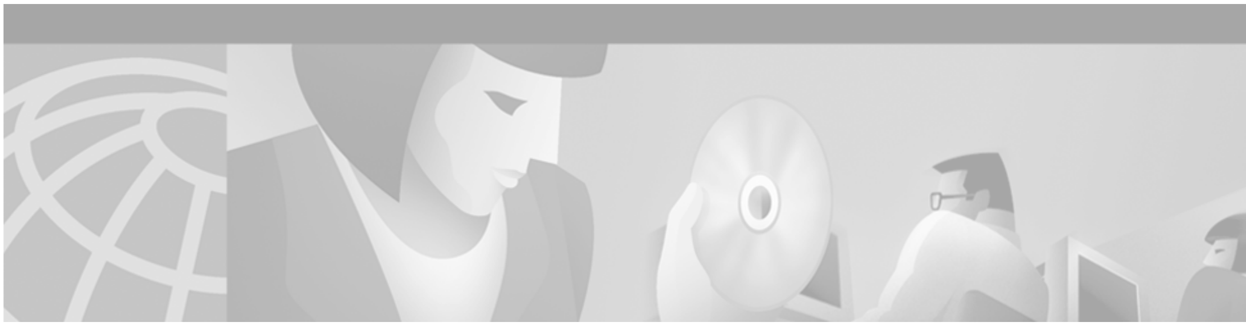


MPLS Class of Service Enhancements

This feature module describes the MPLS CoS (class of service) enhancements for Release 12.1(5)T.

The document contains the following sections:

- Feature Overview
- Supported Platforms
- Supported Standards and MIBs
- Prerequisites
- Configuration Tasks
- Using MPLS Class of Service Enhancements
- Setting the MPLS Experimental Field Value
- Configuring the Output IP Packet's CoS
- Command Reference
- Glossary

Note MPLS Class of Service is now referred to as MPLS Quality of Service. This transition reflects the growth of MPLS to encompass a wider meaning and highlight the path towards future enhancements.

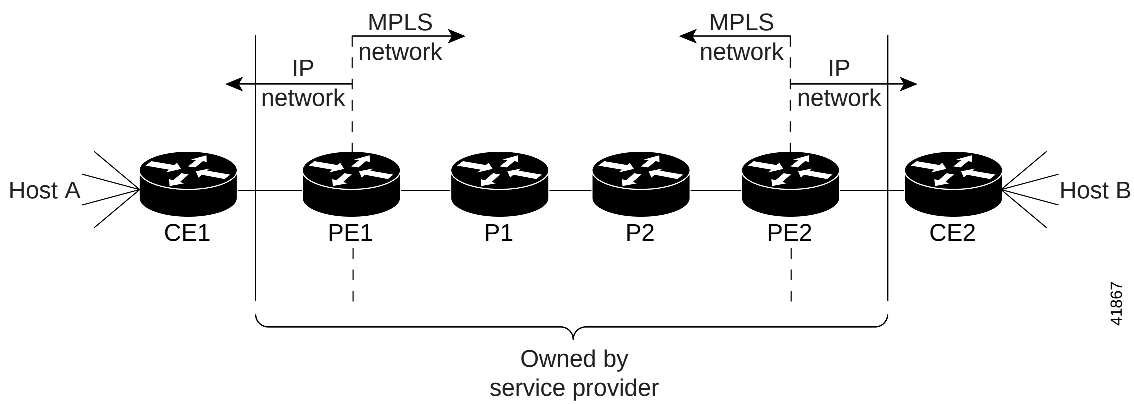
Feature Overview

When a customer transmits IP packets from one site to another, the IP precedence field (the first three bits of the DSCP field in the header of an IP packet) specifies the class of service (CoS). Based on the IP precedence marking, the packet is given the desired treatment such as the latency or the percent of bandwidth allowed for that class of service. If the service provider network is an MPLS network, then the IP precedence bits are copied into the MPLS EXP field at the edge of the network. However, the service provider might want to set an MPLS packet's CoS to a different value determined by the service offering.

This feature allows the service provider to set the MPLS experimental field instead of overwriting the value in the customer's IP precedence field. The IP header remains available for the customer's use; the IP packet's CoS is not changed as the packet travels through the multiprotocol label switching (MPLS) network.

Figure 1 shows an MPLS network that connects two sites of a customer's IP network.

Figure 1 MPLS Network Connecting Two Sites of a Customer's IP Network



> **Note** The network is bidirectional, but for the purpose of this document the packets move left to right.

In Figure 1, the symbols have the following meanings:

Symbol	Meaning
CE1	Customer equipment 1
PE1	Service provider edge router (ingress LSR)
P1	Service provider router within the core of the provider's network
P2	Service provider router within the core of the provider's network
PE2	Service provider edge router (egress LSR)
CE2	Customer equipment 2

> **Note** Notice that PE1 and PE2 are at the boundaries between the MPLS network and the IP network.

In Figure 1

- Packets arrive as IP packets at PE1, the provider edge router (also known as the ingress label switching router).
- PE1 transmits the packets as MPLS packets.

- Within the service provider network, there is no IP precedence field for the queuing mechanism to look at because the packets are MPLS packets. The packets remain MPLS packets until they arrive at PE2, the provider edge router.
- PE2 removes the label from each packet and forwards the packets as IP packets.

Benefits

This section describes

- Benefits to Service Providers
- Benefits to Customers

Benefits to Service Providers

MPLS class of service enhancements allow service providers to classify packets according to their type, input interface, and other factors by setting (marking) each packet within the MPLS experimental field without changing the IP precedence/DSCP field. For example, service providers can classify packets with or without considering the rate of the packets that PE1 receives. If the rate is a consideration, the service provider marks in-rate packets differently from out-of-rate packets.

Benefits to Customers

MPLS class of service enhancements preserve the IP packet's precedence/DSCP bits from being modified in the provider network so that the customer can differentiate traffic within their network, but need not buy multiple grades of service from the provider.

Related Features and Technologies

You should be familiar with the following concepts:

- MPLS
- Cisco Express Forwarding
- CoS

Each is described briefly below.

MPLS

This section briefly describes the difference between a non-MPLS and an MPLS network.

In an IP (non-MPLS) network, the Layer 2 destination address specifies the first router (PE1). The following actions occur:

1. The router looks up the destination address in the IP Router Forwarding table. This table indicates the output interface to which the packet should go.
2. At each hop, the router overwrites the Layer 2 header.

In an MPLS network, routers use labels instead of destination addresses. The following actions occur:

1. Each router calculates the shortest path to the destination network.
2. Each label switching router (LSR) assigns a label comprising 1 to 20 random bits to the shortest route.
3. Each router advertises the shortest route to all its neighbors (adjacent MPLS routers).

4. The router prepends a label to the packet.
5. When a router receives a packet, the label designates the interface to which the router should send the packet.

Note Tunnels allow a router to specify a path other than the shortest path to the destination. A router can put a value in the label other than the advertised label.

Cisco Express Forwarding

Cisco Express Forwarding (CEF) is advanced Layer 3 IP switching technology. CEF optimizes network performance and scalability for networks with large and dynamic traffic patterns, such as the Internet, and for networks characterized by intensive Web-based applications.

CoS

CoS refers to the ability of a network to provide differentiated service to selected network traffic over packet networks and cell networks. In particular, CoS features provide improved and more predictable network service by

- Supporting dedicated bandwidth
- Improving loss characteristics
- Avoiding and managing network congestion
- Shaping network traffic
- Setting traffic priorities across the network

The Class of Service (CoS) feature used in conjunction with MPLS enables network administrators to provide differentiated services across an MPLS network.

MPLS CoS supports the following services:

- Committed Access Rate (CAR)—Classifies packets according to input or output transmission rates. Allows you to set the MPLS experimental bits or the IP precedence/DSCP bits (whichever is appropriate).
- Weighted Random Early Detection (WRED)—Monitors network traffic to prevent congestion by dropping packets based on the IP precedence/DSCP bits or the MPLS experimental field.
- Class-Based Weighted Fair Queuing (CBWFQ)— An automated scheduling system that uses a queuing algorithm to ensure bandwidth allocation to different classes of network traffic.

Note The MPLS experimental bits allow you to specify the CoS for an MPLS packet. The IP precedence/DSCP bits allow you to specify the CoS for an IP packet.

For more information about CoS, see the *MPLS Class of Service* manual.

Related Documents

Refer to the *MPLS Class of Service* manual and to the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Supported Platforms

The network can contain the Cisco 7200 series and/or Cisco 7500 series routers.

Supported Standards and MIBs

Standards

Refer to the IETF http://www.ietf.org.

MIBs

Refer to class-based QoS MIB support.

Prerequisites

To use the MPLS CoS enhancements, your network must support the following Cisco IOS functions:

- MPLS
- CEF switching (on every MPLS-enabled router in your network)

Configuration Tasks

This section provides information about configuring the following:

- MPLS
- Cisco Express Forwarding
- CoS

Configuring MPLS

To configure MPLS, refer to the MPLS documentation.

Configuring Cisco Express Forwarding

Cisco Express Forwarding (CEF) is a prerequisite for using MPLS; CEF must be running on all routers in the network. To enable CEF on routers, enter the appropriate commands shown in Table 1.

Table 1 Cisco Express Forwarding Configuration Commands

For This Router ...	Enter This Command ...
Cisco 7200 series	**ip cef**
Cisco 7500 series	**ip cef distributed**

For more information about configuring CEF, see the *MPLS Class of Service* manual.

Configuring CoS

To configure CoS, you can configure one or more of the following (in addition, of course, to other items not described in this document):

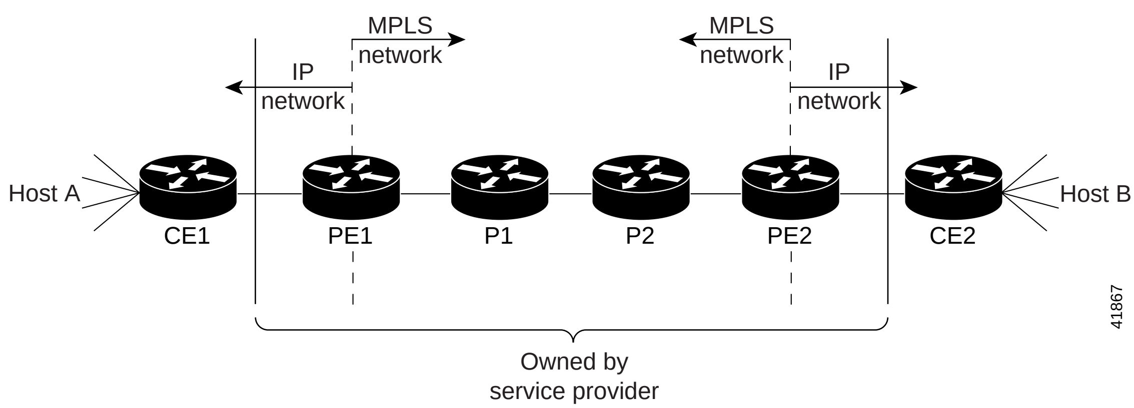
- CAR
- WRED
- WFQ

For configuration information, see the *MPLS Class of Service* manual.

Using MPLS Class of Service Enhancements

Figure 2 shows a service provider's MPLS network that connects two sites of a customer's network.

Figure 2 MPLS Network Connecting Two Sites of a Customer's IP Network



To use these features in a network, set the MPLS experimental field value at PE1 (the ingress label switching router) by using the modular QoS CLI or the **rate-limit** command that CAR provides. This sets the CoS value in the MPLS packet. For detailed instructions, go to "Setting the MPLS Experimental Field Value."

Setting the MPLS Experimental Field Value

Setting the MPLS experimental field value satisfies the requirement of service providers who do not want the value of the IP precedence field modified within IP packets transported through their networks.

By choosing different values for the MPLS experimental field, you can mark packets based on their characteristics, such as rate or type, so that packets have the priority that they require during periods of congestion.

Importance of Prioritizing a Packet Appropriately

During Step 1 of the configuration process (described in "Using the Modular QoS CLI to Configure the Ingress Label Switching Router" and "Using CAR to Configure the Ingress Label Switching Router") you classify IP packets according to their source address, destination address, port, protocol identification, or class of service field. For example, packets can be identified based on one or more of the above specified fields, as Voice Over IP (VoIP) or a File Transfer Protocol (FTP). Packet classification/marking is important because a packet's priority is determined by how it is classified/marked.

A packet's priority affects how the packet is treated during periods of congestion. For example, service providers have service level agreements (SLAs) with customers. The agreement specifies how much traffic the service provider has agreed to deliver. To comply with the agreement, the customer must not transmit more than the agreed-upon rate. Packets are considered to be in-rate or out-of-rate. If there is congestion in the network, out-of-rate packets might be dropped more aggressively.

Configuration Tasks

To classify IP packets, you configure the ingress label switching router. Packets are received at the ingress router as IP packets and transmitted as MPLS packets. To perform the configuration, use either of the following:

- Modular QoS CLI, the newer and more flexible method—Use this method if you do not want to consider the rate of the packets that PE1 receives.
- CAR—Use if you want to consider the rate of the incoming packets.
  - If a packet conforms to the service level agreement between the service provider and the customer (that is, the packet is in-rate), the service provider gives the packet preferential treatment when the service provider's network is congested.
  - If a packet does not conform (that is, it is out-of-rate) and the network is congested, the service provider might discard the packet or give it less preferential treatment.

Using the Modular QoS CLI to Configure the Ingress Label Switching Router

To use the modular QoS CLI to configure PE1 (the ingress label switching router), do the following:

Step 1 Configure a class map to classify IP packets according to their IP precedence.

Step 2 Configure a policy map to mark MPLS packets. (Write their classification into the MPLS experimental field.)

Step 3 Configure the input interface to attach the service policy.

Configuring a Class Map to Classify IP Packets

To configure a class map, perform the following steps:

	Command	Purpose
Step 1	`Router(config)#` **`class-map`** *`class-map-name`*	Specifies the class map to which packets will be matched.
Step 2	`Router(config-cmap)#` **`match`** *`criteria`*	Specifies the packet characteristics that will be matched to the class.
Step 3	`Router(config-cmap)#` **`end`**	Exits class map configuration mode.

In the following example, all packets that contain IP precedence 4 are matched by the class-map name IP_prec4:

```
Router(config)# class-map IP_prec4
Router(config-cmap)# match ip precedence 4
Router(config-cmap)# end
```

Configuring a Policy Map to Set the MPLS Experimental Field

To configure a policy map, perform the following steps:

	Command	Purpose
Step 1	`Router(config)#` **`policy-map`** *`policy-map-name`*	Creates a policy map that can be attached to one or more interfaces to specify a service policy.
Step 2	`Router(config-pmap)#` **`class`** *`class-map-name`*	Specifies the name of the class map previously designated in the **class-map** command.
Step 3	`Router(config-pmap-c)#` **`set mpls experimental`** *`value`*	Designates the value to which the MPLS bits are set if the packets match the specified policy map.
Step 4	`Router(config-pmap-c)#` **`end`**	Exits policy map configuration mode.

In the following example, the value in the MPLS experimental field of each packet that is matched by the class-map IP_prec4 is set to 5:

```
Router(config)# policy-map set_experimental_5
Router(config-pmap)# class IP_prec4
Router(config-pmap-c)# set mpls experimental 5
Router(config-pmap-c)# end
```

Configuring the Input Interface to Attach the Service Policy

To configure the input interface, perform the following steps:

	Command	Purpose
Step 1	`Router(config)#` **`interface`** *`name`*	Designates the input interface.
Step 2	`Router(config-int)#` **`service-policy input`** *`policy-map-name`*	Attaches the specified policy map to the input interface.
Step 3	`Router(config-int)#` **`end`**	Exits interface configuration mode.

In the following example, the service policy set_experimental_5 is attached to an Ethernet input interface:

```
Router(config)# interface et 1/0/0
Router(config-int)# service-policy input set_experimental_5
Router(config-int)# end
```

Using CAR to Configure the Ingress Label Switching Router

To use CAR to configure the ingress label switching router, do the following:

Step 1 Configure an IP rate-limit access list for classifying IP packets according to their IP precedence. Perform this step at PE1 (the ingress LSR).

Step 2 Configure a rate-limit on an input interface to set MPLS packets. (Write the packet's classification into the MPLS experimental field.)

These steps are explained in the following sections.

Configuring a Rate-Limit Access List for Classifying IP Packets

To configure a rate-limit access list, perform the following steps:

	Command	Purpose
Step 1	`Router(config)#` **`access-list rate-limit`** *`acl-index precedence`*	Specifies the criteria to be matched.
Step 2	`Router(config)#` **`end`**	Exits configuration mode.

In the following example, all packets that contain IP precedence 4 are matched by the rate-limit access list 24:

```
Router(config)# access-list rate-limit 24 4
Router(config)# end
```

Configuring a Rate-Limit on an Input Interface to Set MPLS Packets

To configure a rate-limit on an input interface, perform the following steps:

	Command	Purpose
Step 1	`Router(config)#` **interface** *name*	Designates the input interface.
Step 2	`Router(config-int)#` **rate-limit input** [**access-group** [**rate-limit**]*acl-index*] *bps burst-normal burst-max* **conform-action set-mpls-exp-transmit** *exp* **exceed-action set-mpls-exp-transmit** *exp*	Specifies the action to take on packets during label imposition.
Step 3	`Router(config-int)#` **end**	Exits interface configuration mode.

In the following example, the experimental field for the output MPLS packet is set to 4 if the input IP packets match the access-list and conform to the rate. The MPLS experimental field is set to 0 if packets match access list 24 and exceed the input rate.

```
Router(config)# interface et 1/0/0
Router(config-int)# rate-limit input access-group rate-limit 24 8000 8000 8000
conform-action set-mpls-exp-transmit 4 exceed-action set-mpls-exp-transmit 0
Router(config-int)# end
```

Configuring the Output IP Packet's CoS

The output packet's class of service is determined by the IP header information. For configuration details, refer to the *Cisco IOS Quality of Service Solutions Configuration Guide*.

Command Reference

This section documents the following new or modified commands:

- **access-list rate-limit**
- **rate-limit**
- **set mpls experimental**

All other commands used with this feature are documented in the Cisco IOS Release 12.0 and Release 12.1 command reference publications.

access-list rate-limit

To configure an access list for use with committed access rate (CAR) policies, use the **access-list rate-limit** global configuration command. 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

acl-index	Specifies the access list number. To classify packets by • IP precedence, use any number from 1 to 99 • MAC address, use any number from 100 to 199 • MPLS experimental field, use any number from 200 to 299
precedence	Specifies the IP precedence. Valid values are 0 to 7.
mac-address	Specifies the MAC address.
exp	Specifies the MPLS experimental field. Valid values are 0 to 7.
mask *mask*	Specifies the mask. Use this option if you want to assign multiple IP precedences or MPLS experimental field values to the same rate-limit access list.

Defaults

No CAR access lists are configured.

Command Modes

Global configuration

Command History

Release	Modification
11.1 CC	This command was introduced.
12.1(5)T	This command now includes an access list based on the MPLS experimental field.

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. This causes packets with different IP precedences, MAC addresses, or MPLS experimental field values to be 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 with 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:

Step 1 Decide which precedences you want to assign to this rate-limit access list.

Step 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.

Step 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.

Step 4 The command expects hexadecimal format. Convert the binary mask into the corresponding hexadecimal number. For example, 01000010 becomes 42. This value is used in the **access-list rate-limit** 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
rate-limit	Configures committed access rate (CAR) and distributed CAR (DCAR) policies.
show access-list rate-limit	Displays information about rate-limit access lists.

rate-limit

To configure CAR and DCAR policies, use the **rate-limit** interface configuration command. To remove the rate limit from the configuration, use the **no** form of this command.

rate-limit {**input** | **output**} [**access-group** [**rate-limit**] *acl-index*] *bps*
burst-normal burst-max **conform-action** *conform-action* **exceed-action** *exceed-action*

no rate-limit {**input** | **output**}[**access-group** [**rate-limit**] *acl-index*] *bps*
burst-normal burst-max **conform-action** *conform-action* **exceed-action** *exceed-action*

Syntax Description

input	Applies this CAR traffic policy to packets received on this input interface.
output	Applies this CAR traffic policy to packets sent on this output interface.
access-group	(Optional) Applies this CAR traffic policy to the specified access list.
rate-limit	(Optional) The access list is a rate-limit access list.
acl-index	(Optional) Access list number.
bps	Average rate, in bits per second. The value must be in increments of 8 kbps.
burst-normal	Normal burst size, in bytes. The minimum value is bps divided by 2000.
burst-max	Excess burst size, in bytes.
conform-action *conform-action*	Action to take on packets that conform to the specified rate limit. Specify one of the following keywords: • **continue**—Evaluate the next **rate-limit** command. • **drop**—Drop the packet. • **set-dscp-continue—**Set the differentiated services codepoint (0 to 63) and evaluate the next **rate-limit** command. • **set-dscp-transmit**—Transmit the differentiated services codepoint and transmit the packet. • **set-mpls-exp-continue—**Set the MPLS experimental bits (0 to 7) and evaluate the next **rate-limit** command. • **set-mpls-exp-transmit—**Set the MPLS experimental bits (0 to 7) and transmit the packet. • **set-prec-continue**—Set the IP precedence (0 to 7) and evaluate the next **rate-limit** command. • **set-prec-transmit—**Set the IP precedence (0 to 7) and transmit the packet. • **set-qos-continue**—Set the QoS group ID (1 to 99) and evaluate the next **rate-limit** command. • **set-qos-transmit**—Set the QoS group ID (1 to 99) and transmit the packet. • **transmit—**Transmit the packet.

exceed-action *exceed-action*	Action to take on packets that exceed the specified rate limit. Specify one of the following keywords: • **continue**—Evaluate the next **rate-limit** command. • **drop**—Drop the packet. • **set-dscp-continue—**Set the differentiated services codepoint (0 to 63) and evaluate the next **rate-limit** command. • **set-dscp-transmit—**Transmit the differentiated services codepoint and transmit the packet. • **set-mpls-exp-continue**—Set the MPLS experimental bits (0 to 7) and evaluate the next **rate-limit** command. • **set-mpls-exp-transmit**—Set the MPLS experimental bits (0 to 7) and transmit the packet. • **set-prec-continue—**Set the IP precedence (0 to 7) and evaluate the next **rate-limit** command. • **set-prec-transmit**—Set the IP precedence (0 to 7) and transmit the packet. • **set-qos-continue**—Set the QoS group ID (1 to 99) and evaluate the next **rate-limit** command. • **set-qos-transmit**—Set the QoS group ID (1 to 99) and transmit the packet. • **transmit**—Transmit the packet.

Defaults

CAR and DCAR are disabled.

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CC	This command was introduced.
12.1(5)T	This command now includes **conform** and **exceed** actions for the MPLS experimental field.

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.

Examples

In the following example, the rate is limited by application:

- 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 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 16000 bytes and an excess burst size of 24000 bytes. Traffic that conforms is transmitted 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 16000 24000 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 24000 32000
  conform-action set-mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 0
router(config-if)# rate-limit input access-group 102 10000000 24000 32000
  conform-action set-mpls-exp-transmit 5 exceed-action drop
router(config-if)# rate-limit input 8000000 16000 24000 conform-action
  set-mpls-exp-transmit 5 exceed-action drop
router(config-if)# ip address 200.200.14.250 255.255.255.252
!
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 FastEtheret1/1/0
router(config)# rate-limit input 8000 1000 1000 access-group conform-action
  set mpls-exp-transmit 5 exceed-action set-mpls-exp-transmit 5
```

Related Commands

Command	Description
access-list rate-limit	Configures an access list for use with committed access rate (CAR) policies.
show access-list rate-limit	Displays information about rate-limit access lists.
show interfaces rate-limit	Displays information about committed access rate (CAR) for a specified interface.

set mpls experimental

To configure a policy to set the MPLS experimental field within the modular QoS CLI, use the **set mpls experimental** policy map configuration command. To disable the policy map, use the **no** form of this command.

set mpls experimental *value*

no set mpls experimental *value*

Syntax Description

value	Specifies the value used to set MPLS experimental bits defined by the policy map. Valid values are 0 to 7, and they can be space-delimited. For example, 3 4 7.

Defaults

No default behavior or values.

Command Modes

Policy map configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

Use the policy map to set the MPLS experimental field when it is undesirable to modify the IP precedence field.

Examples

The following example specifies a policy map called out_pmap. The policy map comprises class maps. Class map mpls_2 matches packets with MPLS experimental field 2 and resets the MPLS experimental field to 3.

```
router(config)# class-map mpls_2
   match mpls experimental 2
router(config)# policy-map out_pmap
   class mpls_2
      set mpls experimental 3
```

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to the class specified.
policy-map	Creates a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Attaches a policy map to an input interface or an output interface to be used as the service policy for that interface.

Glossary

CAR—Committed Access Rate. Classifies packets according to input or output transmission rates. Allows you to set the MPLS experimental bits or the IP precedence/DSCP bits (whichever is appropriate).

CBWFQ—Class-based weighted fair queuing. An automated scheduling system that uses a queuing algorithm to ensure bandwidth allocation to different classes of network traffic.

CE router—Customer edge router. A router, which is part of a customer network, that interfaces to a PE router.

class-based weighted fair queuing—See CBWFQ.

class of service—See CoS.

CoS—A feature that provides scalable, differentiated types of service across an MPLS network.

committed access rate—See CAR.

customer network—A network that is under the control of an end customer. A customer network can use private addresses as defined in RFC 1918. Customer networks are logically isolated from each other and from the service provider's network.

differentiated services code point—See DSCP.

DSCP—Differentiated Services Code Point. Six bits in the IP header, as defined by the IETF. These bits determine the class of service provided to the IP packet.

IP precedence field—The first three bits of the DSCP field in the header of an IP packet. These bits allow you to specify the CoS for the IP packet.

label—A short, fixed-length label that tells switching nodes how to forward data (packets).

label disposition—The act of removing the last MPLS label from a packet.

label imposition—The act of putting an MPLS label onto a packet for transmission on a label switched path (LSP).

label switching router—See LSR.

LSR—Label switching router. A Layer 3 router that forwards a packet based on the value of a label encapsulated in the packet.

MPLS—Multiprotocol label switching. Emerging industry standard upon which label switching is based.

MPLS experimental bits—Bits that allow you to specify the CoS for an MPLS packet.

multiprotocol label switching—See MPLS.

PE router—Provider edge router. A router, at the edge of a service provider's network, that interfaces to CE routers.

provider edge router—See PE router.

provider network—A backbone network that is under the control of a service provider and provides transport between customer sites.

QoS—A measure of performance for a transmission system that reflects its transmission quality and service availability.

quality of service—See QoS.

VPN—Virtual private network. A network that enables IP traffic to use tunneling to travel securely over a public TCP/IP network.

virtual private network—See VPN.

WRED—Weighted random early detection. A congestion management algorithm that monitors network traffic and prevents congestion by dropping packets based on the IP precedence or the value in the MPLS experimental field.

weighted random early detection—See WRED.