168.101.1
Flowspec that caused blockade:
  Average bitrate:      5K bits/second
  Maximum burst:       5K bytes
  Peak bitrate:        5K bits/second
  Minimum policed unit: 0 bytes
  Maximum packet size: 0 bytes
  Requested bitrate:   5K bits/second
  Slack:               0 milliseconds
  Blockade ends in:    16 seconds

Session address: 192.168.101.2, port: 1002. Protocol: UDP
Sender address: 192.168.101.1, port: 1002
Admission control error location: 192.168.101.1
Flowspec that caused blockade:
  Average bitrate:      5K bits/second
  Maximum burst:       5K bytes
  Peak bitrate:        5K bits/second
  Minimum policed unit: 0 bytes
  Maximum packet size: 0 bytes
  Requested bitrate:   5K bits/second
  Slack:               0 milliseconds
  Blockade ends in:    47 seconds

Session address: 225.1.1.1, port: 2222. Protocol: UDP
Sender address: 192.168.104.1, port: 2222
```

```

Admission control error location: 192.168.101.1
Flowspec that caused blockade:
  Average bitrate:      5K bits/second
  Maximum burst:       5K bytes
  Peak bitrate:        5K bits/second
  Minimum policed unit: 0 bytes
  Maximum packet size: 0 bytes
  Requested bitrate:   5K bits/second
  Slack:               0 milliseconds
  Blockade ends in:    124 seconds

```

Table 136 describes the fields shown in the display.

**Table 136** *show ip rsvp signalling blockade detail Command Field Descriptions*

Field	Description
Session address	Destination IP address of the reservation affected by the blockade.
port	Destination port number of the reservation affected by the blockade.
Protocol	Protocol used by the reservation affected by the blockade; choices include User Datagram Protocol (UDP) and TCP.
Sender address	Source IP address of the reservation affected by the blockade.
port	Source port number of the reservation affected by the blockade.
Admission control error location	IP address of the router where the admission control error occurred.
Flowspec that caused blockade	Parameters for the flowspec that caused the blockade.
Average bitrate	The average rate, in bits per second, for the flowspec.
Maximum burst	The maximum burst size, in bytes, for the flowspec.
Peak bitrate	The peak rate, in bps, for the flowspec.
Minimum policed unit	The minimum policed unit, in bytes, for the flowspec.
Maximum packet size	The maximum packet size, in bytes, for the flowspec.
Requested bitrate	The requested rate, in bits per second, for the flowspec.
Slack	Time, in milliseconds, allocated to a router for scheduling delivery of packets.
Blockade ends in	Time, in seconds, until the blockade expires.

# show ip rsvp signalling fast-local-repair

To display fast-local-repair (FLR)-specific information maintained by Resource Reservation Protocol (RSVP), use the **show ip rsvp signalling fast-local-repair** command in user EXEC or privileged EXEC mode.

**show ip rsvp signalling fast-local-repair** [**statistics** [**detail**]]

## Syntax Description

<b>statistics</b>	(Optional) Displays information about FLR procedures.
<b>detail</b>	(Optional) Displays additional information about FLR procedures.

## Command Default

Information for the FLR and RSVP message pacing displays.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.2(33)SRB	This command was introduced.

## Usage Guidelines

Use the **show ip rsvp signalling fast-local-repair** command to display the FLR and RSVP message pacing rates that are configured.

Use the **show ip rsvp signalling fast-local-repair statistics** command to display the FLR procedures and related information including the following:

- The process number
- The state
- The start time
- The number of path state blocks (PSBs) repaired
- The repair rate
- The routing information base (RIB) notification process time
- The repair time of the last PSB

Use the **show ip rsvp signalling fast-local-repair statistics detail** command to display detailed information about FLR procedures including the following:

- The time of the routing notification
- The elapsed time for processing all notifications in the queue
- The rate and pacing unit (the refresh spacing in ms) used
- The number of PSBs repaired
- The number of times RSVP has suspended

For each run, the following information appears:

- The time that the run started relative to the start of the procedure
- The time that RSVP suspended again
- The number of notifications processed in this run

For each neighbor, the following information appears:

- The delay of the first PATH message sent to this neighbor
- The delay of the last PATH message sent to this neighbor

## Examples

### show ip rsvp signalling fast-local-repair Example

The following example displays information about the FLR rate:

```
Router# show ip rsvp signalling fast-local-repair

Fast Local Repair: enabled
  Max repair rate (paths/sec): 400
  Max processed (paths/run): 1000
```

Table 137 describes the significant fields shown in the display.

**Table 137** *show ip rsvp signalling fast-local-repair Field Descriptions*

Field	Description
Fast Local Repair	FLR state. Values are the following: <ul style="list-style-type: none"> <li>• Enabled—FLR is configured.</li> <li>• Disabled—FLR is not configured.</li> </ul>
Max repair rate (paths/sec)	Maximum repair rate, in paths per second.
Max processed (paths/run)	Maximum notification elements processed, in paths per run.

### show ip rsvp signalling fast-local-repair statistics Example

The following example displays information about FLR procedures:

```
Router# show ip rsvp signalling fast-local-repair statistics

Fast Local Repair: enabled
  Max repair rate (paths/sec): 1000
  Max processed (paths/run): 1000

FLR Statistics:

FLR   State   Start                               #PSB   Repair RIB Proc Last
Proc. Time                                     Repair Rate   Time   PSB
1     DONE    15:16:32 MET Wed Oct 25 2006    2496   1000   91(ms) 3111(ms)
```

Table 138 describes the significant fields shown in the display.

**Table 138** *show ip rsvp signalling fast-local-repair statistics Field Descriptions*

Field	Description
Fast Local Repair	FLR state. Values are the following: <ul style="list-style-type: none"> <li>Enabled—FLR is configured.</li> <li>Disabled—FLR is not configured.</li> </ul>
Max repair rate (paths/sec)	Maximum repair rate, in paths per second.
Max processed (paths/run)	Maximum notification elements processed, in paths per run.
FLR Statistics	FLR-related information.
FLR Proc.	FLR procedure number. The last 32 procedures are listed from the most recent to the oldest; they are numbered from 1 to 32.
State	Current state of the FLR procedure. Values are the following: <ul style="list-style-type: none"> <li>DONE—The FLR procedure is complete.</li> <li>IN PROGRESS—The FLR procedure is incomplete.</li> </ul>
Start Time	Time when RSVP received the routing notification.
#PSB Repair	Number of PSBs repaired.
Repair Rate	Repair rate used, in paths per second.
RIB Proc Time	Time that RSVP spent to process all RIB notifications and schedule the path refreshes, in microseconds (us), milliseconds (msec or ms), or seconds (sec). <p><b>Note</b> The value is converted to fit the column width; however, seconds are rarely used because RSVP RIB notification processing is very fast.</p>
Last PSB	Elapsed time, in microseconds (us), milliseconds (msec or ms), or seconds (sec), between the start of an FLR procedure and when RSVP sent the last PATH message. <p><b>Note</b> The value is converted to fit the column width; however, seconds are rarely used because RSVP RIB notification processing is very fast.</p>

#### show ip rsvp signalling fast-local-repair statistics detail Example

The following example displays detailed information about FLR procedures:

```
Router# show ip rsvp signalling fast-local-repair statistics detail
```

```
Fast Local Repair: enabled
  Max repair rate (paths/sec): 1000
  Max processed (paths/run): 1000

FLR Statistics:

  FLR 1: DONE
    Start Time: 15:16:32 MET Wed Oct 25 2006
    Number of PSBs repaired:      2496
    Used Repair Rate (msgs/sec):  1000
```

```

RIB notification processing time: 91(ms)
Time of last PSB refresh:      3111(ms)
Time of last Resv received:    4355(ms)
Time of last Perr received:    0(us)
Suspend count: 2
  Run  Number  Started      Duration
  ID   of ntf.  (time from Start)
  2    498     81(ms)      10(ms)
  1    998     49(ms)      21(ms)
  0    1000    0(us)       22(ms)
FLR Pacing Unit: 1 msec
Affected neighbors:
  Nbr Address          Relative Delay Values (msec)
  10.1.0.70           [500 , ..., 2995 ]

```

Table 139 describes the significant fields shown in the display.

**Table 139** *show ip rsvp signalling fast-local-repair statistics detail Field Descriptions*

Field	Description
Fast Local Repair	FLR state. Values are the following: <ul style="list-style-type: none"> <li>Enabled—FLR is configured.</li> <li>Disabled—FLR is not configured.</li> </ul>
Max repair rate (paths/sec)	Maximum repair rate, in paths per second.
Max processed (paths/run)	Maximum notification elements processed, in paths per run.
FLR Statistics	FLR-related information.
FLR #	FLR procedure number and current state. The last 32 procedures are listed from the most recent to the oldest; they are numbered from 1 to 32. Values for the state are the following: <ul style="list-style-type: none"> <li>DONE—The FLR procedure is complete.</li> <li>IN PROGRESS—The FLR procedure is incomplete.</li> </ul>
Start Time	Time when RSVP received the routing notification.
Number of PSBs repaired	Total PSBs repaired.
Used Repair Rate (msgs/sec)	Repair rate used, in messages per second.
RIB notification processing time	Time, in milliseconds (ms), that RSVP spent to process all RIB notifications.
Time of last PSB refresh	Elapsed time, in milliseconds (ms), between the start of an FLR procedure and when RSVP sent the last PATH refresh message.
Time of last Resv received	Elapsed time, in milliseconds (ms), between the start of an FLR procedure and when RSVP received the last RESV message.
Time of last Perr received	Elapsed time, in microseconds (us), between the start of an FLR procedure and when RSVP received the last PATHERROR message.

**Table 139** *show ip rsvp signalling fast-local-repair statistics detail Field Descriptions (continued)*

Field	Description
Suspend count	Number of times that RSVP has suspended during a specific procedure. <b>Note</b> If this value is non-zero, details for each run are shown.
Run ID	Identifier (number) for each time that RSVP has run.
Number of ntf.	Number of notifications (PSBs) processed in a run.
Started (time from Start)	Time, in milliseconds (ms), that the run began relative to the start of the FLR procedure.
Duration	Length of time, in milliseconds (ms), for the run.
FLR Pacing Unit	Frequency, in milliseconds (msec), for RSVP message pacing; that is, how often a PATH message is sent. The value is rounded down.
Affected neighbors	Neighbors involved in the FLR procedure.
Nbr Address	IP address for each neighbor involved in a procedure.
Relative Delay Values	Times, in milliseconds (msec), when the PSB refreshes were sent. <b>Note</b> In the sample display, there is a 1-msec pacing unit; therefore, PSBs to 10.1.0.70 have been sent with delays of 1 msec from 500, 501, 502, 503, ... 2995. If a 5-msec pacing unit were used, the delays would be 500, 505, 510,... 2990, 2995.

**Related Commands**

Command	Description
<b>ip rsvp signalling fast-local-repair notifications</b>	Configures the number of notifications that are processed before RSVP suspends.
<b>ip rsvp signalling fast-local-repair rate</b>	Configures the repair rate that RSVP uses for an FLR procedure.
<b>ip rsvp signalling fast-local-repair wait</b>	Configures the delay used to start an FLR procedure.
<b>ip rsvp signalling rate-limit</b>	Controls the transmission rate for RSVP messages sent to a neighboring router during a specified amount of time.

# show ip rsvp signalling rate-limit

To display the Resource Reservation Protocol (RSVP) rate-limiting parameters, use the **show ip rsvp signalling rate-limit** command in user EXEC or privileged EXEC mode.

**show ip rsvp signalling rate-limit**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.2(13)T	This command was introduced.
12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.
12.0(29)S	The command output was modified to show the revised rate-limiting parameters.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(18)SXF5	This command was integrated into Cisco IOS Release 12.2(18)SXF5.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Examples

The following command shows the rate-limiting parameters:

```
Router# show ip rsvp signalling rate-limit
```

```
Rate Limiting:
  Max msgs per interval: 4
  Interval length (msec): 20
  Max queue size: 500
  Max msgs per second: 200
```

[Table 140](#) describes the fields shown in the display.

**Table 140** *show ip rsvp signalling rate-limit Field Descriptions*

Field	Description
Rate Limiting	<p>The RSVP rate-limiting parameters are enabled or disabled. They include the following:</p> <ul style="list-style-type: none"> <li>Burst = number of messages sent each period from the queue.</li> <li>Limit = maximum number of messages sent each period from the queue.</li> <li>Max size = maximum size of the message queue in bytes.</li> <li>Period (msec) = interval (time frame) length in milliseconds.</li> <li>Max rate (msgs/sec) = maximum number of messages allowed to be sent per second.</li> </ul>

## ■ show ip rsvp signalling rate-limit

Related Commands	Command	Description
	<b>clear ip rsvp signalling rate-limit</b>	Clears (sets to zero) the number of messages that were dropped because of a full queue.
	<b>debug ip rsvp rate-limit</b>	Displays debug messages for RSVP rate-limiting events.
	<b>ip rsvp signalling rate-limit</b>	Controls the transmission rate for RSVP messages sent to a neighboring router during a specified amount of time.

# show ip rsvp signalling refresh reduction

To display the Resource Reservation Protocol (RSVP) refresh-reduction parameters, use the **show ip rsvp signalling refresh reduction** command in EXEC mode.

**show ip rsvp signalling refresh reduction**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(13)T	This command was introduced.

**Examples** The following command shows the refresh-reduction parameters:

```
Router# show ip rsvp signalling refresh reduction

Refresh Reduction:
  ACK delay (msec): 250
  Initial retransmit delay (msec): 1000
  Local epoch: 0xF2F6BC
  Message IDs: in use 1, total allocated 4, total freed 3
```

[Table 141](#) describes the fields shown in the display.

**Table 141** *show ip rsvp signalling refresh reduction Command Field Descriptions*

Field	Description
Refresh Reduction	<p>The RSVP refresh-reduction parameters in effect including the following:</p> <ul style="list-style-type: none"> <li>• ACK delay (msec) = how long in milliseconds before the receiving router sends an acknowledgment (ACK).</li> <li>• Initial retransmit delay (msec) = how long in milliseconds before the sending router retransmits a message.</li> <li>• Local epoch = the RSVP message number space ID (identifier); randomly generated each time a node reboots or the RSVP process restarts.</li> <li>• Message IDs = the number of message IDs in use, the total number allocated, and the total number available (freed).</li> </ul>

## ■ show ip rsvp signalling refresh reduction

Related Commands	Command	Description
	<b>clear ip rsvp signalling refresh reduction</b>	Clears (sets to zero) the counters recording retransmissions and out-of-order messages.
	<b>ip rsvp signalling refresh reduction</b>	Enables refresh reduction.

# show ip rtp header-compression

To display Real-Time Transport Protocol (RTP) statistics, use the **show ip rtp header-compression** command in privileged EXEC mode.

**show ip rtp header-compression** [*interface-type interface-number*] [**detail**]

<b>Syntax Description</b>	<i>interface-type</i>	(Optional) The interface type and number.
	<i>interface-number</i>	
	<b>detail</b>	(Optional) Displays details of each connection.

**Command Default** No default behavior or values

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.3	This command was introduced.
	12.1(5)T	The command output was modified to include information related to the Distributed Compressed Real-Time Transport Protocol (dCRTP) feature.
	12.3(11)T	The command output was modified to include information related to the Enhanced Compressed Real-Time Transport Protocol (ECRTP) feature.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** The **detail** keyword is not available with the **show ip rtp header-compression** command on a Route Switch Processor (RSP). However, the **detail** keyword is available with the **show ip rtp header-compression** command on a Versatile Interface Processor (VIP). Enter the **show ip rtp header-compression interface-type interface-number detail** command on a VIP to retrieve detailed information regarding RTP header compression on a specific interface.

**Examples** The following example displays statistics from ECRTP on an interface:

```
Router# show ip rtp header-compression

RTP/UDP/IP header compression statistics:
Interface Serial2/0 (compression on, IETF, ECRTP)
  Rcvd:  1473 total, 1452 compressed, 0 errors, 0 status msgs
        0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  1234 total, 1216 compressed, 0 status msgs, 379 not predicted
        41995 bytes saved, 24755 bytes sent
        2.69 efficiency improvement factor
```

```

Connect: 16 rx slots, 16 tx slots,
        6 misses, 0 collisions, 0 negative cache hits, 13 free contexts
        99% hit ratio, five minute miss rate 0 misses/sec, 0 max

```

Table 142 describes the significant fields shown in the display.

**Table 142** *show ip rtp header-compression Field Descriptions*

Field	Description
Interface	Type and number of interface.
Rcvd	Received statistics described in subsequent fields.
total	Number of packets received on the interface.
compressed	Number of packets received with compressed headers.
errors	Number of errors.
status msgs	Number of resynchronization messages received from the peer.
dropped	Number of packets dropped.
buffer copies	Number of buffers that were copied.
buffer failures	Number of failures in allocating buffers.
Sent	Sent statistics described in subsequent fields.
total	Number of packets sent on the interface.
compressed	Number of packets sent with compressed headers.
status msgs	Number of resynchronization messages sent from the peer.
not predicted	Number of packets taking a non-optimal path through the compressor.
bytes saved	Total savings in bytes due to compression.
bytes sent	Total bytes sent after compression.
efficiency improvement factor	Compression efficiency.
Connect	Connect statistics described in subsequent fields.
rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
misses	Total number of misses.
collisions	Total number of collisions.
negative cache hits	Total number of negative cache hits.
free contexts	Number of available context resources.
hit ratio	Percentage of received packets that have an associated context.
five minute miss rate	Number of new flows found per second averaged over the last five minutes.
max	Highest average rate of new flows reported.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip rtp compression-connections</b>	Specifies the total number of RTP header compression connections supported on the interface.
<b>ip rtp header-compression</b>	Enables RTP header compression.

# show ip tcp header-compression

To display Transmission Control Protocol (TCP)/IP header compression statistics, use the **show ip tcp header-compression** command in user EXEC or privileged EXEC mode.

**show ip tcp header-compression** [*interface-type interface-number*] [**detail**]

<b>Syntax Description</b>	<i>interface-type</i>	(Optional) The interface type and number.
	<i>interface-number</i>	
	<b>detail</b>	(Optional) Displays details of each connection. This keyword is available only in privileged EXEC mode.

<b>Command Modes</b>	User EXEC (>)
	Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
		10.0
	12.4	This command was integrated into Cisco Release 12.4 and its command output was modified to include additional compression statistics.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Examples** The following is sample output from the **show ip tcp header-compression** command:

```
Router# show ip tcp header-compression
```

```
TCP/IP header compression statistics:
Interface Serial2/0 (compression on, IETF)
  Rcvd:  53797 total, 53796 compressed, 0 errors, 0 status msgs
        0 dropped, 0 buffer copies, 0 buffer failures
  Sent:  53797 total, 53796 compressed, 0 status msgs, 0 not predicted
        1721848 bytes saved, 430032 bytes sent
        5.00 efficiency improvement factor
  Connect: 16 rx slots, 16 tx slots,
           1 misses, 0 collisions, 0 negative cache hits, 15 free contexts
           99% hit ratio, five minute miss rate 0 misses/sec, 0 max
```

Table 143 describes significant fields shown in the display.

**Table 143** *show ip tcp header-compression Field Descriptions*

Field	Description
Interface Serial2/0 (compression on, IETF)	Interface type and number on which compression is enabled.
Rcvd:	Received statistics described in subsequent fields.
total	Total number of TCP packets received on the interface.
compressed	Total number of TCP packets compressed.
errors	Number of packets received with errors.
status msgs	Number of resynchronization messages received from the peer.
dropped	Number of packets dropped due to invalid compression.
buffer copies	Number of packets that needed to be copied into bigger buffers for decompression.
buffer failures	Number of packets dropped due to a lack of buffers.
Sent:	Sent statistics described in subsequent fields.
total	Total number of TCP packets sent on the interface.
compressed	Total number of TCP packets compressed.
status msgs	Number of resynchronization messages sent from the peer.
not predicted	Number of packets taking a non-optimal path through the compressor.
bytes saved	Total savings in bytes due to compression.
bytes sent	Total bytes sent after compression.
efficiency improvement factor	Improvement in line efficiency because of TCP header compression.
Connect:	Connection statistics described in subsequent fields.
rx slots	Total number of receive slots.
tx slots	Total number of transmit slots.
misses	Indicates the number of times a match could not be made. If your output shows a large miss rate, then the number of allowable simultaneous compression connections may be too low.
collisions	Total number of collisions.
negative cache hits	Total number of negative cache hits.  <b>Note</b> This field is not relevant for TCP header compression; it is used for Real-Time Transport Protocol (RTP) header compression.
free contexts	Total number of free contexts.  <b>Note</b> Free contexts (also known as connections) are an indication of the number of resources that are available, but not currently in use, for TCP header compression.
hit ratio	Percentage of times the software found a match and was able to compress the header.

**Table 143** *show ip tcp header-compression Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Five minute miss rate in misses/sec	Calculates the miss rate over the previous five minutes for a longer-term (and more accurate) look at miss rate trends.
max	Maximum value of the previous field.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip tcp compression-connections</b>	Specifies the total number of TCP header compression connections that can exist on an interface

# show iphc-profile

To display configuration information for one or more IP Header Compression (IPHC) profiles, use the **show iphc-profile** command in privileged EXEC mode.

```
show iphc-profile [profile-name]
```

<b>Syntax Description</b>	<i>profile-name</i> (Optional) Name of an IPHC profile to display.				
<b>Command Default</b>	If you do not specify an IPHC profile name, all IPHC profiles are displayed.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>12.4(9)T</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	12.4(9)T	This command was introduced.
Release	Modification				
12.4(9)T	This command was introduced.				

## Usage Guidelines

### Information Included in Display

The display includes information such as the profile type, the type of header compression enabled, the number of contexts, the refresh period (for Real-Time Transport [RTP] header compression), whether feedback messages are disabled, and the interfaces to which the IPHC profile is attached.

### For More Information About IPHC Profiles

An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

## Examples

The following is sample output from the **show iphc-profile** command. In the output, information about two IPHC profiles, profile21 and profile20, is displayed.

```
Router# show iphc-profile

IPHC Profile "profile21"
Type: VJ
  Compressing: TCP
  Contexts    : TCP fixed at 150
  Controlled interfaces: (1)
                Se3/1
IPHC Profile "profile20"
Type: IETF
  Compressing: TCP NON-TCP (RTP)
  Contexts    : TCP 1 for each 0 kbits NON-TCP 1 for each 0 kbits
  Refresh     : NON-TCP and RTP every 5 seconds or 256 packets
  Controlled interfaces: (1)
                Se3/0
```

Table 144 describes the significant fields shown in the display.

**Table 144** *show iphc-profile Field Descriptions*

Field	Description
IPHC Profile	IPHC profile name.
Type	IPHC profile type, either VJ (for van-jacobson) or IETF.
Compressing	Type of header compression used, such as TCP, non-TCP, or RTP.
Contexts	Number of contexts and setting used to calculate the context number.
Controlled interfaces	Interfaces to which the IPHC profile is attached.

#### Related Commands

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.

# show lane qos database

To display the contents of a specific LAN Emulation (LANE) quality of service (QoS) database, use the **show lane qos database** command in privileged EXEC mode.

**show lane qos database** *name*

## Syntax Description

<i>name</i>	Specifies the QoS over LANE database to display.
-------------	--

## Command Default

This command is not configured by default.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.1(2)E	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Examples

This example shows how to display the contents of a QoS over LANE database for a Catalyst 5000 family ATM Module:

```
ATM# show lane qos database user1

QoS: user1
  configured cos values: 5-7, usage: 1
  dst nsap: 47.0091810000000061705B0C01.00E0B0951A40.0A
  pcr: 500000, mcr: 100000
```

This example shows how to display the contents of a QoS over LANE database for a Cisco 4500, 7200, or 7500 series router:

```
Router# show lane qos database user2

QoS: user2
  configured cos values: 5-7, usage: 1
  dst nsap: 47.0091810000000061705B0C01.00E0B0951A40.0A
  pcr: 500000, mcr: 100000
```

## Related Commands

Command	Description
<b>atm-address</b>	Specifies the QoS parameters associated with a particular ATM address.
<b>lane client qos</b>	Applies a QoS over LANE database to an interface.

<b>Command</b>	<b>Description</b>
<b>lane qos database</b>	Begins the process of building a QoS over LANE database.
<b>ubr+ cos</b>	Maps a CoS value to a UBR+ VCC.

# show mls qos

To display Multilayer Switching (MLS) quality of service (QoS) information, use the **show mls qos** command in privileged EXEC mode.

```
show mls qos [{arp | ipv6 | ip | ipx | last | mac | maps [map-type]} [interface interface-number |
slot slot | null interface-number | port-channel number | vlan vlan-id]]
```

Syntax Description	
<b>arp</b>	(Optional) Displays Address Resolution Protocol (ARP) information.
<b>ipv6</b>	(Optional) Displays IPv6 information.
<b>ip   ipx</b>	(Optional) Displays information about the Multilayer Switching (MLS) IP or Internetwork Packet Exchange (IPX) status.
<b>last</b>	(Optional) Displays information about the last packet-policing.
<b>mac</b>	(Optional) Displays information about the MAC address-based QoS status.
<b>maps</b>	(Optional) Displays information about the QoS mapping.
<i>map-type</i>	(Optional) Map type; see the “Usage Guidelines” section for valid values.
<i>interface</i>	(Optional) Interface type; possible valid values are <b>ethernet</b> , <b>fastethernet</b> , <b>gigabitethernet</b> , <b>tengigabitethernet</b> , <b>ge-wan</b> , <b>pos</b> , and <b>atm</b> .
<i>interface-number</i>	(Optional) Module and port number; see the “Usage Guidelines” section for valid values.
<b>slot slot</b>	(Optional) Specifies the slot number; displays the global and per-interface QoS enabled and disabled settings and the global QoS counters.
<b>null interface-number</b>	(Optional) Specifies the null interface; the valid value is <b>0</b> .
<b>port-channel number</b>	(Optional) Specifies the channel interface; valid values are a maximum of 64 values ranging from 1 to 282.
<b>vlan vlan-id</b>	(Optional) Specifies the VLAN ID; valid values are from 1 to 4094.

**Command Default** This command has no default settings.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17a)SX	This command was changed to add the <i>map-type</i> argument.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(18)SXE	This command was changed to add the <b>arp</b> and <b>ipv6</b> keywords on the Supervisor Engine 720 only.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines**

The **ge-wan**, **pos**, and **atm** keywords are not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 720.

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 1 to 13 and valid values for the port number are from 1 to 48.

The **port-channel number** values from 257 to 282 are supported on the Content Switching Module (CSM) and the Firewall Services Module (FWSM) only.

Valid values for *map-types* are defined as follows:

- **cos-dscp**—Specifies the ingress class of service (CoS)-to-differentiated services code point (DSCP) mapping to display; valid values are from 0 to 7.
- **dscp-cos**—Displays the egress DSCP-to-CoS mapping.
- **dscp-exp**—Displays the DSCP-to-EXP mapping on the Multiprotocol Label Switching (MPLS) domain ingress and egress; this keyword is not supported.
- **exp-dscp**—Displays the EXP-to-DSCP mapping on the MPLS domain ingress and egress; this keyword is not supported.
- **ip-prec-dscp value**—Specifies the ingress IP precedence-to-DSCP mapping to display; valid values are from 0 to 7.
- **policed-dscp**—Displays the policed DSCP values to marked-down DSCP values mapping.

The **dscp-exp** and **exp-dscp** options are supported on Cisco 7600 series routers that are configured with a Supervisor Engine 720 only.

**Examples**

This example shows how to display information about the last logged packet:

```
Router# show mls qos last

QoS engine last packet information:
  Packet was transmitted
  Output TOS/DSCP: 0xC0/48[unchanged]   Output COS: 0[unchanged]
  Aggregate policer index: 0(none)
  Microflow policer index: 0(none)
Router#
```

This example shows how to display the QoS-map settings:

```
Router# show mls qos maps

Policed-dscp map:
   0  1  2  3  4  5  6  7  8  9
-----
00:  00 01 02 03 04 05 06 07 08 09
10:  10 11 12 13 14 15 16 17 18 19
20:  20 21 22 23 24 25 26 27 28 29
30:  30 31 32 33 34 35 36 37 38 39
40:  40 41 42 43 44 45 46 47 48 49
50:  50 51 52 53 54 55 56 57 58 59
60:  60 61 62 63

Dscp-cos map:
   0  1  2  3  4  5  6  7  8  9
-----
```

```

00: 00 00 00 00 00 00 00 00 01 01
10: 01 01 01 01 01 01 02 02 02 02
20: 02 02 02 02 03 03 03 03 03 03
30: 03 03 04 04 04 04 04 04 04 04
40: 05 05 05 05 05 05 05 05 06 06
50: 06 06 06 06 06 06 07 07 07 07
60: 07 07 07 07

```

```

Cos-dscp map:
  cos:   0  1  2  3  4  5  6  7
-----
  dscp:  0  8 16 24 32 40 48 56

```

```

IpPrecedence-dscp map:
  ipprec: 0  1  2  3  4  5  6  7
-----
  dscp:   0  8 16 24 32 40 48 56

```

Router#

This example shows how to verify the configuration of DSCP-mutation mapping:

```
Router# show mls qos maps | begin DSCP mutation
```

```

DSCP mutation map mutmap1:                (dscp= d1d2)
d1 : d2 0  1  2  3  4  5  6  7  8  9
-----
  0 :   00 01 02 03 04 05 06 07 08 09
  1 :   10 11 12 13 14 15 16 17 18 19
  2 :   20 21 22 23 24 25 26 27 28 29
  3 :   08 31 32 33 34 35 36 37 38 39
  4 :   40 41 42 43 44 45 46 47 48 49
  5 :   50 51 52 53 54 55 56 57 58 59
  6 :   60 61 62 63

```

<...Output Truncated...>

Router#



#### Note

In the DSCP-mutation map displays, the marked-down DSCP values are shown in the body of the matrix. The first digit of the original DSCP value is in the column labeled d1, and the second digit is in the top row. In the example, DSCP 30 maps to DSCP 08.

This example shows how to display IPv6 information:

```
Router# show mls qos ipv6
```

```
QoS Summary [IPv6]:          (* - shared aggregates, Mod - switch module)
```

```

      Int Mod Dir  Class-map DSCP  Agg  Trust Fl  AgForward-By  AgPoliced-By
              Id          Id          Id          Id
-----
      All  7  -   Default    0    0*   No   0          189115356          0
Router#

```

## Supervisor Engine 720 Examples

This example shows the output from Cisco 7600 series routers that are configured with a Supervisor Engine 720.

This example shows how to display QoS information:

```
Router# show mls qos

QoS is enabled globally
Microflow policing is enabled globally
QoS ip packet dscp rewrite enabled globally

QoS is disabled on the following interfaces:
Fa6/3 Fa6/4

QoS DSCP-mutation map is enabled on the following interfaces:
Fa6/5
Vlan or Portchannel(Multi-Earl) policies supported: Yes
Egress policies supported: Yes

----- Module [5] -----
QoS global counters:
Total packets: 164
IP shortcut packets: 0
Packets dropped by policing: 0
IP packets with TOS changed by policing: 0
IP packets with COS changed by policing: 0
Non-IP packets with COS changed by policing: 0
MPLS packets with EXP changed by policing: 0
Router#
```

## Supervisor Engine 2 Examples

This example shows the output from Cisco 7600 series routers that are configured with a Supervisor Engine 2.

This example shows the output if you do not enter any keywords:

```
Router# show mls qos

QoS is enabled globally
Microflow QoS is enabled globally

QoS global counters:
Total packets: 217500
IP shortcut packets: 344
Packets dropped by policing: 344
IP packets with TOS changed by policing 18323
IP packets with COS changed by policing 1602
Non-IP packets with COS changed by policing 0
Router#
```

### Related Commands

Command	Description
<b>mls qos (global configuration mode)</b>	Enables the QoS functionality globally.
<b>mls qos (interface configuration mode)</b>	Enables the QoS functionality on an interface.

# show mls qos aggregate policer

To display information about the aggregate policer for multilayer switching (MLS) quality of service (QoS), use the **show mls qos aggregate policer** command in EXEC mode.

```
show mls qos aggregate policer [aggregate-name]
```

<b>Syntax Description</b>	<i>aggregate-name</i> (Optional) Name of the aggregate policer.
---------------------------	---

<b>Command Default</b>	This command has no default settings.
------------------------	---------------------------------------

<b>Command Modes</b>	EXEC
----------------------	------

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

<b>Usage Guidelines</b>	Aggregate policing works independently on each Distributed Forwarding Card (DFC)-equipped switching module and independently on the Policy Feature Card 2 (PFC2), which supports any non-DFC-equipped switching modules. Aggregate policing does not combine flow statistics from different DFC-equipped switching modules. You can display aggregate-policing statistics for each DFC-equipped switching module, the PFC2, and any non-DFC-equipped switching modules that are supported by the PFC2.
-------------------------	--

<b>Examples</b>	This example shows how to display information about the aggregate policer for MLS QoS:
-----------------	--

```
Router# show mls qos aggregate-policer

ag1 (undefined)
  AgId=0 [ pol1 pol2 ]
ag2 64000 64000 conform-action set-dscp-transmit 56 exceed-action drop
  AgId=0 [ pol3 ]
ag3 32000 32000 conform-action set-dscp-transmit 34 exceed-action drop
```

In the output, the following applies:

- The **AgId** parameter displays the hardware-policer ID and is nonzero if assigned.
- The policy maps using the policer, if any, are listed in the square brackets ([]).
- If there are no policies using the policer, no **AgId** line is displayed.
- If the policer is referred to in policy maps, but has not been defined, **[undefined]** is displayed.

■ show mls qos aggregate policer

Related Commands	Command	Description
	mls qos aggregate-policer	Defines a named aggregate policer for use in policy maps.

# show mls qos free-agram

To display the number of free aggregate RAM indexes on the switch processor and the Distributed Forwarding Cards (DFCs), use the **show mls qos free-agram** command in EXEC mode.

## show mls qos free-agram

**Syntax Description** This command has no arguments or keywords.

**Command Default** This command has no default settings.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(18)SXD	Support for this command was introduced on the Supervisor Engine 720 and the Supervisor Engine 2.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Examples** This example shows how to display the number of free aggregate RAM indexes on the switch processor and the DFCs:

```
Router# show mls qos free-agram

Total Number of Available AG RAM indices : 1023

Module [1]
Free AGIDs : 1023

Module [6]
Free AGIDs : 1023
```

# show mls qos mpls

To display an interface summary for Multiprotocol Label Switching (MPLS) quality of service (QoS) classes in policy maps, use the **show mls qos mpls** command in user EXEC or privileged EXEC mode.

**show mls qos mpls** [*interface-type interface-number* | **module slot**]

## Syntax Description

<i>interface-type</i>	(Optional) Interface type; valid values are the following:
<i>interface-number</i>	<ul style="list-style-type: none"> <li>• <b>fastethernet</b></li> <li>• <b>gigabitethernet</b></li> <li>• <b>tengigabitethernet</b>.</li> </ul> (Optional) Module and port number; see the “Usage Guidelines” section for valid values.
<b>module slot</b>	(Optional) Specifies the module slot number.

## Command Modes

User EXEC  
Privileged EXEC

## Command History

Release	Modification
12.2(17a)SX	This command was introduced on the Supervisor Engine 720.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.

## Usage Guidelines

This command is supported in PFC3BXL or PFC3B mode only.

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 1 to 13 and valid values for the port number are from 1 to 48.

## Examples

The following example shows an interface summary for MPLS QoS classes in policy maps:

```
Router# show mls qos mpls
```

```
QoS Summary [MPLS]: (* - shared aggregates, Mod - switch module)
Int Mod Dir Class-map DSCP Agg Trust Fl AgForward-By AgPoliced-By
Id Id
-----
Fa3/38 5 In exp2 0 1 dscp 0 378900 0
Fa3/41 5 In exp4 0 3 dscp 0 0 0
All 5 - Default 0 0* No 0 1191011240 0
```

Table 145 describes the significant fields shown in the display.

**Table 145** *show mls qos mpls Field Descriptions*

Field	Description
QoS Summary [MPLS]: (* - shared aggregates, Mod - switch module)	Shows if there are any shared aggregate policers, indicated by *, and the type of module.
Int Mod Dir Class-map DSCP Agg Trust Fl AgForward-By AgPoliced-By	Provides the column headings for the following lines in the display. These include interface name and number, module number, direction, class-map name, and DSCP value.
Fa3/38 5 In exp2 0 1 dscp 0 378900 0	Provides the following information: <ul style="list-style-type: none"> <li>• Fa3/38—Interface name and number.</li> <li>• 5—Module number in the chassis.</li> <li>• In—Direction of the policy applied (In = ingress).</li> <li>• exp2—Class map configured in the policy.</li> <li>• 0—Differentiated Services Code Point (DSCP) value.</li> <li>• 1—Policer ID assigned to that class map.</li> <li>• dscp—Trust value configured on the port. In this example, the value is trusting on DSCP.</li> <li>• 0—The flow ID if the flow policer is configured.</li> <li>• 378900—The aggregate forwarded bytes, meaning the forwarded traffic.</li> <li>• 0—The aggregate policed bytes, meaning this traffic has been subjected to policing.</li> </ul>
All 5 - Default 0 0* No 0 1191011240 0	The total of the preceding lines including the aggregate forwarded and aggregate policed bytes.

#### Related Commands

Command	Description
<b>mls qos exp-mutation</b>	Attaches an egress-EXP mutation map to the interface.
<b>mls qos map exp-dscp</b>	Defines the ingress EXP value to the internal DSCP map.
<b>mls qos map exp-mutation</b>	Maps a packet's EXP to a new EXP value.

# show mls qos protocol

To display protocol pass-through information, use the **show mls qos protocol** command in EXEC mode.

```
show mls qos protocol [module number]
```

<b>Syntax Description</b>	<b>module number</b> (Optional) Specifies the module number.
---------------------------	--

<b>Command Default</b>	This command has no default settings.
------------------------	---------------------------------------

<b>Command Modes</b>	EXEC
----------------------	------

Command History	Release	Modification
	12.2(17a)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(18)SXE	Support for this command was introduced on the Supervisor Engine 2 but does not support Address Resolution Protocol (ARP), Integrated Intermediate System-to-Intermediate System (IS-IS), or Enhanced Interior Gateway Routing Protocol (EIGRP).  Support for neighbor discovery protocol packets was added on the Supervisor Engine 720 only.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Examples

This example shows how to display protocol pass-through information:

```
Router# show mls qos protocol

RIP : Passthru mode
OSPF : Passthru mode
ND : Policing mode Cir = 32000 Burst = 1000
----- Module [5] -----
Routing protocol RIP is using AgId 0*
Routing protocol OSPF is using AgId 0*
Routing protocol ND is using AgId 1
----- Module [6] -----
Routing protocol RIP is using AgId 0*
Routing protocol OSPF is using AgId 0*
```

Related Commands	Command	Description
	<b>mls qos protocol</b>	Defines the routing-protocol packet policing.

# show mls qos statistics-export info

To display information about the multilayer switching (MLS)-statistics data-export status and configuration, use the **show mls qos statistics-export info** command in EXEC mode

## show mls qos statistics-export info

**Syntax Description** This command has no keywords or arguments.

**Command Default** This command has no default settings.

**Command Modes** EXEC

Command History	Release	Modification
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** Quality of service (QoS)-statistics data export is not supported on Optical Service Module (OSM) interfaces.

**Examples** This example shows how to display information about the MLS-statistics data-export status and configuration:

```
Router# show mls qos statistics-export info

QoS Statistics Data Export Status and Configuration information
-----
Export Status : enabled
Export Interval : 250 seconds
Export Delimiter : @
Export Destination : 172.20.52.3, UDP port 514 Facility local6, Severity debug

QoS Statistics Data Export is enabled on following ports:
-----
FastEthernet5/24

QoS Statistics Data export is enabled on following shared aggregate policers:
-----
aggr1M

QoS Statistics Data Export is enabled on following class-maps:
-----
class3
```

Related Commands	Command	Description
	<b>mls qos statistics-export (global configuration)</b>	Enables QoS-statistics data export globally.
	<b>mls qos statistics-export (interface configuration)</b>	Enables per-port QoS-statistics data export.
	<b>mls qos statistics-export aggregate-policer</b>	Enables QoS-statistics data export on the named aggregate policer.
	<b>mls qos statistics-export class-map</b>	Enables QoS-statistics data export for a class map.
	<b>mls qos statistics-export delimiter</b>	Sets the QoS-statistics data-export field delimiter.
	<b>mls qos statistics-export destination</b>	Configures the QoS-statistics data-export destination host and UDP port number.
	<b>mls qos statistics-export interval</b>	Specifies how often a port and/or aggregate-policer QoS-statistics data is read and exported.

# show platform qos policy-map

To display the type and number of policy maps that are configured on the router, use the **show platform qos policy-map** command in privileged EXEC mode.

**show platform qos policy-map**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.2(18)SXE	This command was introduced for Cisco Catalyst 6500 series switches and Cisco 7600 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

## Usage Guidelines

On Cisco Catalyst 6500 series switches and Cisco 7600 series routers, you cannot attach a quality of service (QoS) policy map with **match input vlan** to an interface if you have already attached a QoS policy map to a VLAN interface (a logical interface that has been created with the **interface vlan** command). If you attempt to use both types of service policies, you must remove both types of service policies before you can add the policy maps.

The **show platform qos policy-map** command shows whether the router is currently configured for **interface vlan** and **match input vlan** service policies. It also shows the number of policy maps for each type.

## Examples

The following example shows a router that has service policies configured only on VLAN interfaces:

```
Router# show platform qos policy-map

service policy configured on int vlan: TRUE
# of int vlan service policy instances: 3
match input vlan service policy configured: FALSE
# of match input vlan service policy instances: 0
```

The following example shows a router that has service policies configured on VLAN interfaces and that has a service policy configured with **match input vlan**. In this configuration, you must remove all service policies from their interfaces, and then configure only one type or another.

```
Router# show platform qos policy-map

service policy configured on int vlan: TRUE
# of int vlan service policy instances: 1
match input vlan service policy configured: TRUE
# of match input vlan service policy instances: 1
```

Table 146 describes each field shown in the **show platform qos policy-map** command:

**Table 146** *show platform qos policy-map Field Descriptions*

Field	Description
service policy configured on int vlan	Indicates whether any QoS policy maps are configured on VLAN interfaces.
# of int vlan service policy instances	Number of QoS policy maps that are configured on VLAN interfaces.
match input vlan service policy configured	Indicates whether any QoS policy maps that use the <b>match input vlan</b> command are configured on interfaces.
# of match input vlan service policy instances	Number of QoS policy maps using the <b>match input vlan</b> command that are configured on interfaces.

#### Related Commands

Command	Description
<b>match input vlan</b>	Configures a class map to match incoming packets that have a specific virtual local area network (VLAN) ID.
<b>match qos-group</b>	Identifies a specified QoS group value as a match criterion.
<b>mls qos trust</b>	Sets the trusted state of an interface, to determine which incoming QoS field on a packet, if any, should be preserved.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>service-policy</b>	Attaches a policy map to an input interface or VC, or an output interface or VC, to be used as the service policy for that interface or VC.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show platform qos policy-map</b>	Displays the type and number of policy maps that are configured on the router.

# show policy-map

To display the configuration of all classes for a specified service policy map or of all classes for all existing policy maps, use the **show policy-map** command in user EXEC or privileged EXEC mode.

**show policy-map** [*policy-map*]

## Syntax Description

*policy-map* (Optional) Name of the service policy map whose complete configuration is to be displayed. The name can be a maximum of 40 characters.

## Command Default

All existing policy map configurations are displayed.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was incorporated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was incorporated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was incorporated into Cisco IOS Release 12.1(1)E.
12.2(4)T	This command was modified for two-rate traffic policing to display burst parameters and associated actions.
12.2(8)T	The command was modified for the Policer Enhancement—Multiple Actions feature and the WRED—Explicit Congestion Notification (ECN) feature.
12.2(13)T	The following modifications were made: <ul style="list-style-type: none"> <li>The output was modified for the Percentage-Based Policing and Shaping feature.</li> <li>This command was modified as part of the Modular QoS CLI (MQC) Unconditional Packet Discard feature. Traffic classes can now be configured to discard packets belonging to a specified class.</li> <li>This command was modified for the Enhanced Packet Marking feature. A mapping table (table map) can now be used to convert and propagate packet-marking values.</li> </ul>
12.2(15)T	This command was modified to support display of Frame Relay voice-adaptive traffic-shaping information.
12.0(28)S	The output of this command was modified for the QoS: Percentage-Based Policing feature to display the committed (conform) burst (bc) and excess (peak) burst (be) sizes in milliseconds (ms).
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.

Release	Modification
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB, and the command was modified to display information about Layer 2 Tunnel Protocol Version 3 (L2TPv3) tunnel marking.
12.2(31)SB2	This command was enhanced to display bandwidth-remaining ratios configured on traffic classes and ATM overhead accounting, and was implemented on the Cisco 10000 series router for the PRE3.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRC	Support for the Cisco 7600 series router was added.
12.4(15)T2	This command was modified to display information about Generic Routing Encapsulation (GRE) tunnel marking.  <b>Note</b> For this release, GRE-tunnel marking is supported on the Cisco MGX Route Processor Module (RPM-XF) platform <i>only</i> .
12.2(33)SB	This command was modified to display information about GRE-tunnel marking, and support for the Cisco 7300 series router was added. This command's output was modified on the Cisco 10000 series router for the PRE3 and PRE4.
Cisco IOS XE 2.1	This command integrated into Cisco IOS XE Release 2.1 and was implemented on the Cisco ASR 1000 series router.

### Usage Guidelines

The **show policy-map** command displays the configuration of a policy map created using the **policy-map** command. You can use the **show policy-map** command to display all class configurations comprising any existing service policy map, whether or not that policy map has been attached to an interface. The command displays:

- ECN marking information only if ECN is enabled on the interface.
- Bandwidth-remaining ratio configuration and statistical information, if configured and used to determine the amount of unused (excess) bandwidth to allocate to a class queue during periods of congestion.

### Cisco 10000 Series Router Usage Guidelines

In Cisco IOS Release 12.2(33)SB, the output of the **show policy-map** command is slightly different from previous releases when the policy is an hierarchical policy.

For example, in Cisco IOS Release 12.2(33)SB output similar to the following displays when you specify a hierarchical policy in the **show policy-map** command:

```
Router# show policy-map Bronze
policy-map bronze
  class class-default
    shape average 34386000
    service-policy Child
```

In Cisco IOS Release 12.2(31)SB, output similar to the following displays when you specify a hierarchical policy in the **show policy-map** command:

```
Router# show policy-map Gold
policy-map Gold
  Class class-default
    Average Rate Traffic Shaping
    cir 34386000 (bps)
    service-policy Child2
```

In Cisco IOS Release 12.2(33)SB, the output from the **show policy-map** command displays police actions on separate lines as shown in the following sample output:

```
Router# show policy-map Premium
Policy Map Premium
Class P1
  priority
  police percent 50 25 ms 0 ms
  conform-action transmit
  exceed-action transmit
  violate-action drop
```

In Cisco IOS Release 12.2(31)SB, the output from the **show policy-map** command displays police actions on one line as shown in the following sample output:

```
Router# show policy-map Premium
Policy Map Premium
Class P2
  priority
  police percent 50 25 ms 0 ms conform-action transmit exceed-action transmit violate-
action drop
```

## Examples

This section provides sample output from typical **show policy-map** commands. Depending upon the interface or platform in use and the options enabled (for example, Weighted Fair Queueing [WFQ]), the output you see may vary slightly from the ones shown below.

- [Weighted Fair Queueing: Example, page 962](#)
- [Frame Relay Voice-Adaptive Traffic-Shaping: Example, page 964](#)
- [Traffic Policing: Example, page 965](#)
- [Two-Rate Traffic Policing: Example, page 965](#)
- [Multiple Traffic Policing Actions: Example, page 966](#)
- [Explicit Congestion Notification: Example, page 967](#)
- [Modular QoS CLI \(MQC\) Unconditional Packet Discard: Example, page 968](#)
- [Percentage-Based Policing and Shaping: Example, page 968](#)
- [Enhanced Packet Marking: Example, page 970](#)
- [Bandwidth-Remaining Ratio: Example, page 970](#)
- [ATM Overhead Accounting: Example, page 971](#)
- [Tunnel Marking: Example, page 971](#)

### Weighted Fair Queueing: Example

The following example displays the contents of the service policy map called po1. In this example, WFQ is enabled.

```
Router# show policy-map po1

Policy Map po1
  Weighted Fair Queueing
    Class class1
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 937 (kbps) Max thresh 64 (packets)
```

```

Class class3
  Bandwidth 937 (kbps) Max thresh 64 (packets)
Class class4
  Bandwidth 937 (kbps) Max thresh 64 (packets)
Class class5
  Bandwidth 937 (kbps) Max thresh 64 (packets)
Class class6
  Bandwidth 937 (kbps) Max thresh 64 (packets)
Class class7
  Bandwidth 937 (kbps) Max thresh 64 (packets)
Class class8
  Bandwidth 937 (kbps) Max thresh 64 (packets)

```

The following example displays the contents of all policy maps on the router. Again, WFQ is enabled.

```

Router# show policy-map

Policy Map poH1
  Weighted Fair Queueing
    Class class1
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class3
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class4
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class5
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class6
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class7
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class8
      Bandwidth 937 (kbps) Max thresh 64 (packets)
Policy Map policy2
  Weighted Fair Queueing
    Class class1
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class3
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class4
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class5
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class6
      Bandwidth 300 (kbps) Max thresh 64 (packets)

```

Table 147 describes the significant fields shown in the display.

**Table 147** *show policy-map Field Descriptions—Configured for WFQ*

Field	Description
Policy Map	Policy map name.
Class	Class name.
Bandwidth	Amount of bandwidth in kbps allocated to class.
Max thresh	Maximum threshold in number of packets.

### Frame Relay Voice-Adaptive Traffic-Shaping: Example

The following sample output for the **show-policy map** command indicates that Frame Relay voice-adaptive traffic-shaping is configured in the class-default class in the policy map “MQC-SHAPE-LLQ1” and that the deactivation timer is set to 30 seconds.

```
Router# show policy-map

Policy Map VSD1
  Class VOICE1
    Strict Priority
    Bandwidth 10 (kbps) Burst 250 (Bytes)
  Class SIGNALS1
    Bandwidth 8 (kbps) Max Threshold 64 (packets)
  Class DATA1
    Bandwidth 15 (kbps) Max Threshold 64 (packets)

Policy Map MQC-SHAPE-LLQ1
  Class class-default
    Traffic Shaping
      Average Rate Traffic Shaping
        CIR 63000 (bps) Max. Buffers Limit 1000 (Packets)
        Adapt to 8000 (bps)
        Voice Adapt Deactivation Timer 30 Sec
  service-policy VSD1
```

Table 148 describes the significant fields shown in the display.

**Table 148** *show policy-map Field Descriptions—Configured for Frame Relay Voice-Adaptive Traffic-Shaping*

Field	Description
Strict Priority	Indicates the queueing priority assigned to the traffic in this class.
Burst	Specifies the traffic burst size in bytes.
Traffic Shaping	Indicates that Traffic Shaping is enabled.
Average Rate Traffic Shaping	Indicates the type of Traffic Shaping enabled. Choices are Peak Rate Traffic Shaping or Average Rate Traffic Shaping.
CIR	Committed Information Rate (CIR) in bps.
Max. Buffers Limit	Maximum memory buffer size in packets.

**Table 148** *show policy-map Field Descriptions—Configured for Frame Relay Voice-Adaptive Traffic-Shaping (continued)*

Field	Description
Adapt to	Traffic rate when shaping is active.
Voice Adapt Deactivation Timer	Indicates that Frame Relay voice-adaptive traffic-shaping is configured, and that the deactivation timer is set to 30 seconds.
service-policy	Name of the service policy configured in the policy map “MQC-SHAPE-LLQ1”.

**Traffic Policing: Example**

The following is sample output from the **show policy-map** command. This sample output displays the contents of a policy map called “policy1.” In policy 1, traffic policing on the basis of a committed information rate (CIR) of 20 percent has been configured, and the bc and be have been specified in milliseconds. As part of the traffic policing configuration, optional conform, exceed, and violate actions have been specified.

```
Router# show policy-map policy1

Policy Map policy1
Class class1
  police cir percent 20 bc 300 ms pir percent 40 be 400 ms
    conform-action transmit
    exceed-action drop
    violate-action drop
```

Table 149 describes the significant fields shown in the display.

**Table 149** *show policy-map Field Descriptions—Configured for Traffic Policing*

Field	Description
Policy Map	Name of policy map displayed.
Class	Name of the class configured in the policy map displayed.
police	Indicates that traffic policing on the basis of specified percentage of bandwidth has been enabled. The committed burst (Bc) and excess burst (Be) sizes have been specified in milliseconds (ms), and optional conform, exceed, and violate actions have been specified.

**Two-Rate Traffic Policing: Example**

The following is sample output from the **show policy-map** command when two-rate traffic policing has been configured. As shown below, two-rate traffic policing has been configured for a class called “police.” In turn, the class called police has been configured in a policy map called “policy1.” Two-rate traffic policing has been configured to limit traffic to an average committed rate of 500 kbps and a peak rate of 1 Mbps.

```
Router(config)# class-map police
Router(config-cmap)# match access-group 101
Router(config-cmap)# policy-map policy1
Router(config-pmap)# class police
Router(config-pmap-c)# police cir 500000 bc 10000 pir 1000000 be 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Router(config-pmap-c)# interface serial13/0
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

```
Router(config)# interface serial13/0
Router(config-if)# service-policy output policy1
Router(config-if)# end
```

The following sample output shows the contents of the policy map called “policy1”:

```
Router# show policy-map policy1

Policy Map policy1
Class police
  police cir 500000 conform-burst 10000 pir 1000000 peak-burst 10000 conform-action
  transmit exceed-action set-prec-transmit 2 violate-action drop
```

Traffic marked as conforming to the average committed rate (500 kbps) will be sent as is. Traffic marked as exceeding 500 kbps, but not exceeding 1 Mbps, will be marked with IP Precedence 2 and then sent. All traffic exceeding 1 Mbps will be dropped. The burst parameters are set to 10000 bytes.

Table 150 describes the significant fields shown in the display.

**Table 150** show policy-map Field Descriptions—Configured for Two-Rate Traffic Policing

Field	Description
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified CIR, conform burst size (bc), peak information rate (PIR), and peak burst (BE) size used for marking packets.
conform-action	Displays the action to be taken on packets conforming to a specified rate.
exceed-action	Displays the action to be taken on packets exceeding a specified rate.
violate-action	Displays the action to be taken on packets violating a specified rate.

### Multiple Traffic Policing Actions: Example

The following is sample output from the **show policy-map** command when the Policer Enhancement—Multiple Actions feature has been configured. The following sample output from the **show policy-map** command displays the configuration for a service policy called “police.” In this service policy, traffic policing has been configured to allow multiple actions for packets marked as conforming to, exceeding, or violating the CIR or the PIR shown in the example.

```
Router# show policy-map police

Policy Map police
Class class-default
  police cir 1000000 bc 31250 pir 2000000 be 31250
    conform-action transmit
    exceed-action set-prec-transmit 4
    exceed-action set-frde-transmit

    violate-action set-prec-transmit 2
    violate-action set-frde-transmit
```

Packets conforming to the specified CIR (1000000 bps) are marked as conforming packets. These are transmitted unaltered.

Packets exceeding the specified CIR (but not the specified PIR, 2000000 bps) are marked as exceeding packets. For these packets, the IP Precedence level is set to 4, the discard eligibility (DE) bit is set to 1, and the packet is transmitted.

Packets exceeding the specified PIR are marked as violating packets. For these packets, the IP Precedence level is set to 2, the DE bit is set to 1, and the packet is transmitted.

**Note**

Actions are specified by using the *action* argument of the **police** command. For more information about the available actions, see the **police** command reference page.

Table 151 describes the significant fields shown in the display.

**Table 151** *show policy-map Field Descriptions—Configured for Multiple Traffic Policing Actions*

Field	Description
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified CIR, BC, PIR, and BE used for marking packets.
conform-action	Displays the one or more actions to be taken on packets conforming to a specified rate.
exceed-action	Displays the one or more actions to be taken on packets exceeding a specified rate.
violate-action	Displays the one or more actions to be taken on packets violating a specified rate.

**Explicit Congestion Notification: Example**

The following is sample output from the **show policy-map** command when the WRED—Explicit Congestion Notification (ECN) feature has been configured. The words “explicit congestion notification” (along with the ECN marking information) included in the output indicate that ECN has been enabled.

```
Router# show policy-map

Policy Map poll
  Class class-default
    Weighted Fair Queueing
      Bandwidth 70 (%)
      exponential weight 9
      explicit congestion notification
      class min-threshold max-threshold mark-probability
      -----
      -----
      0          -          -          1/10
      1          -          -          1/10
      2          -          -          1/10
      3          -          -          1/10
      4          -          -          1/10
      5          -          -          1/10
      6          -          -          1/10
      7          -          -          1/10
      rsvp      -          -          1/10
```

Table 152 describes the significant fields shown in the display.

**Table 152** *show policy-map Field Descriptions—Configured for ECN*

Field	Description
explicit congestion notification	Indication that Explicit Congestion Notification is enabled.
class	IP precedence value.
min-threshold	Minimum threshold. Minimum WRED threshold in number of packets.
max-threshold	Maximum threshold. Maximum WRED threshold in number of packets.
mark-probability	Fraction of packets dropped when the average queue depth is at the maximum threshold.

#### **Modular QoS CLI (MQC) Unconditional Packet Discard: Example**

The following example displays the contents of the policy map called “policy1.” All the packets belonging to the class called “c1” are discarded.

```
Router# show policy-map policy1

Policy Map policy1
  Class c1
    drop
```

Table 153 describes the significant fields shown in the display.

**Table 153** *show policy-map Field Descriptions—Configured for MQC Unconditional Packet Discard*

Field	Description
Policy Map	Name of the policy map being displayed.
Class	Name of the class in the policy map being displayed.
drop	Indicates that the packet discarding action for all the packets belonging to the specified class has been configured.

#### **Percentage-Based Policing and Shaping: Example**

The following example displays the contents of two service policy maps—one called “policy1” and one called “policy2.” In policy1, traffic policing based on a CIR of 50 percent has been configured. In policy 2, traffic shaping based on an average rate of 35 percent has been configured.

```
Router# show policy-map policy1

Policy Map policy1
  class class1
    police cir percent 50

Router# show policy-map policy2

Policy Map policy2
  class class2
    shape average percent 35
```

The following example displays the contents of the service policy map called “po1”:

```
Router# show policy-map po1

Policy Map po1
  Weighted Fair Queueing
    Class class1
  Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class3
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class4
      Bandwidth 937 (kbps) Max thresh 64 (packets)
```

The following example displays the contents of all policy maps on the router:

```
Router# show policy-map

Policy Map poH1
  Weighted Fair Queueing
    Class class1
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class3
      Bandwidth 937 (kbps) Max thresh 64 (packets)
    Class class4
      Bandwidth 937 (kbps) Max thresh 64 (packets)
Policy Map policy2
  Weighted Fair Queueing
    Class class1
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class2
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class3
      Bandwidth 300 (kbps) Max thresh 64 (packets)
    Class class4
      Bandwidth 300 (kbps) Max thresh 64 (packets)
```

Table 154 describes the significant fields shown in the display.

**Table 154** *show policy-map Field Descriptions—Configured for Percentage-Based Policing and Shaping*

Field	Description
Policy Map	Name of policy map displayed.
Weighted Fair Queueing	Indicates that weighted fair queueing (WFQ) has been enabled.
Class	Name of class configured in policy map displayed.
Bandwidth	Bandwidth, in kbps, configured for this class.
Max threshold	Maximum threshold. Maximum WRED threshold in number of packets.

**Enhanced Packet Marking: Example**

The following sample output from the **show policy-map** command displays the configuration for policy maps called “policy1” and “policy2”.

In “policy1”, a table map called “table-map-cos1” has been configured to determine the precedence based on the class of service (CoS) value. Policy map “policy 1” converts and propagates the packet markings defined in the table map called “table-map-cos1”.

The following sample output from the **show policy-map** command displays the configuration for service polices called “policy1” and “policy2”. In “policy1”, a table map called “table-map1” has been configured to determine the precedence according to the CoS value. In “policy2”, a table map called “table-map2” has been configured to determine the CoS value according to the precedence value.

```
Router# show policy-map policy1

Policy Map policy1
Class class-default
  set precedence cos table table-map1

Router# show policy-map policy2

Policy Map policy2
Class class-default
  set cos precedence table table-map2
```

Table 155 describes the fields shown in the display.

**Table 155** *show policy-map Field Descriptions—Configured for Enhanced Packet Marking*

Field	Description
Policy Map	Name of the policy map being displayed.
Class	Name of the class in the policy map being displayed.
set precedence cos table table-map1 or set cos precedence table table-map2	Name of the set command used to set the specified value.  For instance, set precedence cos table-map1 indicates that a table map called “table-map1” has been configured to set the precedence value on the basis of the values defined in the table map.  Alternately, set cos table table-map2 indicates that a table map called “table-map2” has been configured to set the CoS value on the basis of the values defined in the table map.

**Bandwidth-Remaining Ratio: Example**

The following sample output for the **show policy-map** command indicates that the class-default class of the policy map named vlan10\_policy has a bandwidth-remaining ratio of 10. When congestion occurs, the scheduler allocates class-default traffic 10 times the unused bandwidth allocated in relation to other subinterfaces.

```
Router# show policy-map vlan10_policy

Policy Map vlan10_policy
Class class-default
  Average Rate Traffic Shaping
  cir 1000000 (bps)
  bandwidth remaining ratio 10
  service-policy child_policy
```

Table 156 describes the fields shown in the display.

**Table 156** *show policy-map Field Descriptions—Configured for Bandwidth-Remaining Ratio*

Field	Description
Policy Map	Name of the policy map being displayed.
Class	Name of the class in the policy map being displayed.
Average Rate Traffic Shaping	Indicates that Average Rate Traffic Shaping is configured.
cir	Committed information rate (CIR) used to shape traffic.
bandwidth remaining ratio	Indicates the ratio used to allocate excess bandwidth.

#### ATM Overhead Accounting: Example

The following sample output for the **show policy-map** command indicates that ATM overhead accounting is enabled for the class-default class. The BRAS-DSLAM encapsulation is dot1q and the subscriber encapsulation is snap-rbe for the AAL5 service.

```
Policy Map unit-test
  Class class-default
    Average Rate Traffic Shaping
      cir 10% account dot1q aal5 snap-rbe
```

Table 157 describes the significant fields shown in the display.

**Table 157** *show policy-map Field Descriptions—Configured for ATM Overhead Accounting*

Field	Description
Average Rate	Committed burst (Bc) is the maximum number of bits sent out in each interval.
cir 10%	Committed information rate (CIR) is 10 percent of the available interface bandwidth.
dot1q	BRAS-DSLAM encapsulation is 802.1Q VLAN.
aal5	DSLAM-CPE encapsulation type is based on the ATM Adaptation Layer 5 service. AAL5 supports connection-oriented variable bit rate (VBR) services.
snap-rbe	Subscriber encapsulation type.

#### Tunnel Marking: Example

In this sample output of the **show policy-map** command, the character string “ip precedence tunnel 4” indicates that tunnel marking (either L2TPv3 or GRE) has been configured to set the IP precedence value to 4 in the header of a tunneled packet.



#### Note

As of Cisco IOS Release 12.4(15)T2, GRE-tunnel marking is supported on the RPM-XF platform *only*.

```
Router# show policy-map

Policy Map TUNNEL_MARKING
  Class MATCH_FRDE
    set ip precedence tunnel 4
```

Table 158 describes the fields shown in the display.

**Table 158** *show policy-map Field Descriptions—Configured for Tunnel Marking*

Field	Description
Policy Map	Name of the policy map being displayed.
Class	Name of the class in the policy map being displayed.
set ip precedence tunnel	Indicates that tunnel marking has been configured.

#### Related Commands

Command	Description
<b>bandwidth</b>	Specifies or modifies the bandwidth allocated for a class belonging to a policy map, and enables ATM overhead accounting.
<b>bandwidth remaining ratio</b>	Specifies a bandwidth-remaining ratio for class queues and subinterface-level queues to determine the amount of unused (excess) bandwidth to allocate to the queue during congestion.
<b>class (policy map)</b>	Specifies the name of the class whose policy you want to create or change, and the default class (commonly known as the class-default class) before you configure its policy.
<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
<b>drop</b>	Configures a traffic class to discard packets belonging to a specific class.
<b>police</b>	Configures traffic policing.
<b>police (two rates)</b>	Configures traffic policing using two rates, the CIR and the PIR.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>random-detect ecn</b>	Enables ECN.
<b>shape</b>	Shapes traffic to the indicated bit rate according to the algorithm specified, and enables ATM overhead accounting.
<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.
<b>show running-config</b>	Displays the current configuration of the router. If configured, the command output includes information about ATM overhead accounting.
<b>show table-map</b>	Displays the configuration of a specified table map or of all table maps.
<b>table-map (value mapping)</b>	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

# show policy-map class

To display the configuration for the specified class of the specified policy map, use the **show policy-map class** command in EXEC mode.

```
show policy-map policy-map class class-name
```

## Syntax Description

<i>policy-map</i>	The name of a policy map that contains the class configuration to be displayed.
<i>class-name</i>	The name of the class whose configuration is to be displayed.

## Command Modes

EXEC

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

You can use the **show policy-map class** command to display any single class configuration for any service policy map, whether or not the specified service policy map has been attached to an interface.

## Examples

The following example displays configurations for the class called class7 that belongs to the policy map called po1:

```
Router# show policy-map po1 class class7

Class class7
  Bandwidth 937 (kbps) Max Thresh 64 (packets)
```

## Related Commands

Command	Description
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.

# show policy-map control-plane

To display the configuration and statistics for a traffic class or all traffic classes in the policy maps attached to the control plane for aggregate or distributed control plane services, use the **show policy-map control-plane** command in privileged EXEC mode.

## Cisco 3660, 3800, 7200, 7400, and 7500 Series Routers

```
show policy-map control-plane [type policy-type] [all | slot slot-number] [host | transit | cef-exception] [input [class class-name] | output [class class-name]]
```

## Cisco 7600 Series Routers

```
show policy-map control-plane [all] [input [class class-name] | output [class class-name]]
```

Syntax Description		
<b>type</b> <i>policy-type</i>	(Optional)	Specifies policy-map type for which you want statistics (for example, port-filter or queue-threshold).
<b>all</b>	(Optional)	Displays all QoS control plane policies used in aggregate and distributed control plane (CP) services.
<b>slot</b> <i>slot-number</i>	(Optional)	Displays information about the quality of service (QoS) policy used to perform distributed CP services on the specified line card.
<b>host</b>	(Optional)	Displays policy-map and class-map statistics for the host subinterface.
<b>transit</b>	(Optional)	Displays policy-map and class-map statistics for the transit subinterface.
<b>cef-exception</b>	(Optional)	Displays policy-map and class-map statistics for the Cef-exception subinterface.
<b>input</b>	(Optional)	Displays statistics for the attached input policy.
<b>output</b>	(Optional)	Displays statistics for the attached output policy.
	<b>Note</b>	The <b>output</b> keyword is supported only in Cisco IOS Release 12.3(4)T and later Cisco IOS 12.3T releases.
<b>class</b> <i>class-name</i>	(Optional)	Name of the class whose configuration and statistics are to be displayed.

**Command Default** Information displays for all classes of the policy map of the control plane.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(18)S	This command was introduced.
	12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T, and support for the <b>output</b> keyword was added.
	12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.

Release	Modification
12.2(18)SXD1	This command was integrated into Cisco IOS Release 12.2(18)SXD1.
12.0(30)S	The <b>slot</b> <i>slot-number</i> parameter was added to support distributed CP services.
12.4(4)T	Support was added for the <b>type</b> <i>policy-type</i> keyword and argument combination and for the <b>host</b> , <b>transit</b> , and <b>cef-exception</b> keywords.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

### Usage Guidelines

The **show policy-map control-plane** command displays information for aggregate and distributed control-plane policing services that manage the number or rate of control-plane (CP) packets sent to the process level of the route processor.

Information for distributed control-plane service is displayed for a specified line card. Distributed CP services are performed on a line card's distributed switch engine and manage CP traffic sent from all interfaces on the line card to the route processor, where aggregate CP services (for CP packets received from all line cards on the router) are performed.

### Examples

The following example shows that the policy map TEST is associated with the control plane. This policy map polices traffic that matches the class map TEST, while allowing all other traffic (that matches the class map called "class-default") to go through as is.

```
Router# show policy-map control-plane

Control Plane

Service-policy input:TEST

Class-map:TEST (match-all)
  20 packets, 11280 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match:access-group 101
  police:
    8000 bps, 1500 limit, 1500 extended limit
    conformed 15 packets, 6210 bytes; action:transmit
    exceeded 5 packets, 5070 bytes; action:drop
    violated 0 packets, 0 bytes; action:drop
    conformed 0 bps, exceed 0 bps, violate 0 bps

Class-map:class-default (match-any)
  105325 packets, 11415151 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match:any
```

Table 159 describes the significant fields shown in the display.

**Table 159** show policy-map control-plane Field Descriptions

Field	Description
<b>Fields Associated with Classes or Service Policies</b>	
Service-policy input	Name of the input service policy that is applied to the control plane. (This field will also show the output service policy, if configured.)

**Table 159** *show policy-map control-plane Field Descriptions (continued)*

Field	Description
Class-map	Class of traffic being displayed. Traffic is displayed for each configured class. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
offered rate	Rate, in kbps, at which packets are coming into the class.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria for the specified class of traffic.  For more information about the variety of match criteria options available, see the “Configuring the Modular Quality of Service Command-Line Interface” chapter in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
<b>Fields Associated with Traffic Policing</b>	
police	Indicates that the <b>police</b> command has been configured to enable traffic policing.
conformed	Displays the action to be taken on packets that conform to a specified rate. Displays the number of packets and bytes on which the action was taken.
exceeded	Displays the action to be taken on packets that exceed a specified rate. Displays the number of packets and bytes on which the action was taken.
violated	Displays the action to be taken on packets that violate a specified rate. Displays the number of packets and bytes on which the action was taken.

**Related Commands**

Command	Description
<b>control-plane</b>	Enters control-plane configuration mode to apply a QoS policy to police traffic destined for the control plane.
<b>service-policy (control-plane)</b>	Attaches a policy map to the control plane for aggregate or distributed control-plane services.

# show policy-map interface

To display the statistics and the configurations of the input and output policies that are attached to an interface, use the **show policy-map interface** command in the appropriate EXEC mode.

## Cisco 3660, 3845, 6500, 7200, 7400, 7500, and ASR 1000 Series Routers

```
show policy-map interface [type access-control] type number [vc [vpi] vci] [dldci dldci]
[input | output]
```

## ATM Shared Port Adapters

```
show policy-map interface slot/subslot/port [.subinterface]
```

## Cisco 7600 Series Routers

```
show policy-map interface [interface-type interface-number | null interface-number |
vlan vlan-id] [input | output]
```

Syntax	Description
<b>type access-control</b>	(Optional) Displays class maps configured to determine the exact pattern to look for in the protocol stack of interest.
<i>type</i>	Type of interface or subinterface whose policy configuration is to be displayed.
<i>number</i>	Port, connector, or interface card number.
<b>vc</b>	(Optional) For ATM interfaces only, shows the policy configuration for a specified PVC.
<i>vpi</i>	(Optional) ATM network virtual path identifier (VPI) for this permanent virtual circuit (PVC). On the Cisco 7200 and 7500 series routers, this value ranges from 0 to 255.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.  The absence of both the forward slash (/) and a <i>vpi</i> value defaults the <i>vpi</i> value to 0. If this value is omitted, information for all virtual circuits (VCs) on the specified ATM interface or subinterface is displayed.
<i>vci</i>	(Optional) ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the <b>atm vc-per-vc</b> command. Typically, the lower values 0 to 31 are reserved for specific traffic (F4 Operation, Administration, and Maintenance [OAM], switched virtual circuit [SVC] signaling, Integrated Local Management Interface [ILMI], and so on) and should not be used.  The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.
<b>dldci</b>	(Optional) Indicates a specific PVC for which policy configuration will be displayed.

<i>dlci</i>	(Optional) A specific data-link connection identifier (DLCI) number used on the interface. Policy configuration for the corresponding PVC will be displayed when a DLCI is specified.
<b>input</b>	(Optional) Indicates that the statistics for the attached input policy will be displayed.
<b>output</b>	(Optional) Indicates that the statistics for the attached output policy will be displayed.
<i>slot</i>	(ATM shared port adapter only) Chassis slot number. See the appropriate hardware manual for slot information. For SIPs, see the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for SIPs and SPAs” topic in the platform-specific SPA software configuration guide.
<i>lsubslot</i>	(ATM shared port adapter only) Secondary slot number on an SPA interface processor (SIP) where a SPA is installed. See the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on an SPA” topic in the platform-specific SPA software configuration guide for subslot information.
<i>lport</i>	(ATM shared port adapter only) Port or interface number. See the appropriate hardware manual for port information. For SPAs, see the corresponding “Specifying the Interface Address” topics in the platform-specific SPA software configuration guide.
<i>.subinterface</i>	(ATM shared port adapter only—Optional) Subinterface number. The number that precedes the period must match the number to which this subinterface belongs. The range is 1 to 4,294,967,293.
<i>interface-type</i>	(Optional) Interface type; possible valid values are <b>ethernet</b> , <b>fastethernet</b> , <b>gigabitethernet</b> , <b>tengigabitethernet</b> , <b>pos</b> , <b>atm</b> , and <b>ge-wan</b> .
<i>interface-number</i>	(Optional) Module and port number; see the “Usage Guidelines” section for valid values.
<b>null</b> <i>interface-number</i>	(Optional) Specifies the null interface; the valid value is 0.
<b>vlan</b> <i>vlan-id</i>	(Optional) Specifies the VLAN ID; valid values are from 1 to 4094.

### Command Default

This command displays the packet statistics of all classes that are configured for all service policies on the specified interface or subinterface or on a specific permanent virtual circuit (PVC) on the interface.

The absence of both the forward slash (*/*) and a *vpi* value defaults the *vpi* value to 0. If this value is omitted, information for all virtual circuits (VCs) on the specified ATM interface or subinterface is displayed.

### ATM Shared Port Adapter

When used with the ATM shared port adapter, this command has no default behavior or values.

### Command Modes

Privileged EXEC (#)

### ATM Shared Port Adapter

When used with the ATM shared port adapter, user EXEC (>) or privileged EXEC (#).

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
	12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
	12.0(28)S	This command was modified for the QoS: Percentage-Based Policing feature to include milliseconds when calculating the committed (conform) burst (bc) and excess (peak) burst (be) sizes.
	12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
	12.1(2)T	This command was modified to display information about the policy for all Frame Relay PVCs on the interface or, if a DLCI is specified, the policy for that specific PVC. This command was also modified to display the total number of packets marked by the quality of service (QoS) set action.
	12.1(3)T	This command was modified to display per-class accounting statistics.
	12.2(4)T	This command was modified for two-rate traffic policing. It now can display burst parameters and associated actions.
	12.2(8)T	<p>The command was modified for the Policer Enhancement—Multiple Actions feature and the WRED—Explicit Congestion Notification (ECN) feature.</p> <p>For the Policer Enhancement—Multiple Actions feature, the command was modified to display the multiple actions configured for packets conforming to, exceeding, or violating a specific rate.</p> <p>For the WRED—Explicit Congestion Notification (ECN) feature, the command displays ECN marking information.</p>
	12.2(13)T	<p>The following modifications were made:</p> <ul style="list-style-type: none"> <li>• This command was modified for the Percentage-Based Policing and Shaping feature.</li> <li>• This command was modified for the Class-Based RTP and TCP Header Compression feature.</li> <li>• This command was modified as part of the Modular QoS CLI (MQC) Unconditional Packet Discard feature. Traffic classes in policy maps can now be configured to discard packets belonging to a specified class.</li> <li>• This command was modified to display the Frame Relay DLCI number as a criterion for matching traffic inside a class map.</li> <li>• This command was modified to display Layer 3 packet length as a criterion for matching traffic inside a class map.</li> <li>• This command was modified for the Enhanced Packet Marking feature. A mapping table (table map) can now be used to convert and propagate packet-marking values.</li> </ul>
	12.2(14)SX	Support for this command was introduced on Cisco 7600 series routers.
	12.2(15)T	This command was modified to display Frame Relay voice-adaptive traffic-shaping information.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.3(14)T	This command was modified to display bandwidth estimation parameters.

Release	Modification
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE. This command was modified to display aggregate WRED statistics for the ATM shared port adapter. Note that changes were made to the syntax, defaults, and command modes. These changes are labelled “ATM Shared Port Adapter.”
12.4(4)T	The <b>type access-control</b> keywords were added to support flexible packet matching.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB, and the following modifications were made: <ul style="list-style-type: none"> <li>This command was modified to display either legacy (undistributed processing) QoS or hierarchical queueing framework (HQF) parameters on Frame Relay interfaces or PVCs.</li> <li>This command was modified to display information about Layer 2 Tunnel Protocol Version 3 (L2TPv3) tunnel marking.</li> </ul>
12.2(31)SB2	The following modifications were made: <ul style="list-style-type: none"> <li>This command was enhanced to display statistical information for each level of priority service configured and information about bandwidth-remaining ratios, and this command was implemented on the Cisco 10000 series router for the PRE3.</li> <li>This command was modified to display statistics for matching packets on the basis of VLAN identification numbers. As of Cisco IOS Release 12.2(31)SB2, matching packets on the basis of VLAN identification numbers is supported on Cisco 10000 series routers only.</li> </ul>
12.2(33)SRC	This command was integrated into Cisco IOS Release 12.2(33)SRC.
12.4(15)T2	This command was modified to display information about Generic Routing Encapsulation (GRE) tunnel marking. <p><b>Note</b> As of this release, GRE-tunnel marking is supported on the Cisco MGX Route Processor Module (RPM-XF) platform <i>only</i>.</p>
12.2(33)SB	This command was modified to display information about GRE-tunnel marking, and support for the Cisco 7300 series router was added.
Cisco IOS XE 2.1	This command integrated into Cisco IOS XE Release 2.1 and was implemented on the Cisco ASR 1000 series router.

## Usage Guidelines

### Cisco 3660, 3845, 6500, 7200, 7400, 7500, and ASR 1000 Series Routers

The **show policy-map interface** command displays the packet statistics for classes on the specified interface or the specified PVC only if a service policy has been attached to the interface or the PVC.

The counters displayed after the **show policy-map interface** command is entered are updated only if congestion is present on the interface.

The **show policy-map interface** command displays policy information about Frame Relay PVCs only if Frame Relay Traffic Shaping (FRTS) is enabled on the interface.

The **show policy-map interface** command displays ECN marking information only if ECN is enabled on the interface.

To determine if shaping is active with HQF, check the queue depth field of the “(queue depth/total drops/no-buffer drops)” line in the **show policy-map interface** command output.

### Cisco 7600 Series Routers

The **pos**, **atm**, and **ge-wan** keywords are not supported on Cisco 7600 series routers that are configured with a Supervisor Engine 720.

Cisco 7600 series routers that are configured with a Supervisor Engine 2 display packet counters, and Cisco 7600 series routers that are configured with a Supervisor Engine 720 display byte counters.

The output does not display policed-counter information; 0 is displayed in its place (for example, 0 packets, 0 bytes). To display dropped and forwarded policed-counter information, enter the **show mls qos** command.

For OSM WAN interfaces only, if you configure policing within a policy map, the hardware counters are displayed and the class-default counters are not displayed. If you do not configure policing within a policy map, the class-default counters are displayed.

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 1 to 13 and valid values for the port number are from 1 to 48.

### Examples

This section provides sample output from typical **show policy-map interface** commands. Depending upon the interface or platform in use and the options enabled, the output you see may vary slightly from the ones shown below.

- [Weighted Fair Queueing \(WFQ\) on Serial Interface: Example, page 982](#)
- [Traffic Shaping on Serial Interface: Example, page 983](#)
- [Precedence-Based Aggregate WRED on ATM Shared Port Adapter: Example, page 986](#)
- [DSCP-Based Aggregate WRED on ATM Shared Port Adapter: Example, page 987](#)
- [Frame Relay Voice-Adaptive Traffic-Shaping: Example, page 989](#)
- [Two-Rate Traffic Policing: Example, page 989](#)
- [Multiple Traffic Policing Actions: Example, page 990](#)
- [Explicit Congestion Notification: Example, page 967](#)
- [Class-Based RTP and TCP Header Compression: Example, page 993](#)
- [Modular QoS CLI \(MQC\) Unconditional Packet Discard: Example, page 968](#)
- [Percentage-Based Policing and Shaping: Example, page 968](#)
- [Traffic Shaping: Example, page 997](#)
- [Packet Classification Based on Layer 3 Packet Length: Example, page 999](#)
- [Enhanced Packet Marking: Example, page 1000](#)
- [Traffic Policing: Example, page 1001](#)
- [Formula for Calculating the CIR: Example, page 1002](#)
- [Formula for Calculating the PIR: Example, page 1002](#)
- [Formula for Calculating the Committed Burst \(bc\): Example, page 1003](#)
- [Formula for Calculating the Excess Burst \(be\): Example, page 1003](#)
- [Bandwidth Estimation: Example, page 1004](#)
- [Shaping with HQF Enabled: Example, page 1004](#)

- [Packets Matched on the Basis of VLAN ID Number: Example, page 1005](#)
- [Cisco 7600 Series Routers: Example, page 1006](#)
- [Multiple Priority Queues on Serial Interface: Example, page 1007](#)
- [Bandwidth-Remaining Ratios: Example, page 1008](#)
- [Tunnel Marking: Example, page 1009](#)
- [Traffic Shaping Overhead Accounting for ATM: Example, page 1010](#)

### Weighted Fair Queueing (WFQ) on Serial Interface: Example

The following sample output of the **show policy-map interface** command displays the statistics for the serial 3/1 interface, to which a service policy called mypolicy (configured as shown below) is attached. Weighted fair queueing (WFQ) has been enabled on this interface. See [Table 160](#) for an explanation of the significant fields that commonly appear in the command output.

```
policy-map mypolicy
  class voice
    priority 128
  class gold
    bandwidth 100
  class silver
    bandwidth 80
    random-detect
```

```
Router# show policy-map interface serial3/1 output
```

```
Serial3/1
```

```
Service-policy output: mypolicy
```

```
Class-map: voice (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 5
  Weighted Fair Queueing
    Strict Priority
    Output Queue: Conversation 264
    Bandwidth 128 (kbps) Burst 3200 (Bytes)
    (pkts matched/bytes matched) 0/0
    (total drops/bytes drops) 0/0

Class-map: gold (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 2
  Weighted Fair Queueing
    Output Queue: Conversation 265
    Bandwidth 100 (kbps) Max Threshold 64 (packets)
    (pkts matched/bytes matched) 0/0
    (depth/total drops/no-buffer drops) 0/0/0

Class-map: silver (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 1
  Weighted Fair Queueing
    Output Queue: Conversation 266
    Bandwidth 80 (kbps)
    (pkts matched/bytes matched) 0/0
    (depth/total drops/no-buffer drops) 0/0/0
    exponential weight: 9
```

## show policy-map interface

```

mean queue depth: 0

class      Transmitted      Random drop      Tail drop      Minimum Maximum Mark
          pkts/bytes      pkts/bytes      pkts/bytes      thresh  thresh  prob
0          0/0            0/0            0/0            20     40    1/10
1          0/0            0/0            0/0            22     40    1/10
2          0/0            0/0            0/0            24     40    1/10
3          0/0            0/0            0/0            26     40    1/10
4          0/0            0/0            0/0            28     40    1/10
5          0/0            0/0            0/0            30     40    1/10
6          0/0            0/0            0/0            32     40    1/10
7          0/0            0/0            0/0            34     40    1/10
rsvp      0/0            0/0            0/0            36     40    1/10

Class-map: class-default (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: any

```

### Traffic Shaping on Serial Interface: Example

The following sample output from the **show policy-map interface** command displays the statistics for the serial 3/2 interface, to which a service policy called p1 (configured as shown below) is attached. Traffic shaping has been enabled on this interface. See [Table 160](#) for an explanation of the significant fields that commonly appear in the command output.

```

policy-map p1
  class c1
    shape average 320000

Router# show policy-map interface serial3/2 output

Serial3/2

Service-policy output: p1

Class-map: c1 (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 0
  Traffic Shaping
    Target   Byte   Sustain  Excess   Interval  Increment Adapt
    Rate    Limit bits/int bits/int (ms)      (bytes)  Active
    320000  2000  8000    8000    25        1000    -

    Queue   Packets  Bytes   Packets  Bytes   Shaping
    Depth                                Delayed  Delayed  Active
    0        0        0       0        0       no

Class-map: class-default (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: any

```

[Table 160](#) describes significant fields commonly shown in the displays. The fields in the table are grouped according to the relevant QoS feature.

**Table 160** show policy-map interface Field Descriptions<sup>1</sup>

Field	Description
<b>Fields Associated with Classes or Service Policies</b>	
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
<b>Note</b>	In distributed architecture platforms (such as the Cisco 7500 series platform), the value of the transfer rate, calculated as the difference between the offered rate and the drop rate counters, can sporadically deviate from the average by up to 20 percent or more. This can occur while no corresponding burst is registered by independent traffic analyser equipment.
Match	Match criteria specified for the class of traffic. Choices include criteria such as IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental (EXP) value, access groups, and QoS groups. For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .

Table 160 show policy-map interface Field Descriptions<sup>1</sup> (continued)

Field	Description
<b>Fields Associated with Queueing (if Enabled)</b>	
Output Queue	The weighted fair queueing (WFQ) conversation to which this class of traffic is allocated.
Bandwidth	Bandwidth, in either kbps or percentage, configured for this class and the burst size.
pkts matched/bytes matched	Number of packets (also shown in bytes) matching this class that were placed in the queue. This number reflects the total number of matching packets queued at any time. Packets matching this class are queued only when congestion exists. If packets match the class but are never queued because the network was not congested, those packets are not included in this total. However, if process switching is in use, the number of packets is always incremented even if the network is not congested.
depth/total drops/no-buffer drops	Number of packets discarded for this class. No-buffer indicates that no memory buffer exists to service the packet.
<b>Fields Associated with Weighted Random Early Detection (WRED) (if Enabled)</b>	
exponential weight	Exponent used in the average queue size calculation for a WRED parameter group.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a fluctuating average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
class	IP precedence level.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED.  <b>Note</b> If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped <i>after</i> the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as “no-buffer drops”) are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence level.
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence level.
Minimum thresh	Minimum threshold. Minimum WRED threshold in number of packets.
Maximum thresh	Maximum threshold. Maximum WRED threshold in number of packets.
Mark prob	Mark probability. Fraction of packets dropped when the average queue depth is at the maximum threshold.

**Table 160** show policy-map interface Field Descriptions<sup>1</sup> (continued)

Field	Description
<b>Fields Associated with Traffic Shaping (if Enabled)</b>	
Target Rate	Rate used for shaping traffic.
Byte Limit	Maximum number of bytes that can be transmitted per interval. Calculated as follows: $((Bc+Be) / 8) \times 1$
Sustain bits/int	Committed burst (Bc) rate.
Excess bits/int	Excess burst (Be) rate.
Interval (ms)	Time interval value in milliseconds (ms).
Increment (bytes)	Number of credits (in bytes) received in the token bucket of the traffic shaper during each time interval.
Queue Depth	Current queue depth of the traffic shaper.
Packets	Total number of packets that have entered the traffic shaper system.
Bytes	Total number of bytes that have entered the traffic shaper system.
Packets Delayed	Total number of packets delayed in the queue of the traffic shaper before being transmitted.
Bytes Delayed	Total number of bytes delayed in the queue of the traffic shaper before being transmitted.
Shaping Active	Indicates whether the traffic shaper is active. For example, if a traffic shaper is active, and the traffic being sent exceeds the traffic shaping rate, a “yes” appears in this field.

1. A number in parentheses may appear next to the service-policy output name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

### Precedence-Based Aggregate WRED on ATM Shared Port Adapter: Example

The following sample output of the **show policy-map interface** command displays the statistics for the ATM shared port adapter interface 4/1/0.10, to which a service policy called prec-aggr-wred (configured as shown below) is attached. Because aggregate WRED has been enabled on this interface, the class through Mark Prob statistics are aggregated by subclasses. See [Table 161](#) for an explanation of the significant fields that commonly appear in the command output.

```
Router(config)# policy-map prec-aggr-wred
Router(config-pmap)# class class-default
Router(config-pmap-c)# random-detect aggregate
Router(config-pmap-c)# random-detect precedence values 0 1 2 3 minimum-thresh 10
maximum-thresh 100 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 4 5 minimum-thresh 40
maximum-thresh 400 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 6 minimum-thresh 60 maximum-thresh
600 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 7 minimum-thresh 70 maximum-thresh
700 mark-prob 10
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface ATM4/1/0.10 point-to-point
```



```

Match: any
Exp-weight-constant: 0 (1/1)
Mean queue depth: 0
class      Transmitted      Random drop      Tail drop      Minimum      Maximum      Mark
           pkts/bytespkts/bytespkts/bytespkts/bytespkts/bytespkts/bytespkts/bytespkts/bytes
default   0/0                      0/0              0/0              1            10           1/10
0 1 2 3
4 5 6 7   0/0                      0/0              0/0              10           20           1/10
8 9 10 11 0/0                      0/0              0/0              10           40           1/10

```

Table 161 describes the significant fields shown in the display when aggregate WRED is configured for an ATM shared port adapter.

**Table 161** *show policy-map interface Field Descriptions—Configured for Aggregate WRED on ATM Shared Port Adapter*

Field	Description
exponential weight	Exponent used in the average queue size calculation for a Weighted Random Early Detection (WRED) parameter group.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a fluctuating average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
<b>Note</b>	When Aggregate Weighted Random Early Detection (WRED) is enabled, the following WRED statistics will be aggregated based on their subclass (either their IP precedence or differentiated services code point (DSCP) value).
class	IP precedence level or differentiated services code point (DSCP) value.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED.  <b>Note</b> If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped <i>after</i> the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as “no-buffer drops”) are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence level or DSCP value.
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence level or DSCP value.
Minimum thresh	Minimum threshold. Minimum WRED threshold in number of packets.
Maximum thresh	Maximum threshold. Maximum WRED threshold in number of packets.
Mark prob	Mark probability. Fraction of packets dropped when the average queue depth is at the maximum threshold.

**Frame Relay Voice-Adaptive Traffic-Shaping: Example**

The following sample output shows that Frame Relay voice-adaptive traffic shaping is currently active and has 29 seconds left on the deactivation timer. With traffic shaping active and the deactivation time set, this means that the current sending rate on DLCI 201 is minCIR, but if no voice packets are detected for 29 seconds, the sending rate will increase to CIR.

```
Router# show policy interface Serial3/1.1

Serial3/1.1:DLCI 201 -

Service-policy output:MQC-SHAPE-LLQ1

Class-map:class-default (match-any)
 1434 packets, 148751 bytes
 30 second offered rate 14000 bps, drop rate 0 bps
Match:any
Traffic Shaping
  Target/Average   Byte   Sustain   Excess   Interval   Increment
  Rate             Limit  bits/int  bits/int  (ms)       (bytes)
 63000/63000      1890   7560     7560     120        945

Adapt Queue   Packets  Bytes    Packets  Bytes    Shaping
Active Depth  Delayed  Delayed  Active
BECN 0        1434    162991  26      2704    yes
Voice Adaptive Shaping active, time left 29 secs
```

Table 162 describes the significant fields shown in the display. Significant fields that are not described in Table 162 are described in Table 160, “show policy-map interface Field Descriptions.”

**Table 162** *show policy-map interface Field Descriptions—Configured for Frame Relay Voice-Adaptive Traffic Shaping*

Field	Description
Voice Adaptive Shaping active/inactive	Indicates whether Frame Relay voice-adaptive traffic shaping is active or inactive.
time left	Number of seconds left on the Frame Relay voice-adaptive traffic shaping deactivation timer.

**Two-Rate Traffic Policing: Example**

The following is sample output from the **show policy-map interface** command when two-rate traffic policing has been configured. In the example below, 1.25 Mbps of traffic is sent (“offered”) to a policer class.

```
Router# show policy-map interface serial3/0

Serial3/0

Service-policy output: policy1

Class-map: police (match all)
 148803 packets, 36605538 bytes
 30 second offered rate 1249000 bps, drop rate 249000 bps
Match: access-group 101
police:
  cir 500000 bps, conform-burst 10000, pir 1000000, peak-burst 100000
  conformed 59538 packets, 14646348 bytes; action: transmit
  exceeded 59538 packets, 14646348 bytes; action: set-prec-transmit 2
  violated 29731 packets, 7313826 bytes; action: drop
  conformed 499000 bps, exceed 500000 bps violate 249000 bps
```

```

Class-map: class-default (match-any)
  19 packets, 1990 bytes
  30 seconds offered rate 0 bps, drop rate 0 bps
Match: any

```

The two-rate traffic policer marks 500 kbps of traffic as conforming, 500 kbps of traffic as exceeding, and 250 kbps of traffic as violating the specified rate. Packets marked as conforming will be sent as is, and packets marked as exceeding will be marked with IP Precedence 2 and then sent. Packets marked as violating the specified rate are dropped.

Table 163 describes the significant fields shown in the display.

**Table 163** show policy-map interface Field Descriptions—Configured for Two-Rate Traffic Policing

Field	Description
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified CIR, conform burst size, peak information rate (PIR), and peak burst size used for marking packets.
conformed	Displays the action to be taken on packets conforming to a specified rate. Displays the number of packets and bytes on which the action was taken.
exceeded	Displays the action to be taken on packets exceeding a specified rate. Displays the number of packets and bytes on which the action was taken.
violated	Displays the action to be taken on packets violating a specified rate. Displays the number of packets and bytes on which the action was taken.

### Multiple Traffic Policing Actions: Example

The following is sample output from the **show policy-map** command when the Policer Enhancement—Multiple Actions feature has been configured. The sample output from the **show policy-map interface** command displays the statistics for the serial 3/2 interface, to which a service policy called “police” (configured as shown below) is attached.

```

policy-map police
class class-default
  police cir 1000000 pir 2000000
    conform-action transmit
    exceed-action set-prec-transmit 4
    exceed-action set-frde-transmit
    violate-action set-prec-transmit 2
    violate-action set-frde-transmit

Router# show policy-map interface serial3/2

Serial3/2: DLCI 100 -

Service-policy output: police

Class-map: class-default (match-any)
  172984 packets, 42553700 bytes
  5 minute offered rate 960000 bps, drop rate 277000 bps
Match: any
police:
  cir 1000000 bps, bc 31250 bytes, pir 2000000 bps, be 31250 bytes
  conformed 59679 packets, 14680670 bytes; actions:
    transmit
  exceeded 59549 packets, 14649054 bytes; actions:
    set-prec-transmit 4
    set-frde-transmit

```

```

violated 53758 packets, 13224468 bytes; actions:
  set-prec-transmit 2
  set-frde-transmit
conformed 340000 bps, exceed 341000 bps, violate 314000 bps

```

The sample output from **show policy-map interface** command shows the following:

- 59679 packets were marked as conforming packets (that is, packets conforming to the CIR) and were transmitted unaltered.
- 59549 packets were marked as exceeding packets (that is, packets exceeding the CIR but not exceeding the PIR). Therefore, the IP Precedence value of these packets was changed to an IP Precedence level of 4, the discard eligibility (DE) bit was set to 1, and the packets were transmitted with these changes.
- 53758 packets were marked as violating packets (that is, exceeding the PIR). Therefore, the IP Precedence value of these packets was changed to an IP Precedence level of 2, the DE bit was set to 1, and the packets were transmitted with these changes.


**Note**

Actions are specified by using the *action* argument of the **police** command. For more information about the available actions, see the **police** command reference page.

Table 164 describes the significant fields shown in the display.

**Table 164** *show policy-map interface Field Descriptions—Configured for Multiple Traffic Policing Actions*

Field	Description
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified CIR, conform burst size (BC), PIR, and peak burst size (BE) used for marking packets.
conformed, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as conforming to a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.
exceeded, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as exceeding a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.
violated, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as violating a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.

**Explicit Congestion Notification: Example**

The following is sample output from the **show policy-map interface** command when the WRED — Explicit Congestion Notification (ECN) feature has been configured. The words “explicit congestion notification” included in the output indicate that ECN has been enabled.

```

Router# show policy-map interface Serial14/1

Serial14/1

Service-policy output:policy_ecn
  Class-map:precl (match-all)
    1000 packets, 125000 bytes
    30 second offered rate 14000 bps, drop rate 5000 bps

```

```

Match:ip precedence 1
Weighted Fair Queueing
  Output Queue:Conversation 42
  Bandwidth 20 (%)
  Bandwidth 100 (kbps)
  (pkts matched/bytes matched) 989/123625
(depth/total drops/no-buffer drops) 0/455/0
  exponential weight:9
  explicit congestion notification
  mean queue depth:0

class Transmitted Random drop Tail drop Minimum Maximum Mark
      pkts/bytes   pkts/bytes   pkts/bytes threshold threshold probability
  0          0/0          0/0          0/0          20          40          1/10
  1      545/68125      0/0          0/0          22          40          1/10
  2          0/0          0/0          0/0          24          40          1/10
  3          0/0          0/0          0/0          26          40          1/10
  4          0/0          0/0          0/0          28          40          1/10
  5          0/0          0/0          0/0          30          40          1/10
  6          0/0          0/0          0/0          32          40          1/10
  7          0/0          0/0          0/0          34          40          1/10
rsvp      0/0          0/0          0/0          36          40          1/10

class ECN Mark
      pkts/bytes
  0          0/0
  1      43/5375
  2          0/0
  3          0/0
  4          0/0
  5          0/0
  6          0/0
  7          0/0
rsvp      0/0

```

Table 165 describes the significant fields shown in the display.

**Table 165** show policy-map interface Field Descriptions—Configured for ECN

Field	Description
explicit congestion notification	Indication that Explicit Congestion Notification is enabled.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a moving average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
class	IP precedence value.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED.  <b>Note</b> If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped <i>after</i> the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as “no-buffer drops”) are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence value.

**Table 165** *show policy-map interface Field Descriptions—Configured for ECN (continued)*

Field	Description
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence value.
Minimum threshold	Minimum WRED threshold in number of packets.
Maximum threshold	Maximum WRED threshold in number of packets.
Mark probability	Fraction of packets dropped when the average queue depth is at the maximum threshold.
ECN Mark pkts/bytes	Number of packets (also shown in bytes) marked by ECN.

**Class-Based RTP and TCP Header Compression: Example**

The following sample output from the **show policy-map interface** command shows the RTP header compression has been configured for a class called “prec2” in the policy map called “p1”.

The **show policy-map interface** command output displays the type of header compression configured (RTP), the interface to which the policy map called “p1” is attached (Serial 4/1), the total number of packets, the number of packets compressed, the number of packets saved, the number of packets sent, and the rate at which the packets were compressed (in bits per second (bps)).

In this example, User Datagram Protocol (UDP)/RTP header compressions have been configured, and the compression statistics are included at the end of the display.

```
Router# show policy-map interface Serial4/1

Serial4/1

Service-policy output:p1

  Class-map:class-default (match-any)
    1005 packets, 64320 bytes
    30 second offered rate 16000 bps, drop rate 0 bps
    Match:any
  compress:
    header ip rtp
    UDP/RTP Compression:
    Sent:1000 total, 999 compressed,
      41957 bytes saved, 17983 bytes sent
      3.33 efficiency improvement factor
      99% hit ratio, five minute miss rate 0 misses/sec, 0 max
      rate 5000 bps
```

Table 166 describes the significant fields shown in the display.

**Table 166** *show policy-map interface Field Descriptions—Configured for Class-Based RTP and TCP Header Compression<sup>1</sup>*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.

**Table 166** *show policy-map interface Field Descriptions—Configured for Class-Based RTP and TCP Header Compression<sup>1</sup> (continued)*

Field	Description
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
UDP/RTP Compression	Indicates that RTP header compression has been configured for the class.
Sent total	Count of every packet sent, both compressed packets and full-header packets.
Sent compressed	Count of number of compressed packets sent.
bytes saved	Total number of bytes saved (that is, bytes not needing to be sent).
bytes sent	Total number of bytes sent for both compressed and full-header packets.
efficiency improvement factor	The percentage of increased bandwidth efficiency as a result of header compression. For example, with RTP streams, the efficiency improvement factor can be as much as 2.9 (or 290 percent).
hit ratio	Used mainly for troubleshooting purposes, this is the percentage of packets found in the context database. In most instances, this percentage should be high.
five minute miss rate	The number of new traffic flows found in the last five minutes.
misses/sec max	The average number of new traffic flows found per second, and the highest rate of new traffic flows to date.
rate	The actual traffic rate (in bits per second) after the packets are compressed.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

**Modular QoS CLI (MQC) Unconditional Packet Discard: Example**

The following sample output from the **show policy-map interface** command displays the statistics for the Serial2/0 interface, to which a policy map called “policy1” is attached. The discarding action has been specified for all the packets belonging to a class called “c1.” In this example, 32000 bps of traffic is sent (“offered”) to the class and all of them are dropped. Therefore, the drop rate shows 32000 bps.

```
Router# show policy-map interface Serial2/0

Serial2/0

Service-policy output: policy1

Class-map: c1 (match-all)
  10184 packets, 1056436 bytes
  5 minute offered rate 32000 bps, drop rate 32000 bps
  Match: ip precedence 0
  drop
```

Table 167 describes the significant fields shown in the display.

**Table 167** *show policy-map interface Field Descriptions—Configured for MQC Unconditional Packet Discard<sup>1</sup>*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.

**Table 167** *show policy-map interface Field Descriptions—Configured for MQC Unconditional Packet Discard<sup>1</sup> (continued)*

Field	Description
<b>Note</b>	In distributed architecture platforms (such as the Cisco 7500), the value of the transfer rate, calculated as the difference between the offered rate and the drop rate counters, can sporadically deviate from the average by up to 20 percent or more. This can occur while no corresponding burst is registered by independent traffic analyser equipment.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and QoS groups. For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
drop	Indicates that the packet discarding action for all the packets belonging to the specified class has been configured.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

### Percentage-Based Policing and Shaping: Example

The following sample output from the **show policy-map interface** command shows traffic policing configured using a CIR based on a bandwidth of 20 percent. The CIR and committed burst (Bc) in milliseconds (ms) are included in the display.

```
Router# show policy-map interface Serial3/1

Serial3/1

Service-policy output: mypolicy

Class-map: gold (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
  Match: any
  police:
    cir 20 % bc 10 ms
    cir 2000000 bps, bc 2500 bytes
    pir 40 % be 20 ms
    pir 4000000 bps, be 10000 bytes
  conformed 0 packets, 0 bytes; actions:
    transmit
  exceeded 0 packets, 0 bytes; actions:
    drop
  violated 0 packets, 0 bytes; actions:
    drop
  conformed 0 bps, exceed 0 bps, violate 0 bps
```

Table 168 describes the significant fields shown in the display.

**Table 168** *show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping<sup>1</sup>*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
police	Indicates that traffic policing based on a percentage of bandwidth has been enabled. Also, displays the bandwidth percentage, the CIR, and the committed burst (Bc) size in ms.
conformed, actions	Displays the number of packets and bytes marked as conforming to the specified rates, and the action to be taken on those packets.
exceeded, actions	Displays the number of packets and bytes marked as exceeding the specified rates, and the action to be taken on those packets.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

### Traffic Shaping: Example

The following sample output from the **show policy-map interface** command (shown below) displays the statistics for the serial 3/2 interface. Traffic shaping has been enabled on this interface, and an average rate of 20 percent of the bandwidth has been specified.

```
Router# show policy-map interface Serial3/2

Serial3/2

Service-policy output: p1

Class-map: c1 (match-all)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
Match: any
```

```

Traffic Shaping
Target/Average      Byte   Sustain   Excess      Interval  Increment  Adapt
Rate                Limit  bits/int  bits/int    (ms)      (bytes)    Active
 20 %
201500/201500      1952   7808      7808        38         976        -

Queue   Packets  Bytes   Packets  Bytes   Shaping
Depth   Delayed  Delayed  Active
0        0        0        0        0        no

```

Table 169 describes the significant fields shown in the display.

**Table 169** *show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping (with Traffic Shaping Enabled)<sup>1</sup>*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and quality of service (QoS) groups. For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
Traffic Shaping	Indicates that traffic shaping based on a percentage of bandwidth has been enabled.
Target /Average Rate	Rate (percentage) used for shaping traffic and the number of packets meeting that rate.

**Table 169** *show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping (with Traffic Shaping Enabled)<sup>1</sup> (continued)*

Field	Description
Byte Limit	Maximum number of bytes that can be transmitted per interval. Calculated as follows: $((Bc+Be) / 8) \times 1$
Sustain bits/int	Committed burst (Bc) rate.
Excess bits/int	Excess burst (Be) rate.
Interval (ms)	Time interval value in milliseconds (ms).
Increment (bytes)	Number of credits (in bytes) received in the token bucket of the traffic shaper during each time interval.
Adapt Active	Indicates whether adaptive shaping is enabled.
Queue Depth	Current queue depth of the traffic shaper.
Packets	Total number of packets that have entered the traffic shaper system.
Bytes	Total number of bytes that have entered the traffic shaper system.
Packets Delayed	Total number of packets delayed in the queue of the traffic shaper before being transmitted.
Bytes Delayed	Total number of bytes delayed in the queue of the traffic shaper before being transmitted.
Shaping Active	Indicates whether the traffic shaper is active. For example, if a traffic shaper is active, and the traffic being sent exceeds the traffic shaping rate, a “yes” appears in this field.

1. A number in parentheses may appear next to the service-policy output name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

### Packet Classification Based on Layer 3 Packet Length: Example

The following sample output from the **show policy-map interface** command displays the packet statistics for the Ethernet4/1 interface, to which a service policy called “mypolicy” is attached. The Layer 3 packet length has been specified as a match criterion for the traffic in the class called “class1”.

```
Router# show policy-map interface Ethernet4/1

Ethernet4/1

Service-policy input: mypolicy

Class-map: class1 (match-all)
  500 packets, 125000 bytes
  5 minute offered rate 4000 bps, drop rate 0 bps
  Match: packet length min 100 max 300
  QoS Set
    qos-group 20
    Packets marked 500
```

Table 170 describes the significant fields shown in the display.

**Table 170** *show policy-map interface Field Descriptions—Configured for Packet Classification Based on Layer 3 Packet Length<sup>1</sup>*

Field	Description
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and QoS groups.
QoS Set, qos-group, Packets marked	Indicates that class-based packet marking based on the QoS group has been configured. Includes the qos-group number and the number of packets marked.

1. A number in parentheses may appear next to the service-policy input name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

### Enhanced Packet Marking: Example

The following sample output of the **show policy-map interface** command shows the service policies attached to a FastEthernet subinterface. In this example, a service policy called “policy1” has been attached. In “policy1”, a table map called “table-map1” has been configured. The values in “table-map1” will be used to map the precedence values to the corresponding class of service (CoS) values.

```
Router# show policy-map interface
FastEthernet1/0.1
Service-policy input: policy1
```

```

Class-map: class-default (match-any)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
Match: any
QoS Set
  precedence cos table table-map1
  Packets marked 0

```

Table 171 describes the fields shown in the display.

**Table 171 show policy-map interface Field Descriptions—Configured for Enhanced Packet Marking<sup>1</sup>**

Field	Description
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of the packets coming into the class.
Match	Match criteria specified for the class of traffic. Choices include criteria such as Precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) group (set). For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
QoS Set	Indicates that QoS group (set) has been configured for the particular class.
precedence cos table table-map1	Indicates that a table map (called “table-map1”) has been used to determine the precedence value. The precedence value will be set according to the CoS value defined in the table map.
Packets marked	Total number of packets marked for the particular class.

1. A number in parentheses may appear next to the service-policy input name and the class-map name. The number is for Cisco internal use only and can be disregarded.

### Traffic Policing: Example

The following is sample output from the **show policy-map interface** command. This sample displays the statistics for the serial 2/0 interface on which traffic policing has been enabled. The committed (conform) burst (bc) and excess (peak) burst (be) are specified in milliseconds (ms).

```

Router# show policy-map interface serial2/0

Serial2/0

Service-policy output: policy1 (1050)

Class-map: class1 (match-all) (1051/1)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
Match: ip precedence 0 (1052)
police:
  cir 20 % bc 300 ms
  cir 409500 bps, bc 15360 bytes

```

```

    pir 40 % be 400 ms
    pir 819000 bps, be 40960 bytes
    conformed 0 packets, 0 bytes; actions:
      transmit
    exceeded 0 packets, 0 bytes; actions:
      drop
    violated 0 packets, 0 bytes; actions:
      drop
    conformed 0 bps, exceed 0 bps, violate 0 bps

Class-map: class-default (match-any) (1054/0)
  0 packets, 0 bytes
  5 minute offered rate 0 bps, drop rate 0 bps
Match: any (1055)
  0 packets, 0 bytes
  5 minute rate 0 bps

```

In this example, the CIR and PIR are displayed in bps, and both the committed burst (bc) and excess burst (be) are displayed in bits.

The CIR, PIR bc, and be are calculated on the basis of the formulas described below.

#### Formula for Calculating the CIR: Example

When calculating the CIR, the following formula is used:

- CIR percentage specified (as shown in the output from the **show policy-map** command) \* bandwidth (BW) of the interface (as shown in the output from the **show interfaces** command) = total bits per second

According to the output from the **show interfaces** command for the serial 2/0 interface, the interface has a bandwidth (BW) of 2048 kbps.

```
Router# show interfaces serial2/0
```

```

Serial2/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec, rely 255/255, load 1/255

```

The following values are used for calculating the CIR:

$$20 \% * 2048 \text{ kbps} = 409600 \text{ bps}$$

#### Formula for Calculating the PIR: Example

When calculating the PIR, the following formula is used:

- PIR percentage specified (as shown in the output from the **show policy-map** command) \* bandwidth (BW) of the interface (as shown in the output from the **show interfaces** command) = total bits per second

According to the output from the **show interfaces** command for the serial 2/0 interface, the interface has a bandwidth (BW) of 2048 kbps.

```
Router# show interfaces serial2/0
```

```

Serial2/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec, rely 255/255, load 1/255

```

The following values are used for calculating the PIR:

$$40 \% * 2048 \text{ kbps} = 819200 \text{ bps}$$



**Note** Discrepancies between this total and the total shown in the output from the **show policy-map interface** command can be attributed to a rounding calculation or to differences associated with the specific interface configuration.

#### Formula for Calculating the Committed Burst (bc): Example

When calculating the bc, the following formula is used:

- The bc in milliseconds (as shown in the **show policy-map** command) \* the CIR in bits per seconds = total number bytes

The following values are used for calculating the bc:

$$300 \text{ ms} * 409600 \text{ bps} = 15360 \text{ bytes}$$

#### Formula for Calculating the Excess Burst (be): Example

When calculating the bc and the be, the following formula is used:

- The be in milliseconds (as shown in the **show policy-map** command) \* the PIR in bits per seconds = total number bytes

The following values are used for calculating the be:

$$400 \text{ ms} * 819200 \text{ bps} = 40960 \text{ bytes}$$

[Table 172](#) describes the significant fields shown in the display.

**Table 172** *show policy-map interface Field Descriptions*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) groups. For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
police	Indicates that traffic policing has been enabled. Display includes the CIR, PIR (in both a percentage of bandwidth and in bps) and the bc and be in bytes and milliseconds. Also displays the optional conform, exceed, and violate actions, if any, and the statistics associated with these optional actions.

**Bandwidth Estimation: Example**

The following sample output from the **show policy-map interface** command displays statistics for the Fast Ethernet 0/1 interface on which bandwidth estimates for quality of service (QoS) targets have been generated.

The Bandwidth Estimation section indicates that bandwidth estimates for QoS targets have been defined. These targets include the packet loss rate, the packet delay rate, and the timeframe in milliseconds. Confidence refers to the drop-one-in value (as a percentage) of the targets. Corvil Bandwidth means the bandwidth estimate in kilobits per second.

When no drop or delay targets are specified, “none specified, falling back to drop no more than one packet in 500” appears in the output.

```
Router# show policy-map interface FastEthernet0/1

FastEthernet0/1

Service-policy output: my-policy

Class-map: icmp (match-all)
  199 packets, 22686 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: access-group 101
  Bandwidth Estimation:
    Quality-of-Service targets:
      drop no more than one packet in 1000 (Packet loss < 0.10%)
      delay no more than one packet in 100 by 40 (or more) milliseconds
      (Confidence: 99.0000%)
    Corvil Bandwidth: 1 kbits/sec

Class-map: class-default (match-any)
  112 packets, 14227 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: any
  Bandwidth Estimation:
    Quality-of-Service targets:
      <none specified, falling back to drop no more than one packet in 500
    Corvil Bandwidth: 1 kbits/sec
```

**Shaping with HQF Enabled: Example**

The following sample output from the **show policy-map interface** command shows that shaping is active (as seen in the queue depth field) with HQF enabled on the serial 4/3 interface. All traffic is classified to the class-default queue.

```
Router# show policy-map interface serial4/3

Serial4/3

Service-policy output: shape

Class-map: class-default (match-any)
  2203 packets, 404709 bytes
  30 second offered rate 74000 bps, drop rate 14000 bps
  Match: any
  Queueing
  queue limit 64 packets
  (queue depth/total drops/no-buffer drops) 64/354/0
  (pkts output/bytes output) 1836/337280
  shape (average) cir 128000, bc 1000, be 1000
  target shape rate 128000
    lower bound cir 0, adapt to fecn 0
```

```

Service-policy : LLQ

queue stats for all priority classes:

queue limit 64 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 0/0

Class-map: c1 (match-all)
 0 packets, 0 bytes
 30 second offered rate 0 bps, drop rate 0 bps
 Match: ip precedence 1
 Priority: 32 kbps, burst bytes 1500, b/w exceed drops: 0

Class-map: class-default (match-any)
 2190 packets, 404540 bytes
 30 second offered rate 74000 bps, drop rate 14000 bps
 Match: any

queue limit 64 packets
(queue depth/total drops/no-buffer drops) 63/417/0
(pkts output/bytes output) 2094/386300

```

### Packets Matched on the Basis of VLAN ID Number: Example



#### Note

As of Cisco IOS Release 12.2(31)SB2, matching packets on the basis of VLAN ID numbers is supported on the Catalyst 1000 platform only.

The following is a sample configuration in which packets are matched and classified on the basis of the VLAN ID number. In this sample configuration, packets that match VLAN ID number 150 are placed in a class called “class1.”

```

Router# show class-map

Class Map match-all class1 (id 3)
Match vlan 150

```

Class1 is then configured as part of the policy map called “policy1.” The policy map is attached to Fast Ethernet subinterface 0/0.1.

The following sample output of the **show policy-map interface** command displays the packet statistics for the policy maps attached to Fast Ethernet subinterface 0/0.1. It displays the statistics for policy1, in which class1 has been configured.

```

Router# show policy-map interface

FastEthernet0/0.1

! Policy-map name.
Service-policy input: policy1

! Class configured in the policy map.
Class-map: class1 (match-all)
 0 packets, 0 bytes
 5 minute offered rate 0 bps, drop rate 0 bps

! VLAN ID 150 is the match criterion for the class.
Match: vlan 150
police:
cir 8000000 bps, bc 512000000 bytes

```

```

conformed 0 packets, 0 bytes; actions:
transmit
exceeded 0 packets, 0 bytes; actions:
drop
conformed 0 bps, exceed 0 bps

Class-map: class-default (match-any)
10 packets, 1140 bytes
5 minute offered rate 0 bps, drop rate 0 bps
Match: any
10 packets, 1140 bytes
5 minute rate 0 bps

```

Table 173 describes the significant fields shown in the display.

**Table 173** *show policy-map interface Field Descriptions—Packets Matched on the Basis of VLAN ID Number<sup>1</sup>*

Field	Description
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of the packets coming into the class.
Match	Match criteria specified for the class of traffic. Choices include criteria such as VLAN ID number, precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) group (set). For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .

1. A number in parentheses may appear next to the service-policy input name and the class-map name. The number is for Cisco internal use only and can be disregarded.

### Cisco 7600 Series Routers: Example

The following example shows how to display the statistics and the configurations of all the input and output policies that are attached to an interface on a Cisco 7600 series router:

```

Router# show policy-map interface

FastEthernet5/36
  service-policy input: max-pol-ipp5
    class-map: ipp5 (match-all)
      0 packets, 0 bytes
      5 minute rate 0 bps
      match: ip precedence 5
    class ipp5
      police 2000000000 2000000 conform-action set-prec-transmit 6 exceed-action p
      policed-dscp-transmit

```

The following example shows how to display the input-policy statistics and the configurations for a specific interface on a Cisco 7600 series router:

```
Router# show policy-map interface fastethernet 5/36 input
```

```
FastEthernet5/36
 service-policy input: max-pol-ipp5
  class-map: ipp5 (match-all)
    0 packets, 0 bytes
    5 minute rate 0 bps
    match: ip precedence 5
  class ipp5
    police 2000000000 2000000 conform-action set-prec-transmit 6 exceed-action p
    policed-dscp-transmit
```

Table 174 describes the significant fields shown in the display.

**Table 174** show policy-map interface Field Descriptions—Cisco 7600 Series Routers

Field	Description
service-policy input	Name of the input service policy applied to the specified interface.
class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
minute rate	Rate, in kbps, of the packets coming into the class.
match	Match criteria specified for the class of traffic. Choices include criteria such as VLAN ID number, precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) group (set). For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
class	Precedence value.
police	Indicates that the <b>police</b> command has been configured to enable traffic policing.

#### Multiple Priority Queues on Serial Interface: Example

The following sample output from the **show policy-map interface** command shows the types of statistical information that displays when multiple priority queues are configured. Depending upon the interface in use and the options enabled, the output that you see may vary slightly from the output shown below.

```
Router# show policy-map interface
```

```
Serial2/1/0
Service-policy output: P1
Queue statistics for all priority classes:
.
.
.
Class-map: Gold (match-all)
 0 packets, 0 bytes/*Updated for each priority level configured.*/
5 minute offered rate 0 bps, drop rate 0 bps
```

```

Match: ip precedence 2
Priority: 0 kbps, burst bytes 1500, b/w exceed drops: 0
Priority Level 4:
0 packets, 0 bytes

```

### Bandwidth-Remaining Ratios: Example

The following sample output from the **show policy-map interface** command indicates that bandwidth-remaining ratios are configured for class queues. As shown in the example, the classes precedence\_0, precedence\_1, and precedence\_2 have bandwidth-remaining ratios of 20, 40, and 60, respectively.

```
Router# show policy-map interface GigabitEthernet1/0/0.10
```

```
Service-policy output: vlan10_policy
```

```

Class-map: class-default (match-any)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: any
    0 packets, 0 bytes
    30 second rate 0 bps
  Queueing
  queue limit 250 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
  shape (average) cir 1000000, bc 4000, be 4000
  target shape rate 1000000
  bandwidth remaining ratio 10

```

```
Service-policy : child_policy
```

```

Class-map: precedence_0 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 0
  Queueing
  queue limit 62 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
  shape (average) cir 500000, bc 2000, be 2000
  target shape rate 500000
  bandwidth remaining ratio 20

```

```

Class-map: precedence_1 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 1
  Queueing
  queue limit 62 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
  shape (average) cir 500000, bc 2000, be 2000
  target shape rate 500000
  bandwidth remaining ratio 40

```

```

Class-map: precedence_2 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 2
  Queueing
  queue limit 62 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0

```

```

shape (average) cir 500000, bc 2000, be 2000
target shape rate 500000
bandwidth remaining ratio 60

Class-map: class-default (match-any)
 0 packets, 0 bytes
30 second offered rate 0 bps, drop rate 0 bps
Match: any
 0 packets, 0 bytes
 30 second rate 0 bps

queue limit 62 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 0/0

```

Table 175 describes the significant fields shown in the display.

**Table 175** *show policy-map interface Field Descriptions—Configured for Bandwidth-Remaining Ratios*

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
bandwidth remaining ratio	Indicates the ratio used to allocate excess bandwidth.

### Tunnel Marking: Example

In this sample output of the **show policy-map interface** command, the character string “ip dscp tunnel 3” indicates that L2TPv3 tunnel marking has been configured to set the DSCP value to 3 in the header of a tunneled packet.

```

Router# show policy-map interface

Serial0

Service-policy input: tunnel

Class-map: frde (match-all)
 0 packets, 0 bytes
30 second offered rate 0 bps, drop rate 0 bps
Match: fr-de
QoS Set
  ip dscp tunnel 3
  Packets marked 0

Class-map: class-default (match-any)
13736 packets, 1714682 bytes
30 second offered rate 0 bps, drop rate 0 bps
Match: any
 13736 packets, 1714682 bytes
 30 second rate 0 bps

```

Table 176 describes the significant fields shown in the display.

**Table 176 show policy-map interface Field Descriptions—Configured for Tunnel Marking**

Field	Description
service-policy input	Name of the input service policy applied to the specified interface.
class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
match	Match criteria specified for the class of traffic. In this example, the Frame Relay Discard Eligible (DE) bit has been specified as the match criterion.  For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
ip dscp tunnel	Indicates that tunnel marking has been configured to set the DSCP in the header of a tunneled packet to a value of 3.

#### Traffic Shaping Overhead Accounting for ATM: Example

The following output from the **show policy-map interface** command indicates that ATM overhead accounting is enabled for shaping and disabled for bandwidth:

```
Router# show policy-map interface

Service-policy output:unit-test

  Class-map: class-default (match-any)
    100 packets, 1000 bytes
    30 second offered rate 800 bps, drop rate 0 bps
    Match: any
    shape (average) cir 154400, bc 7720, be 7720
    target shape rate 154400
    overhead accounting: enabled
    bandwidth 30% (463 kbps)
    overhead accounting: disabled

    queue limit 64 packets
    (queue depth/total drops/no-buffer drops) 0/0/0
    (packets output/bytes output) 100/1000
```

Table 177 describes the significant fields shown in the display.

**Table 177 show policy-map interface Field Descriptions—Configured for Traffic Shaping Overhead Accounting for ATM**

Field	Description
service-policy output	Name of the output service policy applied to the specified interface.
class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
match	Match criteria specified for the class of traffic. In this example, the Frame Relay Discard Eligible (DE) bit has been specified as the match criterion.  For more information about the variety of match criteria that are available, see the “Classifying Network Traffic” module in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
target shape rate	Indicates that traffic shaping is enabled at the specified rate.
overhead accounting	Indicates whether overhead accounting is enabled or disabled for traffic shaping.
bandwidth	Indicates the percentage of bandwidth allocated for traffic queueing.
overhead accounting:	Indicates whether overhead accounting is enabled or disabled for traffic queueing.

Related Commands	Command	Description
	<b>bandwidth remaining ratio</b>	Specifies a bandwidth-remaining ratio for class queues and subinterface-level queues to determine the amount of unused (excess) bandwidth to allocate to the queue during congestion.
	<b>class-map</b>	Creates a class map to be used for matching packets to a specified class.
	<b>compression header ip</b>	Configures RTP or TCP IP header compression for a specific class.
	<b>drop</b>	Configures a traffic class to discard packets belonging to a specific class.
	<b>match fr-dlci</b>	Specifies the Frame Relay DLCI number as a match criterion in a class map.
	<b>match packet length (class-map)</b>	Specifies the length of the Layer 3 packet in the IP header as a match criterion in a class map.
	<b>police</b>	Configures traffic policing.
	<b>police (percent)</b>	Configures traffic policing on the basis of a percentage of bandwidth available on an interface.
	<b>police (two rates)</b>	Configures traffic policing using two rates, the CIR and the PIR.
	<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	<b>priority</b>	Specifies that low-latency behavior must be given to a traffic class and configures multiple priority queues.
	<b>random-detect ecn</b>	Enables ECN.
	<b>shape (percent)</b>	Specifies average or peak rate traffic shaping on the basis of a percentage of bandwidth available on an interface.
	<b>show class-map</b>	display all class maps and their matching criteria.
	<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
	<b>show interfaces</b>	Displays statistics for all interfaces configured on a router or access server.
	<b>show mls qos</b>	Displays MLS QoS information.
	<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
	<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
	<b>show table-map</b>	Displays the configuration of a specified table map or of all table maps.
	<b>table-map (value mapping)</b>	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

# show policy-map interface brief

To display information about only the active policy maps attached to an interface, use the **show policy-map interface brief** command in privileged EXEC mode.

```
show policy-map interface [input | output] brief [policy-map-name] [vrf [vrf-id]] [timestamp]
```

## Syntax Description

<b>input</b>	(Optional) Indicates that only the information about the active input policy maps will be displayed.
<b>output</b>	(Optional) Indicates that only the information about the active output policy maps will be displayed.
<b>brief</b>	Indicates that the name of all the active policy maps (both input and output policy maps) and the interfaces to which the policy maps are attached will be displayed. The active input policy maps will be displayed first, followed by the output policy maps.
<i>policy-map-name</i>	(Optional) Name of an active policy map to be displayed.
<b>vrf</b>	(Optional) Indicates that the active policy maps for Virtual Private Network (VPN) routing and forwarding (VRF) instances will be displayed.
<i>vrf-id</i>	(Optional) A specific VRF identifier.
<b>timestamp</b>	(Optional) Indicates that the date and time when the policy map was attached will be displayed, along with the ID of the user who attached the policy map.

## Command Default

If no optional keywords or arguments are specified, all policy maps (even those that are not active) are displayed.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.2(28)SB	This command was introduced.
12.2(33)SRB	This command was integrated into Cisco IOS Release 12.2(33)SRB.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

## Usage Guidelines

The **show policy-map interface brief** command displays the name of the active policy maps and the interfaces to which those policy maps are attached. An active policy map is one that is attached to an interface.

The optional keywords and arguments allow you to tailor the information displayed about VPNs, time stamps, and user IDs.

If you do not specify any optional keywords or arguments, all policy maps (even those that are not active) are displayed.

### VPN Information Reported

The **show policy-map interface brief** command can be used for VRF interfaces in applications that use VPNs. To specify VRF interfaces, use the **vrf** keyword with the *vrf-id* argument.

### Time-stamp and User ID Information Reported

If the optional **timestamp** keyword is used with the **show policy-map interface brief** command, the time and date when a policy map was attached to an interface appear in the display. In addition to the time and date information, the name (that is, the user ID) of the person who attached the policy map to the interface will also be displayed.



**Note** If the network software is reloaded (reinstalled), the time-stamp information (the time and date information) obtained will not be retained for any of the policy maps attached to interfaces on the network. Instead, the time and date information displayed will be the time and date when the software was reloaded.

### Method for Obtaining User Information

The user information included in the display is obtained from the information that you enter when you log in to the router. For example, if you are using the SSH Secure Shell utility to log in to a router, you would typically enter your username and password. However, it is not always possible to obtain the user information. Instances where user information cannot be obtained include the following:

- Not all routers require user information when you log in. Therefore, you may not be prompted to enter your username when you log in to a router.
- If you are connecting to a console port using the Telnet utility in a DOS environment, you do not need to enter user information.
- The user information cannot be retrieved because of system constraints or other factors.

If the user information cannot be obtained, the words “by unknown” will be displayed.

### Hierarchical Policy Map Information

For a hierarchical policy map structure, only the information about the parent policy maps is displayed. Information about child policy maps is not displayed.

### ATM PVCs

For ATM permanent virtual circuits (PVCs), policy maps do not remain associated with the interface if the ATM PVC is not working properly (that is, the ATM PVC is “down”). Therefore, if an ATM PVC is down, and a policy map is attached to an interface, the **show policy-map interface brief** command does not include information about the policy maps in the command output.

## Examples

The information that is displayed by the **show policy-map interface brief** command varies according to the optional keywords and arguments that you specify.

The following sections list the significant keyword and argument combinations used with the command and describe the corresponding information displayed.

**show policy-map interface brief Command Example**

The **show policy-map interface brief** command displays *all* the attached policy maps (both input policy maps and output policy maps) along with the information about the interfaces to which the policy maps are attached. The input policy maps are displayed first, followed by the output policy maps.

```
Service-policy input: policynam1
  interface s2/0/1
  interface s6/0/0
```

```
Service-policy output: policynam1interface s2/0/1 interface s6/0/0
```

**show policy-map interface brief timestamp Command Example**

The **show policy-map interface brief timestamp** command displays *all* the attached policy maps (both input policy maps and output policy maps) along with the information about the interfaces to which the policy maps are attached. The input policy maps are displayed first, followed by the output policy maps.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy input: parentpolicy1
Service-policy input: childpolicy1
  interface s2/0/1 - applied 20:43:04 on 25/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

```
Service-policy output: policynam2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

**show policy-map interface brief *policy-map-name* Command Example**

The **show policy-map interface brief *policy-map-name*** command displays the policy map attached as *either* an input policy map *or* an output policy map, along with the information about the interface to which the policy map is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

For example, the display for the **show policy-map interface brief policynam1** command is as follows:

```
Service-policy input: policynam1
  interface s2/0/1
  interface s6/0/0
```

```
Service-policy output: policynam1
  interface s1/0/2
  interface s3/0/0
```

**show policy-map interface brief *policy-map-name* timestamp Command Example**

The **show policy-map interface brief *policy-map-name* timestamp** command displays the policy map attached as *either* an input policy map *or* an output policy map, along with the information about the interface to which it is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface brief policynam2 timestamp** command is as follows:

```
Service-policy input: policynam2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

```
Service-policy output: policyname2
  interface s4/0/2 - applied 12:47:04 on 24/12/01 by user1
  interface s7/0/1 - applied 14:43:04 on 25/12/01 by user1
```

#### show policy-map interface output brief Command Example

The **show policy-map interface output brief** command displays the attached *output* policy maps, along with the information about the interfaces to which they are attached.

```
Service-policy output: policyname1
```

#### show policy-map interface output brief timestamp Command Example

The **show policy-map interface output brief timestamp** command displays the attached *output* policy maps, along with the information about the interfaces to which they are attached.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy output: policyname2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

#### show policy-map interface input brief Command Example

The **show policy-map interface input brief** command displays the attached *input* policy maps, along with the information about the interfaces to which they are attached.

```
Service-policy input: policyname2
  interface s2/0/2
  interface s6/0/1
```

#### show policy-map interface input brief timestamp Command Example

The **show policy-map interface input brief timestamp** command displays the attached *input* policy maps, along with the information about the interfaces to which they are attached.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy input: policyname2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

#### show policy-map interface output brief *policy-map-name* Command Example

The **show policy-map interface output brief *policy-map-name*** command displays the attached *output* policy map, along with the information about the interface to which it is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

For example, the display for the **show policy-map interface output brief policyname1** command is as follows:

```
Service-policy output: policyname1
  interface s2/0/1
  interface s6/0/0
```

#### show policy-map interface output brief *policy-map-name* timestamp Command Example

The **show policy-map interface output brief *policy-map-name* timestamp** command displays the attached *output* policy map, along with the information about the interface to which it is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface output brief policyname2 timestamp** command is as follows:

```
Service-policy output: policyname2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

#### show policy-map interface input brief *policy-map-name* Command Example

The **show policy-map interface input brief *policy-map-name*** command displays the attached *input* policy map, along with the information about the interface to which it is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

For example, the display for the **show policy-map interface input brief policyname1** command is as follows:

```
Service-policy input: policyname1
  interface s2/0/1
  interface s6/0/0
```

#### show policy-map interface input brief *policy-map-name* timestamp Command Example

The **show policy-map interface input brief *policy-map-name* timestamp** command displays the attached *input* policy map, along with the information about the interface to which it is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface input brief policyname2 timestamp** command is as follows:

```
Service-policy input: policyname2
  interface s2/0/2 - applied 21:47:04 on 24/12/01 by user1
  interface s6/0/1 - applied 19:43:04 on 25/12/01 by user1
```

#### show policy-map interface brief vrf Command Example

The **show policy-map interface brief vrf** command displays *all* the policy maps (both input policy maps and output policy maps), along with information about the interfaces and the VRFs to which the policy maps are attached.

```
Service-policy input: policyname1
  VRFA  interface s2/0/1
  VRFB  interface s6/0/0

Service-policy output: policyname2
  VRFC  interface s2/0/2
  VRFB  interface s6/0/1
```

#### show policy-map interface brief vrf timestamp Command Example

The **show policy-map interface brief vrf timestamp** command displays *all* the policy maps (both input policy maps and output policy maps), along with information about the interfaces and the VRFs to which the policy maps are attached.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy input: policyname1
  VRFA  interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1
  VRFB  interface s6/0/0 - applied 21:47:04 on 23/12/01 by user1
```

```
Service-policy output: policynam2
  VRFC   interface s2/0/3 - applied 20:47:04 on 23/12/01 by user1
  VRFD   interface s6/0/2 - applied 20:49:04 on 21/12/01 by user1
```

In some network configurations, the policy map may be attached to the interface initially, and then at a later time, the interface can be configured to act as a VRF interface. In this kind of network configuration, the time-stamp information displays the time when the policy map was attached to the interface. The display does not include the time when the interface was configured to act as a VRF interface. Displaying only the time when the policy map is attached to the interface also applies to the scenarios that are described in the following paragraph for other network configurations.

In other network configurations, a VRF may be attached to multiple interfaces as described in the following scenarios:

- The policy map is also attached to both the interfaces and the VRFs. In this network configuration, all the interfaces should be shown in the display for the VRF, under the policy map name, as follows:

```
Service-policy input: policynam1
  VRF1   interface s2/0/1 - applied 21:47:37 on 23/12/01 by user1
         interface atm0/0 - applied 11:37:57 on 21/11/01 by user1
```

- The policy map is not attached to all interfaces to which the specific VRF is attached. In this network configuration, only the VRF interfaces that have that policy map configured are displayed.

#### **show policy-map interface brief *policy-map-name* vrf timestamp Command Example**

The **show policy-map interface brief *policy-map-name* vrf timestamp** command displays the policy maps attached as *either* an input policy map *or* an output policy map, along with information about the interface and VRF to which the policy map is attached. Only the policy map specified by the *policy-map-name* argument is displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface brief policynam1 vrf timestamp** command is as follows:

```
Service-policy input: policynam1
  VRF1   interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1

Service-policy output: policynam1
  VRF2   interface s6/0/1 - applied 21:47:04 on 23/12/01 by user1
```

#### **show policy-map interface brief *policy-map-name* vrf *vrf-id* timestamp Command Example**

The **show policy-map interface brief *policy-map-name* vrf *vrf-id* timestamp** command displays *all* the policy maps (both the input policy maps and the output policy maps), along with information about the interface and VRF to which the policy maps are attached. Only the policy map and VRF specified by the *policy-map-name* argument and the *vrf-id* argument are displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for **show policy-map interface brief policynam1 vrf VRFA timestamp** command is as follows:

```
Service-policy input: policynam1
  VRFA   interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1

Service-policy output: policynam1
  VRFA   interface s6/0/1 - applied 21:47:04 on 23/12/01 by user1
```

**show policy-map interface output brief vrf Command Example**

The **show policy-map interface output brief vrf** command displays the attached *output* policy maps, along with information about the interface and VRF to which the policy maps are attached.

```
Service-policy output: policyname2
  VRFC   interface s2/0/2
  VRFA   interface s6/0/1
```

**show policy-map interface output brief vrf timestamp Command Example**

The **show policy-map interface output brief vrf timestamp** command displays the attached *output* policy maps, along with information about the interface and VRF to which the policy maps are attached.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy output: policyname2
  VRFC   interface s2/0/2 - applied 21:47:04 on 23/12/01 by user1
  VRFA   interface s6/0/1 - applied 21:47:04 on 23/12/01 by user1
```

**show policy-map interface input brief vrf Command Example**

The **show policy-map interface input brief vrf** command displays the attached *input* policy maps, along with information about the interface and VRF to which the policy maps are attached.

```
Service-policy input: policyname1
  VRFA   interface s2/0/1
  VRFB   interface s6/0/0
```

```
Service-policy input: policyname2
  VRFC   interface s2/0/2
  VRFB   interface s6/0/1
```

**show policy-map interface input brief vrf timestamp Command Example**

The **show policy-map interface input brief vrf timestamp** command displays the attached *input* policy maps, along with information about the interface and VRF to which the policy maps are attached.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

```
Service-policy input: policyname1
  VRFA   interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1
  VRFB   interface s6/0/0 - applied 21:47:04 on 23/12/01 by user1
```

```
Service-policy input: policyname2
  VRFC   interface s2/0/3 - applied 20:47:04 on 23/12/01 by user1
  VRFD   interface s6/0/2 - applied 20:49:04 on 21/12/01 by user1
```

**show policy-map interface input brief vrf vrf-id Command Example**

The **show policy-map interface input brief vrf vrf-id** command displays the attached *input* policy maps, along with information about the interface and VRF to which the policy maps are attached. Only the policy maps attached to the VRF specified by the *vrf-id* argument are displayed.

For example, the display for the **show policy-map interface input brief vrf VRFA** command is as follows:

```
Service-policy input: policyname1
  VRFA   interface s2/0/1
```

```
Service-policy input: policyname2
  VRFA   interface s6/0/1
```

**show policy-map interface output brief vrf vrf-id Command Example**

The **show policy-map interface output brief vrf vrf-id** command displays the attached *output* policy maps, along with information about the interface and VRF to which the policy maps are attached. Only the policy maps attached to the VRF specified by the *vrf-id* argument are displayed.

For example, the display for the **show policy-map interface output brief vrf VRFB** command is as follows:

```
Service-policy output: policynam1
  VRFB  interface s2/0/1

Service-policy output: policynam2
  VRFB  interface s6/0/1
```

**show policy-map interface input brief vrf vrf-id timestamp Command Example**

The **show policy-map interface input brief vrf vrf-id timestamp** command displays the attached *input* policy maps, along with information about the interface and VRF to which the policy maps are attached. Only the policy maps attached to the VRF specified by the *vrf-id* argument are displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface input brief vrf VRFA timestamp** command is as follows:

```
Service-policy input: policynam1
  VRFA  interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1

Service-policy input: policynam2
  VRFA  interface s6/0/1 - applied 21:47:04 on 23/12/01 by user1
```

**show policy-map interface output brief vrf vrf-id timestamp Command Example**

The **show policy-map interface output brief vrf vrf-id timestamp** command displays the attached *output* policy maps, along with information about the interface and VRF to which the policy maps are attached. Only the policy maps attached to the VRF specified by the *vrf-id* argument are displayed.

The **timestamp** keyword displays the time and date when the policy map was attached to the specific interface, along with the user ID of the person who attached the policy map to the interface.

For example, the display for the **show policy-map interface output brief vrf VRFB timestamp** command is as follows:

```
Service-policy output: policynam1
  VRFB  interface s2/0/1 - applied 21:47:04 on 23/12/01 by user1

Service-policy output: policynam2
  VRFB  interface s6/0/1 - applied 21:47:04 on 23/12/01 by user1
```

[Table 178](#) describes the significant fields shown in the various displays.

**Table 178** *show policy-map interface brief Field Descriptions*

Field	Description
Service-policy output: policynam2	Output policy map name.
Service-policy input: policynam2	Input policy map name.
interface s2/0/1	Interface to which the policy map is attached.

**Table 178** *show policy-map interface brief Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
VRFA	VRF to which the policy map is attached.
applied 21:47:04 on 23/12/01	Time and date when the policy map was attached to the interface or VRF.
by user1	User ID of the person who attached the policy map to the interface or VRF.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

# show policy-map session

To display the quality of service (QoS) policy map in effect for the Subscriber Service Switch (SSS) session, use the **show policy-map session** command in user EXEC or privileged EXEC mode.

```
show policy-map session [uid uid-number] [input class class-name | output class class-name]
```

## Syntax Description

<b>uid</b>	(Optional) Defines a unique session ID.
<i>uid-number</i>	(Optional) Unique session ID. Range is from 1 to 65535.
<b>input</b>	(Optional) Displays the upstream traffic of the unique session.
<b>output</b>	(Optional) Displays the downstream traffic of the unique session.
<b>class</b>	(Optional) Identifies the class that is part of the QoS policy-map definition.
<i>class-name</i>	(Optional) Class name that is part of the QoS policy-map definition.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
12.3(8)T	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB. This command was also modified to include per-session traffic shaping and traffic queueing statistics, if applicable.
12.2(33)SRC	This command was integrated into Cisco IOS Release 12.2(33)SRC, and support for the Cisco 7600 series router was added.
12.2(33)SB	Support for the Cisco 7300 series router was added. This command was also modified to include traffic shaping overhead accounting for ATM statistics, if applicable.

## Usage Guidelines

Use the **show policy-map session** command with the **uid** keyword to verify the QoS policy map of a unique session ID in the input and output streams in the SSS session.

Use the **show policy-map session** command with the optional **class *class-name*** keyword argument combination to display statistics for a particular class. If you use the **show policy-map session** command without the **class *class-name*** keyword argument combination, statistics for all the classes defined in the QoS policy map display.

## Examples

This section contains sample output from the **show policy-map session** command.



### Note

The output of the **show policy-map session** command varies according to the QoS feature configured in the policy map. For instance, if traffic shaping or traffic queueing is configured in the policy maps, the statistics for those features will be included and the output will vary accordingly from what is shown in this section. Additional self-explanatory fields may appear, but the output will be very similar.

The following example from the **show policy-map session** command displays QoS policy-map statistics for traffic in the downstream direction for the QoS policy maps configured:

```
Router# show policy-map session uid 401 output
```

```
SSS session identifier 401 -

Service-policy output: downstream-policy

Class-map: customer1234 (match-any)
  4464 packets, 249984 bytes
  5 minute offered rate 17000 bps, drop rate 0 bps
Match: ip dscp cs1 cs2 cs3 cs4
  4464 packets, 249984 bytes
  5 minute rate 17000 bps
QoS Set
  dscp af11
  Packets marked 4464

Class-map: customer56 (match-any)
  2232 packets, 124992 bytes
  5 minute offered rate 8000 bps, drop rate 0 bps
Match: ip dscp cs5 cs6
  2232 packets, 124992 bytes
  5 minute rate 8000 bps
police:
  cir 20000 bps, bc 10000 bytes
  pir 40000 bps, be 10000 bytes
  conformed 2232 packets, 124992 bytes; actions:
    set-dscp-transmit af21
  exceeded 0 packets, 0 bytes; actions:
    set-dscp-transmit af22
  violated 0 packets, 0 bytes; actions:
    set-dscp-transmit af23
  conformed 8000 bps, exceed 0 bps, violate 0 bps
Class-map: customer7 (match-any)
  1116 packets, 62496 bytes
  5 minute offered rate 4000 bps, drop rate 4000 bps
Match: ip dscp cs7
  1116 packets, 62496 bytes
  5 minute rate 4000 bps
drop

Class-map: class-default (match-any)
  1236 packets, 68272 bytes
  5 minute offered rate 4000 bps, drop rate 0 bps
Match: any
```

Table 179 describes the significant fields shown in the display.

**Table 179** show policy-map session Field Descriptions – Traffic in the Downstream Direction

Field	Description
SSS session identifier	Unique session identifier.
Service-policy output	Name of the output service policy applied to the specified interface or virtual circuit (VC).
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in bps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation [GRE] tunnel and an IP Security [IPsec] tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPsec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in bps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental (EXP) value, access groups, and QoS groups. For more information about the variety of available match criteria options, see the “Applying QoS Features Using the MQC” module of the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
QoS Set	Indicates that packet marking is in place.
dscp	Value used in packet marking.
Packets marked	The number of packets marked.

**Table 179** show policy-map session Field Descriptions (continued)— Traffic in the Downstream

Field	Description
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified committed information rate (CIR), conform burst (bc) size, peak information rate (PIR), and peak burst (be) size used for marking packets.
conformed	Displays the action to be taken on packets that conform to a specified rate. Displays the number of packets and bytes on which the action was taken.
exceeded	Displays the action to be taken on packets that exceed a specified rate. Displays the number of packets and bytes on which the action was taken.
violated	Displays the action to be taken on packets that violate a specified rate. Displays the number of packets and bytes on which the action was taken.

The following example from the **show policy-map session** command displays QoS policy-map statistics for traffic in the upstream direction for all the QoS policy maps configured:

```
Router# show policy-map session uid 401 input

SSS session identifier 401 -

Service-policy input: upstream-policy

Class-map: class-default (match-any)
 1920 packets, 111264 bytes
 5 minute offered rate 7000 bps, drop rate 5000 bps
Match: any
police:
  cir 8000 bps, bc 1500 bytes
  conformed 488 packets, 29452 bytes; actions:
    transmit
  exceeded 1432 packets, 81812 bytes; actions:
    drop
  conformed 7000 bps, exceed 5000 bps
```

Table 180 describes the significant fields shown in the display.

**Table 180** show policy-map session Field Descriptions – Traffic in the Upstream Direction

Field	Description
SSS session identifier	Unique session identifier.
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in bps, of packets coming in to the class.  <b>Note</b> If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified <i>before</i> they enter a combination of tunnels (for example, a generic routing encapsulation [GRE] tunnel and an IP Security [IPsec] tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only <i>one</i> tunnel encapsulation, or may include the overhead for <i>all</i> tunnel encapsulations. In most of the GRE and IPsec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in bps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental (EXP) value, access groups, and QoS groups. For more information about the variety of available match criteria options, see the “Applying QoS Features Using the MQC” module of the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> .
police	Indicates that the <b>police</b> command has been configured to enable traffic policing. Also, displays the specified committed information rate (CIR), conform burst (bc) size, peak information rate (PIR), and peak burst (be) size used for marking packets.

**Table 180** show policy-map session Field Descriptions (continued)— Traffic in the Upstream

Field	Description
conformed	Displays the action to be taken on packets that conform to a specified rate. Displays the number of packets and bytes on which the action was taken.
exceeded	Displays the action to be taken on packets that exceed a specified rate. Displays the number of packets and bytes on which the action was taken.
violated	Displays the action to be taken on packets that violate a specified rate. Displays the number of packets and bytes on which the action was taken.

**Per-Session Shaping and Queueing Output: Example**

The following is sample output of the **show policy-map session** command when per-session traffic shaping and traffic queueing are enabled. With per-session traffic shaping and queueing configured, traffic shaping and traffic queueing statistics are included in the output.

**Note**

The QoS: Per-Session Shaping and Queueing on LNS feature does not support packet marking. That is, this feature does not support the use of the **set** command to mark packets. Therefore, statistics related to packet marking are not included in the output.

```
Router# show policy-map session uid 1 output

SSS session identifier 1 -

Service-policy output: parent

Class-map: class-default (match-any)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: any
    0 packets, 0 bytes
    30 second rate 0 bps
  Queueing
  queue limit 128 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
  shape (average) cir 512000, bc 12800, be 12800
  target shape rate 512000

Service-policy : child

Class-map: prec0 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 0
  Queueing
  queue limit 38 packets
  (queue depth/total drops/no-buffer drops) 0/0/0
  (pkts output/bytes output) 0/0
  bandwidth 30% (153 kbps)

Class-map: prec2 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
```

```

Match: ip precedence 2
Queueing
queue limit 44 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 0/0
shape (average) cir 212000, bc 7632, be 7632
target shape rate 212000

Class-map: class-default (match-any)
 0 packets, 0 bytes
30 second offered rate 0 bps, drop rate 0 bps
Match: any
 0 packets, 0 bytes
 30 second rate 0 bps

queue limit 44 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 0/0

```

Table 181 describes the significant fields related to per-session traffic shaping and queueing shown in the display.

**Table 181** *show policy-map session Field Descriptions—Per-Session Traffic Shaping and Queueing Configured*

Field	Description
Queueing	Indicates that traffic queueing is enabled.
queue limit	Displays the queue limit, in packets.
queue depth	Current queue depth of the traffic shaper.
shape (average) cir, bc, be	Indicates that average rate traffic shaping is enabled. Displays the committed information rate (CIR), the committed burst (bc) rate, and the excess burst (be) rate in bytes.
target shape rate	Displays the traffic shaping rate, in bytes.

### Traffic Shaping Overhead Accounting for ATM: Example

The following output from the **show policy-map session** command indicates that ATM overhead accounting is enabled for shaping.

```
Router# show policy-map session uid 2 output
```

```
SSS session identifier 2 -
```

```
Service-policy output: ATM_OH_POLICY
```

```

Class-map: class-default (match-any)
 0 packets, 0 bytes
30 second offered rate 0 bps, drop rate 0 bps
Match: any
Queueing
queue limit 2500 packets
(queue depth/total drops/no-buffer drops) 0/0/0
(pkts output/bytes output) 0/0
shape (average) cir 10000000, bc 40000, be 40000
target shape rate 10000000
Overhead Accounting Enabled

```

Table 182 describes the significant fields displayed..

**Table 182** *show policy-map session Field Descriptions—Traffic Shaping Overhead Accounting for ATM Configured*

Field	Description
target shape rate	Displays the traffic shaping rate, in bytes.
Overhead Accounting Enabled	Indicates that overhead accounting is enabled.

#### Related Commands

Command	Description
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.
<b>show sss session</b>	Displays SSS session status.

# show protocol phdf

To display protocol information from a specific protocol header description file (PHDF), use the **show protocol phdf** command in privileged EXEC mode.

**show protocol phdf** *protocol-name*

Syntax Description	<i>protocol-name</i>	Loaded PHDF.
--------------------	----------------------	--------------

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.4(4)T	This command was introduced.
	12.2(18)ZY	This command integrated into Cisco IOS Release 12.2(18)ZY on the Catalyst 6500 series of switches equipped with the Programmable Intelligent Services Accelerator (PISA).

## Examples

The following example shows how to define FPM traffic classes for slammer packets (UDP port 1434). The match criteria defined within the class maps is for slammer packets with an IP length not to exceed 404 bytes, UDP port 1434, and pattern 0x4011010 at 224 bytes from start of IP header. This example also shows how to define the service policy “fpm-policy” and apply it to the gigabitEthernet interface. Show commands have been issued to verify the FPM configuration. (Note that PHDFs are not displayed in show output because they are in XML format.)

```
Router(config)# load protocol disk2:ip.phdf
Router(config)# load protocol disk2:udp.phdf
```

```
Router(config)# class-map type stack match-all ip-udp
Router(config-cmap)# description "match UDP over IP packets"
Router(config-cmap)# match field ip protocol eq 0x11 next udp
```

```
Router(config)# class-map type access-control match-all slammer
Router(config-cmap)# description "match on slammer packets"
Router(config-cmap)# match field udp dest-port eq 0x59A
Router(config-cmap)# match field ip length eq 0x194
Router(config-cmap)# match start 13-start offset 224 size 4 eq 0x4011010
```

```
Router(config)# policy-map type access-control fpm-udp-policy
Router(config-pmap)# description "policy for UDP based attacks"
Router(config-pmap)# class slammer
Router(config-pmap-c)# drop
```

```
Router(config)# policy-map type access-control fpm-policy
Router(config-pmap)# description "drop worms and malicious attacks"
Router(config-pmap)# class ip-udp
Router(config-pmap-c)# service-policy fpm-udp-policy
```

```
Router(config)# interface gigabitEthernet 0/1
Router(config-if)# service-policy type access-control input fpm-policy
```

```

Router# show protocols phdf ip

Protocol ID: 1
Protocol name: IP
Description: Definition-for-the-IP-protocol
Original file name: disk2:ip.phdf
Header length: 20
Constraint(s):
Total number of fields: 12
Field id: 0, version, IP-version
Fixed offset. offset 0
Constant length. Length: 4
Field id: 1, ihl, IP-Header-Length
Fixed offset. offset 4
Constant length. Length: 4
Field id: 2, tos, IP-Type-of-Service
Fixed offset. offset 8
Constant length. Length: 8
Field id: 3, length, IP-Total-Length
Fixed offset. offset 16
Constant length. Length: 16
Field id: 4, identification, IP-Identification
Fixed offset. offset 32
Constant length. Length: 16
Field id: 5, flags, IP-Fragmentation-Flags
Fixed offset. offset 48
Constant length. Length: 3
Field id: 6, fragment-offset, IP-Fragmentation-Offset
Fixed offset. offset 51
Constant length. Length: 13
Field id: 7, ttl, Definition-for-the-IP-TTL
Fixed offset. offset 64
Constant length. Length: 8
Field id: 8, protocol, IP-Protocol
Fixed offset. offset 72
Constant length. Length: 8
Field id: 9, checksum, IP-Header-Checksum
Fixed offset. offset 80
Constant length. Length: 16
Field id: 10, source-addr, IP-Source-Address
Fixed offset. offset 96
Constant length. Length: 32
Field id: 11, dest-addr, IP-Destination-Address
Fixed offset. offset 128
Constant length. Length: 32

Router# show protocols phdf udp

Protocol ID: 3
Protocol name: UDP
Description: UDP-Protocol
Original file name: disk2:udp.phdf
Header length: 8
Constraint(s):
Total number of fields: 4
Field id: 0, source-port, UDP-Source-Port
Fixed offset. offset 0
Constant length. Length: 16
Field id: 1, dest-port, UDP-Destination-Port
Fixed offset. offset 16
Constant length. Length: 16
Field id: 2, length, UDP-Length
Fixed offset. offset 32
Constant length. Length: 16

```

Field id: 3, checksum, UDP-Checksum  
Fixed offset. offset 48  
Constant length. Length: 16

**Related Commands**

Command	Description
<b>load protocol</b>	Loads a PHDF onto a router.

# show qbm client

To display quality of service (QoS) bandwidth manager (QBM) clients (applications) and their IDs, use the **show qbm client** command in user EXEC or privileged EXEC mode.

## show qbm client

### Syntax Description

This command has no arguments or keywords.

### Command Modes

User EXEC (>)  
Privileged EXEC (#)

### Command History

Release	Modification
12.2(33)SRC	This command was introduced.

### Usage Guidelines

Use the **show qbm client** command to confirm that a subset of Cisco IOS software has registered with QBM.

A subset of Cisco IOS software becomes a client of QBM by calling a QBM registration application programming interface (API) and receiving an ID. If the subset has not registered, then it is not a client.

### Examples

The following is sample output from the **show qbm client** command when RSVP aggregation is enabled:

```
Router# show qbm client
```

```
Client Name                Client ID
RSVP BW Admit              1
RSVP rfc3175 AggResv      2
```

[Table 183](#) describes the significant fields shown in the display.

**Table 183** show qbm client command Field Descriptions

Field	Description
Client Name	The name of the application. <ul style="list-style-type: none"> <li>RSVP BW Admit—The RSVP QBM client used for admitting bandwidth into QBM bandwidth pools.</li> <li>RSVP rfc3175 AggResv—RSVP aggregation as defined in RFC 3175, <i>Aggregation of RSVP for IPv4 and IPv6 Reservations</i>. <ul style="list-style-type: none"> <li>This client is used to create and maintain QBM bandwidth pools for RSVP aggregate reservations.</li> </ul> </li> </ul>
Client ID	The identifier of the application. One client ID exists per client.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>debug qbm</b>	Enables debugging output for QBM options.
<b>show qbm pool</b>	Displays allocated QBM pools and associated objects.

# show qbm pool

To display allocated quality of service (QoS) bandwidth manager (QBM) pools and identify the objects with which they are associated, use the **show qbm pool** command in user EXEC or privileged EXEC mode.

```
show qbm pool [id pool-id]
```

## Syntax Description

<b>id</b> <i>pool-id</i>	(Optional) Displays the identifier for a specified bandwidth pool that is performing admission control. The values must be between 0x0 and 0xffffffff; there is no default.
--------------------------	---

## Command Default

If you enter the **show qbm pool** command without the optional keyword/argument combination, the command displays information for all configured QBM pools.

## Command Modes

User EXEC (>)  
Privileged EXEC (#)

## Command History

Release	Modification
12.2(33)SRC	This command was introduced.

## Usage Guidelines

Use the **show qbm pool** command to display information for all configured QBM pools or for a specified pool. If you enter a pool ID that does not exist, you receive an error message.

This command is useful for troubleshooting QBM operation.

## Examples

The following sample output is from the **show qbm pool** command when RSVP aggregation is enabled:

```
Router# show qbm pool

Total number of pools allocated: 1

Pool ID 0x00000009
Associated object: 'RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46) '
  Minimum:          300Kbps
  Oper Status:      OPERATIONAL
  Oper Minimum:     300Kbps
Used Bandwidth:    80Kbps
```

[Table 184](#) describes the significant fields shown in the display.

**Table 184** show qbm pool command Field Descriptions

Field	Description
Total number of pools allocated	The number of QBM pools configured.
Pool ID	The QBM pool identifier.
Associated object	The application (or client) associated with the QBM pool. This string is provided by the client and as a result, the client chooses the string, not QBM. For example, RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46) means the QBM pool is associated with the RSVP aggregate reservation with source endpoint (aggregator) having IP address 192.168.40.1, destination endpoint (deaggregator) having IP address 192.168.50.1, and differentiated services code point (DSCP) expedited forwarding (EF).
Minimum	The pool's minimum bandwidth guarantee. (Units may vary.)
Oper Status	Status of the application. Values are the following: <ul style="list-style-type: none"> <li>OPERATIONAL—Application is enabled.</li> <li>NON-OPERATIONAL—Application is disabled.</li> </ul>
Oper Minimum	Defines the minimum bandwidth guarantee that the pool is able to enforce. This value may differ from the pool's minimum bandwidth guarantee because of operational conditions. For example, if the pool is associated with an interface and the interface is down, its Oper Status is NON-OPERATIONAL, then the operational minimum is N/A.
Used Bandwidth	The bandwidth reserved by applications/clients using this pool. N/A displays instead of 0 when the pool's Oper Status is NON-OPERATIONAL.

The following sample output is from the **show qbm pool** command with a specified pool ID:

```
Router# show qbm pool id 0x00000006

Pool ID 0x00000009
Associated object: 'RSVP 3175 AggResv 192.168.40.1->192.168.50.1_ef(46) '
  Minimum:          300Kbps
  Oper Status:      OPERATIONAL
  Oper Minimum:     300Kbps
Used Bandwidth:    80Kbps
```

See [Table 184](#) for a description of the fields.

#### Related Commands

Command	Description
<b>debug qbm</b>	Enables debugging output for QBM options.
<b>show qbm client</b>	Displays registered QBM clients.

# show qdm status

To display the status of the active Quality of Service Device Manager (QDM) clients that are connected to the router, use the **show qdm status** command in EXEC mode.

## show qdm status

**Syntax Description** This command has no arguments or keywords.

**Command Modes** EXEC

Command History	Release	Modification
	12.1(1)E	This command was introduced.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
	12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines** The **show qdm status** command can be used on the Cisco 7600 series router.

The output of the **show qdm status** command includes the following information:

- Number of connected clients
- Client IDs
- Version of the client software
- IP addresses of the connected clients
- Duration of the connection



### Note

QDM is not supported on Optical Service Module (OSM) interfaces.

## Examples

The following example illustrates the **show qdm status** output when two QDM clients are connected to the router:

```
Router# show qdm status

Number of QDM Clients :2
QDM Client v1.0(0.13)-System_1 @ 172.16.0.0 (id:30)
    connected since 09:22:36 UTC Wed Mar 15 2000
QDM Client v1.0(0.12)-System_2 @ 172.31.255.255 (id:29)
    connected since 17:10:23 UTC Tue Mar 14 2000
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>disconnect qdm</b>	Disconnects a QDM client.

# show queue

To display the contents of packets inside a queue for a particular interface or virtual circuit (VC), use the **show queue** command in privileged EXEC mode.

```
show queue interface-name interface-number [queue-number] [vc [vpi] vci]
```

## Syntax Description

<i>interface-name</i>	The name of the interface.
<i>interface-number</i>	The number of the interface.
<i>queue-number</i>	(Optional) The number of the queue. The queue number is a number from 1 to 16.
<b>vc</b>	(Optional) For ATM interfaces only, shows the fair queueing configuration for a specified permanent virtual circuit (PVC). The name can be up to 16 characters long.
<i>vpi</i>	(Optional) ATM network virtual path identifier (VPI) for this PVC. The absence of the “/” and a <i>vpi</i> value defaults the <i>vpi</i> value to 0.  On the Cisco 7200 and Cisco 7500 series routers, this value ranges from 0 to 255.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.  If this value is omitted, information for all VCs on the specified ATM interface or subinterface is displayed.
<i>vci</i>	(Optional) ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the <b>atm vc-per-vp</b> command. Typically, lower values 0 to 31 are reserved for specific traffic (F4 Operation, Administration, and Maintenance (OAM), switched virtual circuit (SVC) signalling, Integrated Local Management Interface (ILMI), and so on) and should not be used.  The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only.  The <i>vpi</i> and <i>vci</i> arguments cannot both be set to 0; if one is 0, the other cannot be 0.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
10.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines**

This command displays the contents of packets inside a queue for a particular interface or VC.

This command does not support VIP-distributed Weighted Random Early Detection WRED (DWRED). You can use the **vc** keyword and the **show queue** command arguments to display output for a PVC only on Enhanced ATM port adapters (PA-A3) that support per-VC queueing.

**Examples**

The following examples show sample output when the **show queue** command is entered and either weighted fair queueing (WFQ), WRED, or flow-based WRED are configured.

**WFQ Example**

The following is sample output from the **show queue** command for PVC 33 on the atm2/0.33 ATM subinterface. Two conversations are active on this interface. WFQ ensures that both data streams receive equal bandwidth on the interface while they have messages in the pipeline.

```
Router# show queue atm2/0.33 vc 33

Interface ATM2/0.33 VC 0/33
  Queueing strategy: weighted fair
  Total output drops per VC: 18149
  Output queue: 57/512/64/18149 (size/max total/threshold/drops)
    Conversations 2/2/256 (active/max active/max total)
    Reserved Conversations 3/3 (allocated/max allocated)

  (depth/weight/discards/tail drops/interleaves) 29/4096/7908/0/0
  Conversation 264, linktype: ip, length: 254
  source: 10.1.1.1, destination: 10.0.2.20, id: 0x0000, ttl: 59,
  TOS: 0 prot: 17, source port 1, destination port 1

  (depth/weight/discards/tail drops/interleaves) 28/4096/10369/0/0
  Conversation 265, linktype: ip, length: 254
  source: 10.1.1.1, destination: 10.0.2.20, id: 0x0000, ttl: 59,
  TOS: 32 prot: 17, source port 1, destination port 2
```

[Table 185](#) describes the significant fields shown in the display.

**Table 185** *show queue Field Descriptions for WFQ*

Field	Description
Queueing strategy	Type of queueing active on this interface.
Total output drops per VC	Total output packet drops.
Output queue	Output queue size, in packets. Max total defines the aggregate queue size of all the WFQ flows. Threshold is the individual queue size of each conversation. Drops are the dropped packets from all the conversations in WFQ.
Conversations	WFQ conversation number. A conversation becomes inactive or times out when its queue is empty. Each traffic flow in WFQ is based on a queue and represented by a conversation. Max active is the number of active conversations that have occurred since the queueing feature was configured. Max total is the number of conversations allowed simultaneously.

**Table 185** *show queue Field Descriptions for WFQ (continued)*

Field	Description
Reserved Conversations	Traffic flows not captured by WFQ, such as class-based weighted fair queueing (CBWFQ) configured by the bandwidth command or a Resource Reservation Protocol (RSVP) flow, have a separate queue that is represented by a reserved conversation. Allocated is the current number of reserved conversations. Max allocated is the maximum number of allocated reserved conversations that have occurred.
depth	Queue depth for the conversation, in packets.
weight	Weight used in WFQ.
discards	Number of packets dropped from the conversation's queue.
tail drops	Number of packets dropped from the conversation when the queue is at capacity.
interleaves	Number of packets interleaved.
linktype	Protocol name.
length	Packet length.
source	Source IP address.
destination	Destination IP address.
id	Packet ID.
ttl	Time to live count.
TOS	IP type of service.
prot	Layer 4 protocol number.

**Flow-Based WRED Example**

The following is sample output from the **show queue** command issued for serial interface 1 on which flow-based WRED is configured. The output shows information for each packet in the queue; the data identifies the packet by number, the flow-based queue to which the packet belongs, the protocol used, and so forth.

```
Router# show queue Serial1
```

```
Output queue for Serial1 is 2/0
```

```
Packet 1, flow id:160, linktype:ip, length:118, flags:0x88
  source:10.1.3.4, destination:10.1.2.2, id:0x0000, ttl:59,
  TOS:32 prot:17, source port 1, destination port 515
  data:0x0001 0x0203 0x0405 0x0607 0x0809 0x0A0B 0x0C0D
        0x0E0F 0x1011 0x1213 0x1415 0x1617 0x1819 0x1A1B
```

```
Packet 2, flow id:161, linktype:ip, length:118, flags:0x88
  source:10.1.3.5, destination:10.1.2.2, id:0x0000, ttl:59,
  TOS:64 prot:17, source port 1, destination port 515
  data:0x0001 0x0203 0x0405 0x0607 0x0809 0x0A0B 0x0C0D
        0x0E0F 0x1011 0x1213 0x1415 0x1617 0x1819 0x1A1B
```

Table 186 describes the significant fields shown in the display.

**Table 186** *show queue Field Descriptions for Flow-Based WRED*

Field	Description
Packet	Packet number.
flow id	Flow-based WRED number.
linktype	Protocol name.
length	Packet length.
flags	Internal version-specific flags.
source	Source IP address.
destination	Destination IP address.
id	Packet ID.
ttl	Time to live count.
prot	Layer 4 protocol number.
data	Packet data.

### WRED Example

The following is sample output from the **show queue** command issued for serial interface 3 on which WRED is configured. The output has been truncated to show only 2 of the 24 packets.

```
Router# show queue Serial3
```

```
Output queue for Serial3 is 24/0
```

```
Packet 1, linktype:ip, length:118, flags:0x88
  source:10.1.3.25, destination:10.1.2.2, id:0x0000, ttl:59,
  TOS:192 prot:17, source port 1, destination port 515
  data:0x0001 0x0203 0x0405 0x0607 0x0809 0x0A0B 0x0C0D
       0x0E0F 0x1011 0x1213 0x1415 0x1617 0x1819 0x1A1B
```

```
Packet 2, linktype:ip, length:118, flags:0x88
  source:10.1.3.26, destination:10.1.2.2, id:0x0000, ttl:59,
  TOS:224 prot:17, source port 1, destination port 515
  data:0x0001 0x0203 0x0405 0x0607 0x0809 0x0A0B 0x0C0D
       0x0E0F 0x1011 0x1213 0x1415 0x1617 0x1819 0x1A1B
```

### Related Commands

Command	Description
<b>atm vc-per-vp</b>	Sets the maximum number of VCIs to support per VPI.
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect flow</b>	Enables flow-based WRED.

<b>Command</b>	<b>Description</b>
<b>show frame-relay pvc</b>	Displays information and statistics about WFQ for a VIP-based interface.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# show queueing

To list all or selected configured queueing strategies, use the **show queueing** command in privileged EXEC mode.

```
show queueing [custom | fair | priority | random-detect [interface atm-subinterface
               [vc [[vpi/] vci]]]
```

Syntax Description	
<b>custom</b>	(Optional) Status of the custom queueing list configuration.
<b>fair</b>	(Optional) Status of the fair queueing configuration.
<b>priority</b>	(Optional) Status of the priority queueing list configuration.
<b>random-detect</b>	(Optional) Status of the Weighted Random Early Detection (WRED) and distributed WRED (DWRED) configuration, including configuration of flow-based WRED.
<b>interface</b> <i>atm-subinterface</i>	(Optional) Displays the WRED parameters of every virtual circuit (VC) with WRED enabled on the specified ATM subinterface.
<b>vc</b>	(Optional) Displays the WRED parameters associated with a specific VC. If desired, both the virtual path identifier (VPI) and virtual circuit identifier (VCI) values, or just the VCI value, can be specified.
<i>vpi</i>	(Optional) Specifies the VPI. If the <i>vpi</i> argument is omitted, 0 is used as the VPI value for locating the permanent virtual circuit (PVC). If the <i>vpi</i> argument is specified, the / separator is required.
<i>vci</i>	(Optional) Specifies the VCI.

**Command Default** If no optional keyword is entered, this command shows the configuration of all interfaces.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	10.3	This command was introduced.
	12.0(4)T	This command was integrated into Cisco IOS Release 12.0(4)T. The <b>red</b> keyword was changed to <b>random-detect</b> .
	12.1(2)T	This command was modified to include information about the Frame Relay PVC Interface Priority Queueing (FR PIPQ) feature.
	12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
	12.0(24)S	This command was integrated into Cisco IOS Release 12.0(24)S.
	12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
	12.2(18)SXF2	This command was integrated into Cisco IOS Release 12.2(18)SXF2.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Examples****FR PIPQ Example**

The following sample output shows that FR PIPQ (referred to as “DLCI priority queue”) is configured on serial interface 0. The output also shows the size of the four data-link connection identifier (DLCI) priority queues.

```
Router# show queueing
```

```
Current fair queue configuration:
```

Interface	Discard threshold	Dynamic queue count	Reserved queue count
Serial3/1	64	256	0
Serial3/3	64	256	0

```
Current DLCI priority queue configuration:
```

Interface	High limit	Medium limit	Normal limit	Low limit
Serial0	20	40	60	80

```
Current priority queue configuration:
```

```
List Queue Args
1 low protocol ipx
1 normal protocol vines
1 normal protocol appletalk
1 normal protocol ip
1 normal protocol decnet
1 normal protocol decnet_node
1 normal protocol decnet_rout
1 normal protocol decnet_rout
1 medium protocol xns
1 high protocol clns
1 normal protocol bridge
1 normal protocol arp
```

```
Current custom queue configuration:
```

```
Current random-detect configuration:
```

**Weighted Fair Queueing Example**

The following is sample output from the **show queueing** command. There are two active conversations in serial interface 0. Weighted fair queueing (WFQ) ensures that both of these IP data streams—both using TCP—receive equal bandwidth on the interface while they have messages in the pipeline, even though more FTP data is in the queue than remote-procedure call (RCP) data.

```
Router# show queueing
```

```
Current fair queue configuration:
```

Interface	Discard threshold	Dynamic queue count	Reserved queue count
Serial0	64	256	0
Serial1	64	256	0
Serial2	64	256	0
Serial3	64	256	0

```
Current priority queue configuration:
```

```
List Queue Args
1 high protocol cdp
2 medium interface Ethernet1
```

```
Current custom queue configuration:
```

Current random-detect configuration:

```
Serial5
Queueing strategy:random early detection (WRED)
Exp-weight-constant:9 (1/512)
Mean queue depth:40
```

Class	Random drop	Tail drop	Minimum threshold	Maximum threshold	Mark probability
0	1401	9066	20	40	1/10
1	0	0	22	40	1/10
2	0	0	24	40	1/10
3	0	0	26	40	1/10
4	0	0	28	40	1/10
5	0	0	31	40	1/10
6	0	0	33	40	1/10
7	0	0	35	40	1/10
rsvp	0	0	37	40	1/10

### Custom Queueing Example

The following is sample output from the **show queueing custom** command:

```
Router# show queueing custom
```

Current custom queue configuration:

```
List Queue Args
3 10 default
3 3 interface Tunnel3
3 3 protocol ip
3 3 byte-count 444 limit 3
```

### Flow-Based WRED Example

The following is sample output from the **show queueing random-detect** command. The output shows that the interface is configured for flow-based WRED to ensure fair packet drop among flows. The **random-detect flow average-depth-factor** command was used to configure a scaling factor of 8 for this interface. The scaling factor is used to scale the number of buffers available per flow and to determine the number of packets allowed in the output queue of each active flow before the queue is susceptible to packet drop. The maximum flow count for this interface was set to 16 by the **random-detect flow count** command.

```
Router# show queueing random-detect
```

Current random-detect configuration:

```
Serial1
Queueing strategy:random early detection (WRED)
Exp-weight-constant:9 (1/512)
Mean queue depth:29
Max flow count:16 Average depth factor:8
Flows (active/max active/max):39/40/16
```

Class	Random drop	Tail drop	Minimum threshold	Maximum threshold	Mark probability
0	31	0	20	40	1/10
1	33	0	22	40	1/10
2	18	0	24	40	1/10
3	14	0	26	40	1/10
4	10	0	28	40	1/10
5	0	0	31	40	1/10
6	0	0	33	40	1/10
7	0	0	35	40	1/10
rsvp	0	0	37	40	1/10

**DWRED Example**

The following is sample output from the **show queuing random-detect** command for DWRED:

```

Current random-detect configuration:
Serial1
  Queueing strategy:random early detection (WRED)
  Exp-weight-constant:9 (1/512)
  Mean queue depth:29
  Max flow count:16      Average depth factor:8
  Flows (active/max active/max):39/40/16

Class  Random      Tail   Minimum   Maximum   Mark
      drop      drop  threshold threshold probability
0       31           0       20       40       1/10
1       33           0       22       40       1/10
2       18           0       24       40       1/10
3       14           0       26       40       1/10
4       10           0       28       40       1/10
5        0           0       31       40       1/10
6        0           0       33       40       1/10
7        0           0       35       40       1/10
rsvp    0           0       37       40       1/10

```

```

Current random-detect configuration:
FastEthernet2/0/0
  Queueing strategy:fifo
  Packet drop strategy:VIP-based random early detection (DWRED)
  Exp-weight-constant:9 (1/512)
  Mean queue depth:0
  Queue size:0      Maximum available buffers:6308
  Output packets:5 WRED drops:0 No buffer:0

Class  Random      Tail   Minimum   Maximum   Mark      Output
      drop      drop  threshold threshold probability Packets
0       0           0      109      218      1/10      5
1       0           0      122      218      1/10      0
2       0           0      135      218      1/10      0
3       0           0      148      218      1/10      0
4       0           0      161      218      1/10      0
5       0           0      174      218      1/10      0
6       0           0      187      218      1/10      0
7       0           0      200      218      1/10      0

```

[Table 187](#) describes the significant fields shown in the display.

**Table 187** *show queuing Field Descriptions*

Field	Description
Discard threshold	Number of messages allowed in each queue.
Dynamic queue count	Number of dynamic queues used for best-effort conversations.
Reserved queue count	Number of reservable queues used for reserved conversations.
High limit	High DLCI priority queue size in maximum number of packets.
Medium limit	Medium DLCI priority queue size, in maximum number of packets.
Normal limit	Normal DLCI priority queue size, in maximum number of packets.

**Table 187** *show queueing Field Descriptions (continued)*

Field	Description
Low limit	Low DLCI priority queue size, in maximum number of packets.
List	Custom queueing—Number of the queue list. Priority queueing—Number of the priority list.
Queue	Custom queueing—Number of the queue. Priority queueing—Priority queue level ( <b>high</b> , <b>medium</b> , <b>normal</b> , or <b>low</b> keyword).
Args	Packet matching criteria for that queue.
Exp-weight-constant	Exponential weight factor.
Mean queue depth	Average queue depth. It is calculated based on the actual queue depth on the interface and the exponential weighting constant. It is a moving average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
Class	IP Precedence value.
Random drop	Number of packets randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP Precedence value.
Tail drop	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP Precedence value.
Minimum threshold	Minimum WRED threshold, in number of packets.
Maximum threshold	Maximum WRED threshold, in number of packets.
Mark probability	Fraction of packets dropped when the average queue depth is at the maximum threshold.

**Related Commands**

Command	Description
<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>exponential-weighting-constant</b>	Configures the exponential weight factor for the average queue size calculation for a WRED parameter group.
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>frame-relay interface-queue priority</b>	Enables the FR PIPQ feature.
<b>precedence (WRED group)</b>	Configures a WRED group for a particular IP Precedence.
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>priority-list interface</b>	Establishes queueing priorities on packets entering from a given interface.
<b>priority-list queue-limit</b>	Specifies the maximum number of packets that can be waiting in each of the priority queues.
<b>queue-list interface</b>	Establishes queueing priorities on packets entering on an interface.
<b>queue-list queue byte-count</b>	Specifies how many bytes the system allows to be delivered from a given queue during a particular cycle.

<b>Command</b>	<b>Description</b>
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect flow average-depth-factor</b>	Sets the multiplier to be used in determining the average depth factor for a flow when flow-based WRED is enabled.
<b>random-detect flow count</b>	Sets the flow count for flow-based WRED.
<b>show interfaces</b>	Displays the statistical information specific to a serial interface.
<b>show queue</b>	Displays the contents of packets inside a queue for a particular interface or VC.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

# show queueing interface

To display the queueing statistics of an interface, use the **show queueing interface** command in user EXEC or privileged EXEC mode.

```
show queueing interface type number [vc [[vpi] vci]]
```

## Cisco 7600 Series Routers

```
show queueing interface {type number | null null-interface-number | vlan vlan-id}
```

### Syntax Description

<i>type number</i>	Interface type and interface number.  For Cisco 7600 series routers, the valid interface types are <b>ethernet</b> , <b>fastethernet</b> , <b>gigabitethernet</b> , <b>tengigabitethernet</b> , <b>pos</b> , <b>atm</b> , and <b>ge-wan</b> .  For Cisco 7600 series routers, interface number is the module and port number. See the “Usage Guidelines” section for more information.
<b>vc</b>	(Optional) Shows the weighted fair queueing (WFQ) and Weighted Random Early Detection (WRED) parameters associated with a specific virtual circuit (VC). If desired, both the virtual path identifier (VPI) and virtual channel identifier (VCI) values, or just the VCI value, can be specified.
<i>vpi</i>	(Optional) Specifies the VPI. If the <i>vpi</i> argument is omitted, 0 is used as the VPI value for locating the permanent virtual circuit (PVC). If the <i>vpi</i> argument is specified, the / separator is required.
<i>vci</i>	(Optional) Specifies the VCI.
<b>null</b> <i>null-interface-number</i>	Specifies the null interface number; the valid value is 0.
<b>vlan</b> <i>vlan-id</i>	Specifies the VLAN identification number; valid values are from 1 to 4094.

### Command Modes

Privileged EXEC

#### Cisco 7600 Series Routers

User EXEC

### Command History

Release	Modification
11.1(22)CC	This command was introduced.
12.2(14)SX	Support for this command was introduced on the Supervisor Engine 720.
12.2(17d)SXB	This command was implemented on the Supervisor Engine 2 and integrated into Cisco IOS Release 12.2(17d)SXB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

**Usage Guidelines****Cisco 7600 Series Routers**

The **pos**, **atm**, and **ge-wan** interface types are supported on Cisco 7600 series routers that are configured with a Supervisor Engine 2 only.

The *type number* argument used with the **interface** keyword designates the module and port number. Valid values depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module installed in a 13-slot chassis, valid values for the module number are from 1 to 13 and valid values for the port number are from 1 to 48.

The **show queueing interface** command does not display the absolute values that are programmed in the hardware. Use the **show qm-sp port-data** command to verify the values that are programmed in the hardware.

**Examples**

The following is sample output from the **show queueing interface** command. In this example, WRED is the queueing strategy in use. The output varies according to queueing strategy in use.

```
Router# show queueing interface atm2/0
```

```
Interface ATM2/0 VC 201/201
Queueing strategy:random early detection (WRED)
Exp-weight-constant:9 (1/512)
Mean queue depth:49
Total output drops per VC:759

Class   Random   Tail   Minimum   Maximum   Mark
        drop    drop  threshold threshold probability
0       165     26     30         50        1/10
1       167     12     32         50        1/10
2       173     14     34         50        1/10
3       177     25     36         50        1/10
4         0      0      38         50        1/10
5         0      0      40         50        1/10
6         0      0      42         50        1/10
7         0      0      44         50        1/10
rsvp    0        0      46         50        1/10
```

[Table 188](#) describes the significant fields shown in the display.

**Table 188** *show queueing interface* Field Descriptions

Field	Description
Queueing strategy	Name of the queueing strategy in use (for example, WRED).
Exp-weight-constant	Exponential weight constant. Exponent used in the average queue size calculation for a WRED parameter group.
Mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a fluctuating average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
Class	IP precedence level.
Random drop	Number of packets randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence level.

**Table 188** *show queueing interface Field Descriptions (continued)*

Field	Description
Tail drop	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence level.
Minimum threshold	Minimum WRED threshold in packets.
Maximum threshold	Maximum WRED threshold in packets.
Mark probability	Fraction of packets dropped when the average queue depth is at the maximum threshold.

**Related Commands**

<b>custom-queue-list</b>	Assigns a custom queue list to an interface.
<b>fair-queue (class-default)</b>	Specifies the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy.
<b>fair-queue (WFQ)</b>	Enables WFQ for an interface.
<b>priority-group</b>	Assigns the specified priority list to an interface.
<b>random-detect flow</b>	Enables flow-based WRED.
<b>random-detect (interface)</b>	Enables WRED or DWRED.
<b>random-detect (per VC)</b>	Enables per-VC WRED or per-VC DWRED.
<b>show frame-relay pvc</b>	Displays information and statistics about WFQ for a VIP-based interface.
<b>show policy-map interface</b>	Displays the configuration of all classes configured for all service policies on the specified interface or displays the classes for the service policy for a specific PVC on the interface.
<b>show qm-sp port-data</b>	Displays information about the QoS manager switch processor.
<b>show queueing</b>	Lists all or selected configured queueing strategies.

# show table-map

To display the configuration of a specified table map or all table maps, use the **show table-map** command in EXEC mode.

**show table-map** *table-map-name*

## Syntax Description

<i>table-map-name</i>	Name of table map used to map one packet-marking value to another. The name can be a maximum of 64 alphanumeric characters.
-----------------------	---

## Command Modes

EXEC

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Examples

The sample output of the **show table-map** command shows the contents of a table map called “map 1”. In “map1”, a “to–from” relationship has been established and a default value has been defined. The fields for establishing the “to–from” mappings are further defined by the policy map in which the table map will be configured. (Configuring a policy map is the next logical step after creating a table map.)

For instance, a precedence or differentiated services code point (DSCP) value of 0 could be mapped to a class of service (CoS) value of 1, or vice versa, depending on the how the values are defined in the table map. Any values not explicitly defined in a “to–from” relationship will be set to a default value.

The following sample output of the **show table-map** command displays the contents of a table map called “map1”. In this table map, a packet-marking value of 0 is mapped to a packet-marking value of 1. All other packet-marking values are mapped to the default value 3.

```
Router# show table-map map1

Table Map map1
from 0 to 1
default 3
```

[Table 189](#) describes the fields shown in the display.

**Table 189** *show table-map Field Descriptions*

Field	Description
Table Map	The name of the table map being displayed.
from, to	The values of the “to–from” relationship established by the <b>table-map</b> (value mapping) command and further defined by the policy map in which the table map will be configured.
default	The default action to be used for any values not explicitly defined in a “to–from” relationship by the <b>table-map</b> (value mapping) command. If a default action is not specified in the table-map (value mapping) command, the default action is “copy”.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
<b>table-map (value mapping)</b>	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

# show tech-support rsvp

To generate a report of all Resource Reservation Protocol (RSVP)-related information, use the **show tech-support rsvp** command in privileged EXEC mode.

**show tech-support rsvp**

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	11.2	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** This command is not required for normal use of the operating system. This command is useful when you contact technical support personnel with questions regarding RSVP. The **show tech-support rsvp** command generates a series of reports that can be useful to technical support personnel attempting to solve problems.

Any issues or caveats that apply to the **show tech-support** command also apply to this command. For example, the enable password, if configured, is not displayed in the output of the **show running-config** command.

**Examples** The **show tech-support rsvp** command is equivalent to issuing the following commands:

- **show ip rsvp installed**
- **show ip rsvp interface**
- **show ip rsvp neighbor**
- **show ip rsvp policy cops**
- **show ip rsvp reservation**
- **show ip rsvp sender**
- **show running-config**
- **show version**

For the specific examples, refer to the displays and descriptions for the individual commands for more information.

# show traffic-shape

To display the current traffic-shaping configuration, use the **show traffic-shape** command in EXEC mode.

```
show traffic-shape [interface-type interface-number]
```

Syntax Description	Parameter	Description
	<i>interface-type</i>	(Optional) The type of the interface. If no interface is specified, traffic-shaping details for all configured interfaces are shown.
	<i>interface-number</i>	(Optional) The number of the interface.

**Command Modes** EXEC

Command History	Release	Modification
	11.2	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** You must have first enabled traffic shaping using the **traffic-shape rate**, **traffic-shape group**, or **frame-relay traffic-shaping** command to display traffic-shaping information.

**Examples** The following is sample output from the **show traffic-shape** command:

```
Router# show traffic-shape

Interface  Fa0/0
          Access Target   Byte   Sustain   Excess   Interval   Increment   Adapt
VC        List   Rate    Limit  bits/int  bits/int  (ms)       (bytes)     Active
-                1000000  6250   25000    25000    25        3125       -
```

[Table 190](#) describes the significant fields shown in the display.

**Table 190** *show traffic-shape Field Descriptions*

Field	Description
Interface	Interface type and number.
VC	Virtual circuit. <b>Note</b> If you configure traffic shaping at a VC level instead of an interface level, a number appears in this field.
Access List	Number of the access list, if one is configured.
Target Rate	Rate that traffic is shaped to, in bits per second.

**Table 190** *show traffic-shape Field Descriptions (continued)*

Field	Description
Byte Limit	Maximum number of bytes sent per internal interval.
Sustain bits/int	Configured sustained bits per interval.
Excess bits/int	Configured excess bits in the first interval.
Interval (ms)	Interval (in milliseconds) being used internally, which may be smaller than the committed burst divided by the committed information rate, if the router determines that traffic flow will be more stable with a smaller configured interval.
Increment (bytes)	Number of bytes that will be sustained per internal interval.
Adapt Active	Contains "BECN" if Frame Relay has backward explicit congestion notification (BECN) adaptation configured.

**Related Commands**

Command	Description
<b>frame-relay cir</b>	Specifies the incoming or outgoing committed information rate (CIR) for a Frame Relay virtual circuit.
<b>frame-relay traffic-rate</b>	Configures all the traffic-shaping characteristics of a virtual circuit (VC) in a single command.
<b>frame-relay traffic-shaping</b>	Enables both traffic shaping and per-VC queueing for all PVCs and SVCs on a Frame Relay interface.
<b>show traffic-shape queue</b>	Displays information about the elements queued by traffic shaping at the interface level or the DLCI level.
<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape fecn-adap</b>	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# show traffic-shape queue

To display information about the elements queued by traffic shaping at the interface level or the data-link connection identifier (DLCI) level, use the **show traffic-shape queue** command in privileged EXEC mode.

```
show traffic-shape queue [interface-number [dcli dcli-number]]
```

Syntax Description	
<i>interface-number</i>	(Optional) The number of the interface.
<b>dcli</b>	(Optional) The specific DLCI for which you wish to display information about queued elements.
<i>dcli-number</i>	(Optional) The number of the DLCI.

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	11.2	This command was introduced.
	12.0(3)XG	This command was integrated into Cisco IOS Release 12.0(3)XG. The <i>dcli</i> argument was added.
	12.0(4)T	This command was integrated into Cisco IOS Release 12.0(4)T. The <i>dcli</i> argument was added.
	12.0(5)T	This command was modified to include information on the special voice queue that is created using the <b>queue</b> keyword of the <b>frame-relay voice bandwidth</b> command.
	12.2(28)SB	This command was modified to support hierarchical queueing framework (HQF) on Frame Relay (FR) interfaces or permanent virtual circuits (PVCs).
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines	When no parameters are specified with this command, the output displays information for all interfaces and DLCIs containing queued elements. When a specific interface and DLCI are specified, information is displayed about the queued elements for that DLCI only.
------------------	---

When you use this command with HQF, no output displays.

**Examples**

The following is sample output for the **show traffic-shape queue** command when weighted fair queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial11/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
Queueing strategy: weighted fair
Queueing Stats: 1/600/64/0 (size/max total/threshold/drops)
Conversations 0/16 (active/max total)
Reserved Conversations 0/2 (active/allocated)
(depth/weight/discards) 1/4096/0
Conversation 5, linktype: ip, length: 608

source: 172.21.59.21, destination: 255.255.255.255, id: 0x0006, ttl: 255,
TOS: 0 prot: 17, source port 68, destination port 67
```

The following is sample output for the **show traffic-shape queue** command when priority queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial11/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
Queueing strategy: priority-group 4
Queueing Stats: low/1/80/0 (queue/size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command when first-come, first-serve queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial11/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
Queueing strategy: fcfs
Queueing Stats: 1/60/0 (size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command displaying statistics for the special queue for voice traffic that is created automatically when the **frame-relay voice bandwidth** command is entered:

```
Router# show traffic-shape queue Serial11/1 dlci 45

Voice queue attached to traffic shaping queue on Serial1 dlci 45
~~~~~
Voice Queueing Stats: 0/100/0 (size/max/dropped)
~~~~~
Traffic queued in shaping queue on Serial1 dlci 45
Queueing strategy: weighted fair
Queueing Stats: 0/600/64/0 (size/max total/threshold/drops)
Conversations 0/16 (active/max total)
Reserved Conversations 0/2 (active/allocated)
```

Table 191 describes the significant fields shown in the display.

**Table 191** *show traffic-shape queue Field Descriptions*

Field	Description
Queueing strategy	When Frame Relay Traffic Shaping (FRTS) is configured, the queueing type can be weighted fair, custom-queue, priority-group, or fcfs (first-come, first-serve), depending on what is configured on the Frame Relay map class for this DLCI. The default is fcfs for FRTS. When generic traffic shaping is configured, the only queueing type available is weighted fair queueing (WFQ).
Queueing Stats	Statistics for the configured queueing strategy, as follows: <ul style="list-style-type: none"> <li>size—Current size of the queue.</li> <li>max total—Maximum number of packets of all types that can be queued in all queues.</li> <li>threshold—For WFQ, the number of packets in the queue after which new packets for high-bandwidth conversations will be dropped.</li> <li>drops—Number of packets discarded during this interval.</li> </ul>
Conversations active	Number of currently active conversations.
Conversations max total	Maximum allowed number of concurrent conversations.
Reserved Conversations active	Number of currently active conversations reserved for voice.
Reserved Conversations allocated	Maximum configured number of conversations reserved.
depth	Number of packets currently queued.
weight	Number used to classify and prioritize the packet.
discards	Number of packets discarded from queues.
Packet	Number of queued packet.
linktype	Protocol type of the queued packet. (cdp = Cisco Discovery Protocol)
length	Number of bytes in the queued packet.
flags	Number of flag characters in the queued packet.
source	Source IP address.
destination	Destination IP address.
id	Packet ID.
ttl	Time to live count.
TOS	IP type of service.
prot	Layer 4 protocol number. Refer to RFC 943 for a list of protocol numbers. (17 = User Datagram Protocol (UDP))
source port	Port number of source port.
destination port	Port number of destination port.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show frame-relay fragment</b>	Displays Frame Relay fragmentation details.
	<b>show frame-relay pvc</b>	Displays statistics about PVCs for Frame Relay interfaces.
	<b>show frame-relay vofr</b>	Displays details about FRF.11 subchannels being used on VoFR DLCIs.
	<b>show traffic-shape</b>	Displays the current traffic-shaping configuration.
	<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.

# show traffic-shape statistics

To display the current traffic-shaping statistics, use the **show traffic-shape statistics** command in EXEC mode.

**show traffic-shape statistics** [*interface-type interface-number*]

Syntax Description	Parameter	Description
	<i>interface-type</i>	(Optional) The type of the interface. If no interface is specified, traffic-shaping statistics for all configured interfaces are shown.
	<i>interface-number</i>	(Optional) The number of the interface.

**Command Modes** EXEC

Command History	Release	Modification
	11.2	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** You must have first enabled traffic shaping using the **traffic-shape rate**, **traffic-shape group**, or **frame-relay traffic-shaping** command to display traffic-shaping information.

**Examples** The following is sample output from the **show traffic-shape statistics** command:

```
Router# show traffic-shape statistics
      Access Queue   Packets   Bytes   Packets   Bytes   Shaping
I/F   List  Depth          Bytes   Delayed   Delayed   Active
Et0   101    0           2       180      0         0       no
Et1    0     0           0         0      0         0       no
```

[Table 192](#) describes the significant fields shown in the display.

**Table 192** *show traffic-shape statistics Field Descriptions*

Field	Description
I/F	Interface.
Access List	Number of the access list.
Queue Depth	Number of messages in the queue.
Packets	Number of packets sent through the interface.
Bytes	Number of bytes sent through the interface.

**Table 192** *show traffic-shape statistics Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
Packets Delayed	Number of packets sent through the interface that were delayed in the traffic-shaping queue.
Bytes Delayed	Number of bytes sent through the interface that were delayed in the traffic-shaping queue.
Shaping Active	Contains “yes” when timers indicate that traffic shaping is occurring and “no” if traffic shaping is not occurring.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>frame-relay traffic-shaping</b>	Enables both traffic shaping and per-VC queueing for all PVCs and SVCs on a Frame Relay interface.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show ip rsvp neighbor</b>	Displays RSVP-related interface information.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# svc-bundle

To create or modify a member of a switched virtual circuit (SVC) bundle, use the **svc-bundle** command in SVC-bundle configuration mode. To remove an SVC bundle member from the bundle, use the **no** form of this command.

```
svc-bundle svc-handle
```

```
no svc-bundle svc-handle
```

Syntax Description	<i>svc-handle</i>	Unique name for the SVC in the router.
--------------------	-------------------	--

Command Default	No SVCs are members of an SVC bundle.
-----------------	---------------------------------------

Command Modes	SVC-bundle configuration
---------------	--------------------------

Command History	Release	Modification
	12.2(4)T	This command was introduced.

Usage Guidelines	Using this command will cause the system to enter SVC-bundle member configuration mode, in which you can configure characteristics of the member such as precedence, variable bit rate (VBR) traffic shaping, unspecified bit rate (UBR) traffic shaping, UBR+ traffic shaping, an idle timeout, and bumping conditions.
------------------	--

Examples	The following example creates a member of an SVC bundle named “five”: <pre>svc-bundle five</pre>
----------	---

# table-map (value mapping)

To create and configure a mapping table for mapping and converting one packet-marking value to another, use the **table-map** (value mapping) command in global configuration mode. To disable the use of this table map, use the **no** form of this command.

**table-map** *table-map-name* **map from** *from-value* **to** *to-value* [**default** *default-value-or-action*]

**no table-map** *table-map-name* **map from** *from-value* **to** *to-value* [**default** *default-value-or-action*]

## Syntax Description

<i>table-map-name</i>	Name of table map to be created. The name can be a maximum of 64 alphanumeric characters.
<b>map from</b>	Indicates that a “map from” value will be used.
<i>from-value</i>	The “map from” value of the packet-marking category. The value range varies according to the packet-marking category from which you want to map and convert. For more information, see the “Usage Guidelines” section below.
<b>to</b>	Indicates that a “map to” value will be used.
<i>to-value</i>	The “map to” value of the packet-marking category. The value range varies according to the packet-marking category to which you want to map and convert. For more information, see the “Usage Guidelines” section below.
<b>default</b>	(Optional) Indicates that a default value or action will be used.
<i>default-value-or-action</i>	(Optional) The default value or action to be used if a “to–from” relationship has not been explicitly configured. Default actions are “ignore” and “copy”. If neither action is specified, “copy” is used.

## Defaults

The **default** keyword and *default-value-or-action* argument sets the default value (or action) to be used if a value is not explicitly designated.

If you configure a table map but you do not specify a *default-value-or-action* argument for the **default** keyword, the default action is “copy”.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(13)T	This command was introduced.

## Usage Guidelines

This command allows you to create a mapping table. The mapping table, a type of conversion chart, is used for establishing a “to–from” relationship between packet-marking types or categories. For example, a mapping table can be used to establish a “to–from” relationship between the following packet-marking categories:

- Class of service (CoS)
- Precedence

- Differentiated services code point (DSCP)
- Quality of service (QoS) group
- Multiprotocol Label Switching (MPLS) experimental (EXP) imposition
- MPLS EXP topmost

When configuring the table map, you must specify the packet-marking values to be used in the conversion. The values you can enter vary by packet-marking category.

Table 193 lists the valid value ranges you can enter for each packet-marking category.

**Table 193** Valid Value Ranges

Packet-Marking Category	Value Ranges
CoS	Specific IEEE 802.1Q number in the range from 0 to 7.
Precedence	Number in the range from 0 to 7.
DSCP	Number in the range from 0 to 63.
QoS Group	Number in the range from 0 to 99.
MPLS EXP imposition	Number in the range from 0 to 7.
MPLS EXP topmost	Number in the range from 0 to 7.

## Examples

In the following example, the **table-map** (value mapping) command has been configured to create a table map called “map1”. In “map1”, two “to–from” relationships have been established and a default value has been defined. The fields for establishing the “to–from” mappings are further defined by the policy map in which the table map will be configured. (Configuring a policy map is the next logical step after creating a table map.)

For instance, a precedence or DSCP value of 0 could be mapped to a CoS value of 0, or vice versa, depending on the how the table map is configured. Any values not explicitly defined in a “to–from” relationship will be set to a default value.

```
Router(config)# table-map map1
Router(config-tablemap)# map from 0 to 0
Router(config-tablemap)# map from 2 to 1
Router(config-tablemap)# default 3
Router(config-tablemap)# end
```

## Related Commands

Command	Description
<b>policy-map</b>	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
<b>show policy-map</b>	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
<b>show policy-map class</b>	Displays the configuration for the specified class of the specified policy map.
<b>show policy-map interface</b>	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.
<b>show table-map</b>	Displays the configuration of a specified table map or all table maps.

# tcp

To enable Transmission Control Protocol (TCP) header compression within an IP Header Compression (IPHC) profile, use the **tcp** command in IPHC-profile configuration mode. To disable TCP header compression, use the **no** form of this command.

**tcp**

**no tcp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** TCP header compression is enabled.

**Command Modes** IPHC-profile configuration

Command History	Release	Modification
	12.4(9)T	This command was introduced.

**Usage Guidelines** **Intended for Use with IPHC Profiles**

The **tcp** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

**Examples** The following is an example of an IPHC profile called profile1. In this example, TCP header compression has been enabled.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile1 van-jacobson
Router(config-iphcp)# tcp
Router(config-iphcp)# end
```

Related Commands	Command	Description
	<b>iphc-profile</b>	Creates an IPHC profile.

# tcp contexts

To set the number of contexts available for Transmission Control Protocol (TCP) header compression, use the **tcp contexts** command in IPHC-profile configuration mode. To remove the number of previously configured contexts, use the **no** form of this command.

```
tcp contexts { absolute number-of-contexts | kpbs-per-context kpbs }
```

```
no tcp contexts
```

Syntax Description	Parameter	Description
	<b>absolute</b>	Indicates that the maximum number of compressed TCP contexts will be based on a fixed (absolute) number.
	<i>number-of-contexts</i>	Number of TCP contexts. Range is from 1 to 256.
	<b>kpbs-per-context</b>	Indicates that the maximum number of compressed TCP contexts will be based on available bandwidth.
	<i>kpbs</i>	Number of kbps to allow for each context. Range is from 1 to 100.

**Command Default** The **tcp contexts** command calculates the number of contexts on the basis of bandwidth and allocates 4 kbps per context.

**Command Modes** IPHC-profile configuration

Command History	Release	Modification
	12.4(9)T	This command was introduced.

**Usage Guidelines** Use the **tcp contexts** command to set the number of contexts available for TCP header compression. A context is the state that the compressor uses to compress a header and that the decompressor uses to decompress a header. The context is the uncompressed version of the last header sent and includes information used to compress and decompress the packet.

### Intended for Use with IPHC Profiles

The **tcp contexts** command is intended for use as part of an IPHC profile. An IPHC profile is used to enable and configure header compression on your network. For more information about using IPHC profiles to configure header compression, see the “Header Compression” module and the “Configuring Header Compression Using IPHC Profiles” module of the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4T.

### Setting the Number of Contexts as an Absolute Number

The **tcp contexts** command allows you to set the number of contexts as an absolute number. To set the number of contexts as an absolute number, enter a number between 1 and 256.

### Calculating the Number of Contexts on the Basis of Bandwidth

The **tcp contexts** command can calculate the number of contexts on the basis of the bandwidth available on the network link to which the IPHC profile is applied.

To have the number of contexts calculated on the basis of the available bandwidth, enter the **kbits-per-context** keyword followed by a value for the *kbits* argument. The command divides the available bandwidth by the kbits specified. For example, if the bandwidth of the network link is 2000 kbits, and you enter 10 for the *kbits* argument, the command calculates 200 contexts.

### Examples

The following is an example of an IPHC profile called profile2. In this example, the number of TCP contexts has been set to 75.

```
Router> enable
Router# configure terminal
Router(config)# iphc-profile profile2 van-jacobson
Router(config-iphcp)# tcp contexts absolute 75
Router(config-iphcp)# end
```

### Related Commands

Command	Description
<b>iphc-profile</b>	Creates an IPHC profile.

# traffic-shape adaptive

To configure a Frame Relay subinterface to estimate the available bandwidth when backward explicit congestion notification (BECN) signals are received, use the **traffic-shape adaptive** interface configuration command in interface configuration mode. To disregard the BECN signals and not estimate the available bandwidth, use the **no** form of this command.

**traffic-shape adaptive** *bit-rate*

**no traffic-shape adaptive**

<b>Syntax Description</b>	<i>bit-rate</i>	Lowest bit rate that traffic is shaped to, in bits per second. The default <i>bit rate</i> value is 0.
---------------------------	-----------------	--

<b>Command Default</b>	Bandwidth is not estimated when BECN signals are received.
------------------------	--

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.	
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.	

<b>Usage Guidelines</b>	This command specifies the boundaries in which traffic will be shaped when BECN signals are received. You must enable traffic shaping on the interface with the <b>traffic-shape rate</b> or <b>traffic-shape group</b> command before you can use the <b>traffic-shape adaptive</b> command.
-------------------------	---

The bit rate specified for the **traffic-shape rate** command is the upper limit, and the bit rate specified for the **traffic-shape adaptive** command is the lower limit to which traffic is shaped when BECN signals are received on the interface. The rate actually shaped to will be between these two bit rates.

You should configure this command and the **traffic-shape fecn-adapt** command on both ends of the connection to ensure adaptive traffic shaping over the connection, even when traffic is flowing primarily in one direction. The **traffic-shape fecn-adapt** command configures the router to reflect forward explicit congestion notification (FECN) signals as BECN signals.

<b>Examples</b>	The following example configures traffic shaping on serial interface 0.1 with an upper limit of 128 kbps and a lower limit of 64 kbps. This configuration allows the link to run from 64 to 128 kbps, depending on the congestion level.
-----------------	--

```
interface serial 0
 encapsulation-frame-relay
 interface serial 0.1
```

## ■ traffic-shape adaptive

```
traffic-shape rate 128000
traffic-shape adaptive 64000
traffic-shape fecn-adapt
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show traffic-shape</b>	Displays the current traffic-shaping configuration.
<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.
<b>traffic-shape fecn-adapt</b>	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# traffic-shape fecn-adapt

To reply to messages with the forward explicit congestion notification (FECN) bit (which are sent with TEST RESPONSE messages with the BECN bit set), use the **traffic-shape fecn-adapt** command in interface configuration mode. To stop backward explicit congestion notification (BECN) signal generation, use the **no** form of this command.

**traffic-shape fecn-adapt**

**no traffic-shape fecn-adapt**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Traffic shaping is disabled.

**Command Modes** Interface configuration

Command History	Release	Modification
	11.2	This command was introduced.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

**Usage Guidelines** Enable traffic shaping on the interface with the **traffic-shape rate** or **traffic-shape group** command. FECN is available only when traffic shaping is configured.

Use this command to reflect FECN bits as BECN bits. Reflecting FECN bits as BECN bits notifies the sending DTE that it is transmitting at a rate too fast for the DTE to handle. Use the **traffic-shape adaptivetraffic-shape adaptive** command to configure the router to adapt its transmission rate when it receives BECN signals.

You should configure this command and the **traffic-shape adaptive** command on both ends of the connection to ensure adaptive traffic shaping over the connection, even when traffic is flowing primarily in one direction.

**Examples** The following example configures traffic shaping on serial interface 0.1 with an upper limit of 128 kbps and a lower limit of 64 kbps. This configuration allows the link to run from 64 to 128 kbps, depending on the congestion level. The router reflects FECN signals as BECN signals.

```
interface serial 0
  encapsulation frame-relay
interface serial 0.1
  traffic-shape rate 128000
```

## ■ traffic-shape fecn-adapt

```
traffic-shape adaptive 64000
traffic-shape fecn-adapt
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show traffic-shape</b>	Displays the current traffic-shaping configuration.
<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# traffic-shape group

To enable traffic shaping based on a specific access list for outbound traffic on an interface, use the **traffic-shape group** command in interface configuration mode. To disable traffic shaping on the interface for the access list, use the **no** form of this command.

**traffic-shape group** *access-list* *bit-rate* [*burst-size* [*excess-burst-size*]]

**no traffic-shape group** *access-list*

## Syntax Description

<i>access-list</i>	Number of the access list that controls the packets that traffic shaping is applied to on the interface. Access list numbers can be numbers from 1 to 2699.
<i>bit-rate</i>	Bit rate that traffic is shaped to, in bits per second. This is the access bit rate that you contract with your service provider, or the service levels you intend to maintain. Bit rates can be numbers in the range of 8000 to 100000000 bps.
<i>burst-size</i>	(Optional) Sustained number of bits that can be sent per interval. On Frame Relay interfaces, this is the Committed Burst size contracted with your service provider. Valid entries are numbers in the range of 0 to 100000000.
<i>excess-burst-size</i>	(Optional) Maximum number of bits that can exceed the burst size in the first interval in a congestion event. On Frame Relay interfaces, this is the Excess Burst size contracted with your service provider. Valid entries are numbers in the range of 0 to 100000000. The default is equal to the <i>burst-size</i> argument.

## Command Default

Disabled

## Command Modes

Interface configuration

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Generic traffic shaping is not supported on ISDN and dialup interfaces. It is also not supported on nongeneric routing encapsulation tunnel interfaces. Traffic shaping is not supported with flow switching. Traffic shaping uses queues to limit surges that can congest a network. Data is buffered and then sent into the network in regulated amounts to ensure that traffic will fit within the promised traffic envelope for the particular connection.

The **traffic-shape group** command allows you to specify one or more previously defined access list to shape traffic on the interface. You must specify one **traffic-shape group** command for each access list on the interface.

The **traffic-shape group** command supports both standard and extended access lists.

Use traffic shaping if you have a network with differing access rates or if you are offering a subrate service. You can configure the values according to your contract with your service provider or the service levels you intend to maintain.

An interval is calculated as follows:

- If the *burst-size* is not equal to zero, the interval is the *burst-size* divided by the *bit-rate*.
- If the *burst-size* is zero, the interval is the *excess-burst-size* divided by the *bit-rate*.

Traffic shaping is supported on all media and encapsulation types on the router. To perform traffic shaping on Frame Relay virtual circuits, you can also use the **frame-relay traffic-shaping** command. For more information on Frame Relay Traffic Shaping, refer to the “Configuring Frame Relay” chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

If traffic shaping is performed on a Frame Relay network with the **traffic-shape rate** command, you can also use the **traffic-shape adaptive** command to specify the minimum bit rate to which the traffic is shaped.

## Examples

The following example enables traffic that matches access list 101 to be shaped to a certain rate and traffic matching access list 102 to be shaped to another rate on the interface:

```
interface serial 1
 traffic-shape group 101 128000 16000 8000
 traffic-shape group 102 130000 10000 1000
```

## Related Commands

Command	Description
<b>access-list (IP Standard)</b>	Defines a standard IP access list.
<b>show traffic-shape</b>	Displays the current traffic-shaping configuration.
<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape fecn-adapt</b>	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
<b>traffic-shape rate</b>	Enables traffic shaping for outbound traffic on an interface.

# traffic-shape rate

To enable traffic shaping for outbound traffic on an interface, use the **traffic-shape rate** command in interface configuration mode. To disable traffic shaping on the interface, use the **no** form of this command.

**traffic-shape rate** *bit-rate* [*burst-size* [*excess-burst-size*]] [*buffer-limit*]

**no traffic-shape rate**

## Syntax Description

<i>bit-rate</i>	Bit rate that traffic is shaped to, in bits per second. This is the access bit rate that you contract with your service provider, or the service levels you intend to maintain. Bit rates can be in the range of 8000 to 100000000 bps.
<i>burst-size</i>	(Optional) Sustained number of bits that can be sent per interval. On Frame Relay interfaces, this is the Committed Burst size contracted with your service provider. Valid entries are numbers in the range of 0 to 100000000.
<i>excess-burst-size</i>	(Optional) Maximum number of bits that can exceed the burst size in the first interval in a congestion event. On Frame Relay interfaces, this is the Excess Burst size contracted with your service provider. Valid entries are numbers in the range of 0 to 100000000. The default is equal to the <i>burst-size</i> argument.
<i>buffer-limit</i>	(Optional) Maximum buffer limit in bps. Valid entries are numbers in the range of 0 to 4096.

## Command Default

Traffic shaping for outbound traffic is not enabled.

## Command Modes

Interface configuration

## Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

Generic traffic shaping is not supported on ISDN and dialup interfaces. It is also not supported on nongeneric routing encapsulation tunnel interfaces. Traffic shaping is not supported with flow switching.

Traffic shaping uses queues to limit surges that can congest a network. Data is buffered and then sent into the network in regulated amounts to ensure that traffic will fit within the promised traffic envelope for the particular connection.

Use traffic shaping if you have a network with differing access rates or if you are offering a substrate service. You can configure the values according to your contract with your service provider or the service levels you intend to maintain.

An interval is calculated as follows:

- If the *burst-size* is not equal to zero, the interval is the *burst-size* divided by the *bit-rate*.
- If the *burst-size* is zero, the interval is the *excess-burst-size* divided by the *bit-rate*.

Traffic shaping is supported on all media and encapsulation types on the router. To perform traffic shaping on Frame Relay virtual circuits, you can also use the **frame-relay traffic-shaping** command. For more information on Frame Relay Traffic Shaping, refer to the “Configuring Frame Relay” chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

If traffic shaping is performed on a Frame Relay network with the **traffic-shape rate** command, you can also use the **traffic-shape adaptive** command to specify the minimum bit rate to which the traffic is shaped.

### Examples

The following example enables traffic shaping on serial interface 0 using the bandwidth required by the service provider:

```
interface serial 0
 traffic-shape rate 128000 16000 8000
```

### Related Commands

Command	Description
<b>show traffic-shape</b>	Displays the current traffic-shaping configuration.
<b>show traffic-shape statistics</b>	Displays the current traffic-shaping statistics.
<b>traffic-shape adaptive</b>	Configures a Frame Relay subinterface to estimate the available bandwidth when BECN signals are received.
<b>traffic-shape fecn-adapt</b>	Replies to messages with the FECN bit (which are set with TEST RESPONSE messages with the BECN bit set).
<b>traffic-shape group</b>	Enables traffic shaping based on a specific access list for outbound traffic on an interface.

# tx-ring-limit

To limit the number of packets that can be used on a transmission ring on the digital subscriber line (DSL) WAN interface card (WIC) or interface, use the **tx-ring-limit** command in ATM VC configuration mode. To not limit the number of packets that can be used on a transmission ring on a DSL WIC or interface, use the **no** form of this command.

**tx-ring-limit** *ring-limit*

**no tx-ring-limit** *ring-limit*

<b>Syntax Description</b>	<i>ring-limit</i>	Specifies the maximum number of allowable packets that can be placed on the transmission ring. Valid entries can be numbers from 1 to 32767. The default value is 60. On Cisco 1700 series routers, possible values are 2 through 60. On Cisco 2600 and 3600 series routers, possible values are 3 through 60.
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<b>Command Default</b>	The default value of the <i>ring-limit</i> argument is 60.
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<b>Command Modes</b>	ATM VC configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.0(7)XE1	This command was introduced.
	12.0(9)S	This command was incorporated into Cisco IOS Release 12.0(9)S.
	12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.
	12.2(2)XK	Support was added for asymmetric digital subscriber line (ADSL), and a transmission (tx) ring setting of 3 was added for latency-critical traffic for ADSL on Cisco 2600 and Cisco 3600 routers.
	12.2(4)XL	Support was added for G.SHDSL.
	12.2(8)YN	Enhanced quality of service (QoS) features were added for Cisco 1720, Cisco 1750, Cisco 1751, Cisco 1760, Cisco 2610XM-2651XM, Cisco 3640, Cisco 3640A, and Cisco 3660.
	12.3(2)T	Support was added for the following platforms: Cisco 1721, Cisco 2610–2651, Cisco 2610XM–2651XM, Cisco 2691, Cisco 3620, and Cisco 3660.
	12.3(3a)	Support was added for Packet over SONET (POS) interfaces on Cisco 7200 Series routers.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
	12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

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**Examples**

The following example configures the transmission ring limit to three packets on an ATM permanent virtual circuit (PVC) subinterface:

```
Router(config)# interface atm1/0.1 point-to-point  
Router(config-subif)# pvc 2/200  
Router(config-if-atm-vc)# tx-ring-limit 3
```

---

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show atm vc</b>	Displays all ATM PVCs and traffic information.

---

# vc-hold-queue

To configure the per-virtual circuit (VC) hold queue on an ATM adapter, use the **vc-hold-queue** command in interface configuration mode. To return to the default value of the per-VC hold queue, use the **no** form of this command.

**vc-hold-queue** *number-of-packets*

**no vc-hold-queue** *number-of-packets*

## Syntax Description

<i>number-of-packets</i>	Specifies number of packets that can be configured for the per-VC hold queue. Number of packets can be a minimum of 5 to a maximum of 1024.
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## Command Default

The default value of the hold queue is set by the queuing mechanism in use.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

## Usage Guidelines

This command can only be used on Cisco 7200 series routers and on Cisco 2600 and 3600 adapters that support per-VC queueing.

This command is configurable at the VC level only.

## Examples

The following example sets the per-VC hold queue to 55:

```
interface atm2/0.1
 pvc 1/101
  vc-hold-queue 55
```

## Related Commands

Command	Description
<b>hold-queue</b>	Specifies the hold-queue limit of an interface.
<b>show interfaces</b>	Displays statistics for all interfaces configured on the router or access server.
<b>show queueing interface</b>	Displays the queueing statistics of an interface or VC.

