



Class-Based Marking



Note

This document only details Class-Based Marking. The document does not detail matching on packets based on these markings.

The previous version of this document included information related to matching based on packet marks (which are configured in class map configuration mode). The sections related to matching have been removed from this document.

If you need information regarding packet matching, see the *Modular Quality of Service Command-Line Interface* document. The *Modular Quality of Service Command-Line Interface* is an overview document that previews all aspects of the Modular QoS CLI, including packet matching.

This document describes the Class-Based Packet Marking feature and includes the following sections:

- [Feature Overview, page 2](#)
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Feature Overview

Table 1 documents the history of this feature.

Table 1 Feature History

Cisco IOS Release	Enhancement
12.2(2)T	The set fr-de command was introduced.
12.1(5)T	The set cos command was introduced. The set atm-clp command was introduced in Cisco IOS Release 12.1 T.
12.1(2)T	This feature was introduced for Cisco IOS Release 12.1(2)T and support for ATM virtual circuits (VCs) was added. In addition, support was added for the Cisco 2600 series, Cisco 3640 series, and Cisco 4500 series routers. Support for the Cisco 7200 series router was also introduced for Cisco IOS Release 12.1 T.
12.0(5)XE	This feature was introduced as QoS Packet Marking. The original version of this feature supported matching based on IP Precedence, IP DSCP, and QoS Groups.

The Class-Based Packet Marking feature provides users with a user-friendly command-line interface (CLI) for efficient packet marking by which users can differentiate packets based on the designated markings. The Class-Based Packet Marking feature allows users to perform the following tasks:

- Mark packets by setting the IP precedence bits or the IP differentiated services code point (DSCP) in the IP type of service (ToS) byte.
- Mark packets by setting the Layer 2 Class of Service (CoS) value.
- Associate a local quality of service (QoS) group value with a packet.
- Set the Cell Loss Priority (CLP) bit setting in the ATM header of a packet from 0 to 1.
- Set the Frame Relay Discard Eligibility (DE) bit in the address field of the frame relay frame from 0 to 1.



Note

This feature module does not document any information related to MPLS experimental value marking. For information on MPLS experimental value marking, see the *MPLS Class of Service Enhancements* feature module in the Cisco IOS Release 12.1(5)T new feature documentation index.

In most cases, the purpose of a packet mark is identification. After a packet is marked, downstream devices identify traffic based on the marking and categorize the traffic according to network needs. This categorization occurs when the **match** commands in the traffic class are configured to identify the packets by the mark (for example, **match ip precedence**, **match ip dscp**, **match cos**, etc.). The traffic policy using this traffic class can then set the appropriate QoS features for the marked traffic. (For information on packet matching, see the note at the beginning of this feature module).

In some cases, the markings can be used for purposes besides identification. WRED and DWRED, for instance, can use the IP precedence or IP DSCP values to detect and drop packets. In ATM networks, the CLP bit of the packet is used to determine the priority of packet in a congested environment. If

congestion occurs in the ATM network, packets with the CLP bit set to 1 are dropped before packets with the CLP bit set to 0. Similarly, the DE bit of a frame relay frame is used to determine the priority of a frame in a congested frame relay network. In frame relay networks, frames with the DE bit set to 1 are dropped before frames with the DE bit set to 0.

Packet marking is supported on interfaces, subinterfaces, and ATM virtual circuits (VCs). In an ATM PVC, a user can configure packet marking in the same traffic policy where he or she configures the queuing actions, on a per-VC basis.

IP Precedence and IP DSCP Marking

Marking a packet with an IP precedence or IP DSCP marking allows users to classify traffic based on an IP precedence or IP DSCP value, depending on which value is marked. These marking can be used to identify traffic within the network, and other interfaces can match traffic based on the IP Precedence or DSCP markings.

IP Precedence and DSCP markings are also used to decide how packets should be treated in Weighted Random Early Detection (WRED).

The IP DSCP value is the first 6 bits in the ToS byte, while the IP Precedence value is the first 3 bits in the ToS value. Therefore, the IP Precedence value is actually part of the IP DSCP value. For this reason, both values cannot be set simultaneously. If both values are set at the same time, the packet will be marked with the IP DSCP value.

If you need to mark packets in your network and all of the devices support IP DSCP marking and matching, use the IP DSCP marking to mark your packets, since the IP DSCP markings provide more packet marking options (64 individual values can be marked using IP DSCP marking, while only 8 individual values can be marked using IP precedence marking). If marking by IP DSCP is somehow undesirable, however, or if you are unsure if the devices in your network support IP DSCP values, use the IP precedence value to mark your packets. The IP precedence value is likely supported by all devices in the network.

A user can set up to 8 different IP precedence markings and 64 different IP DSCP markings.

QoS Group Value Marking

Marking a packet with a local QoS group value allows users to identify a group ID with a packet. The group ID can be used to classify packets into QoS groups based on prefix, autonomous system, and community string. This QoS group marking can only be used to classify traffic within a single router and cannot, therefore, be used to mark packets leaving the router. For this reason, QoS group values cannot be applied on output traffic policies (which are attached to interfaces using the **service-policy output** command).

The QoS group value is usually used for one of the two following reasons:

- To leverage a large range of traffic classes. The QoS group value has 100 different individual packet markings, as opposed to IP DSCP and IP Precedence, which have 64 and 8 values, respectively.
- If changing the IP Precedence or IP DSCP value of the packet is undesirable.

A user can set up to 100 different QoS group markings.

CoS Value Marking

Marking a packet with a local CoS value allows users to associate a Layer 2 Class of Service value with a packet. The value can then be used to classify packets based on user-defined requirements. Layer 2 to Layer 3 mapping can also be configured by matching on the CoS value, since switches already have the capability to 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, since the switch can process the layer 2 CoS header marking.

The CoS value cannot be marked as part of an input traffic policy (which is attached to an interface using the **service-policy input** command). A CoS value marking can only be applied to output traffic policies (which are attached using the **service-policy output** command).

A user can set up to 8 different CoS markings.

ATM Cell Loss Priority Bit Setting

The ATM Cell Loss Priority (CLP) bit setting is used as a method for prioritizing the discarding of cells in congested ATM networks. A CLP bit has only one bit and can therefore only have two settings, 0 or 1. If congestion occurs in an ATM network, cells with a CLP bit setting of 1 are discarded before cells with a CLP bit setting of 0. Therefore, important ATM cells should be forwarded with the CLP bit set to 0, while less important ATM cells should be forwarded with the CLP bit set to 1.

ATM CLP bit setting is especially useful when a packet that left a Cisco router has been converted into an ATM cell. By default, the new cell has a CLP bit setting of 0. This setting can be changed using ATM CLP bit setting.

Frame Relay Discard Eligibility Bit Setting

The discard eligibility (DE) bit in the address field of a frame relay frame is used as a method for prioritizing the discarding of frames in congested frame relay networks. The frame relay DE bit has only one bit and can therefore only have two settings, 0 or 1. If congestion occurs in a frame relay network, frames with the DE bit set at 1 are discarded before frames with the DE bit set at 0. Therefore, important traffic should have the DE bit set at 0 while less important traffic should be forwarded with the DE bit set at 1.

The default DE bit setting is 0. The Class-Based Packet Marking feature allows users to change the DE bit setting to 1 for various traffic, giving users the option of keeping the default value of 0 or changing the value to 1. For this reason, users can use the frame relay DE bit marking to prioritize frames in a frame relay network.

Benefits

Network Partitioning and Categorizing

Packet marking allows you to partition your network into multiple priority levels or classes of service, as follows:

- Class-Based Packet Marking is often used to set the IP precedence or IP DSCP values for packets entering a network. Networking devices within your network can then use the newly-marked IP precedence values to determine how traffic should be treated. For example, voice packets can be marked with a particular marking (IP precedence or DSCP) and Low Latency Queueing (LLQ) can

then be configured to put all packets of that mark into a priority queue. In this case, the marking was used to identify a packet for LLQ.

A marking can be used to identify a packet for any class-based QoS feature (any feature available in policy map class configuration mode, although some restrictions exist).

- Use Class-Based Marking to assign packets to a QoS group within a router. The router can use the QoS groups to determine how to prioritize packets for transmission. The QoS group value is usually used for one of the two following reasons:
 - To leverage a large range of traffic classes. The QoS group value has 100 different individual packet markings, as opposed to IP DSCP and IP Precedence, which have 64 and 8, respectively.
 - If changing the IP Precedence or IP DSCP value of the packet is undesirable.

Layer 2 to Layer 3 Mapping

If a packet that needs to be marked to differentiate user-defined QoS services is leaving a router and entering a switch, the router can set the CoS value of the packet, since the switch can process the layer 2 CoS header marking, and vice versa.

Weighted Random Early Detection Configuration

Weighted random early detection (WRED) uses IP precedence values or IP DSCP values to determine the probability that a packet will be dropped. Therefore, the IP precedence and IP DSCP markings can be used in conjunction with the WRED feature.

Improved Bandwidth Management in ATM Networks

The ability to set the ATM CLP bit allows users to extend their IP QoS policies into an ATM network. As congestion occurs in the ATM network, cells with the CLP bit set are more likely to be dropped, resulting in improved network performance for higher priority traffic and applications.

Improved Bandwidth Management in Frame Relay Networks

The ability to set the Frame Relay DE bit allows users to manage bandwidth in a frame relay network. As congestion occurs in a Frame Relay network, frames with the Frame Relay DE bit set are more likely to be dropped, resulting in improved network performance for higher priority traffic and applications.

Restrictions

- The Class-Based Packet Marking feature only marks packets traveling on Cisco Express Forwarding (CEF) switching paths. In order to use the Class-Based Packet Marking feature, CEF must be configured on both the interface receiving the packet and the interface sending the packet. For information on CEF switching, consult the Cisco Express Forwarding section of the *Cisco IOS Switching Services Configuration Guide*.
- Class-Based Marking can be configured on an interface, a subinterface, or an ATM permanent virtual circuit (PVC). This feature is not supported on the following interfaces:
 - Fast EtherChannel
 - Tunnel
 - PRI
 - ATM switched virtual circuit (SVC)
 - Any interface that does not support CEF

- Before modifying the encapsulation type from IEEE 802.1 Q to ISL, or vice versa, on a subinterface, detach the policy map from the subinterface. After changing the encapsulation type, reattach the policy map.
- A traffic policy containing the **set qos-group** command can only be attached as an input traffic policy. QoS group values are not usable for packets leaving a router.
- A traffic policy containing the **set cos** command can only be attached as an output traffic policy.
- A traffic policy containing the **set atm-clp** command can be attached as an output traffic policy only. The **set atm-clp** command does not support packets that originate from the router.

Related Features and Technologies

- Modular Quality of Service Command-Line Interface. The Class-Based Marking can be used in conjunction with other class-based features (although restrictions might apply depending on which markings are used with which features). The following list includes some class-based features:
 - Weighted Random Early Detection, Distributed Weighted Random Early Detection, and Differentiated Services Compliant Weighted Random Early Detection
 - Traffic Shaping
 - Traffic Policing
 - Class-Based Weighted Fair Queueing and Distributed Class-Based Weighted Fair Queueing
 - Low Latency Queueing and Distributed Low Latency Queueing
- Cisco Express Forwarding

Related Documents

- *Modular Quality of Service Command-Line Interface* document
- *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.1
- *Cisco IOS Quality of Service Solutions Command Reference*, Release 12.1
- Cisco Express Forwarding section of the *Cisco IOS Switching Services Configuration Guide*
- *Weighted Random Early Detection* feature module
- *Distributed Weighted Random Early Detection and Distributed CBWFQ* document
- *DiffServ Compliant Weighted Random Early Detection* feature module

Supported Platforms

- Cisco 2600 series
- Cisco 3640 routers
- Cisco 4500 series
- Cisco 7100 series
- Cisco 7200 series
- Cisco 7500 series with a Versatile Interface Processor (VIP)

**Note**

To use the **set atm-clp** command available with the Class-Based Marking feature, you must have one of the following adapters: the Enhanced ATM Port Adapter (PA-A3), the ATM Inverse Multiplexer over ATM Port Adapter with 8 T1 Ports (PA-A3-8T1IMA), or the ATM Inverse Multiplexer over ATM Port Adapter with 8 E1 Ports (PA-A3-8E1IMA).

Therefore, the **set atm-clp** command is not supported on any platform that does not support these adapters. For more information, refer to the documentation for your specific router.

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

The Class-Based Quality of Service MIB stores information about Modular QoS CLI features, including the Class-Based Marking features. This MIB is actually the following two MIBs:

- CISCO-CLASS-BASED-QOS-MIB
- CISCO-CLASS-BASED-QOS-CAPABILITY-MIB

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2475, *An Architecture for Differentiated Services*
- RFC 2597, *Assured Forwarding PHB Group*
- RFC 2598, *An Expedited Forwarding PHB*

Prerequisites

CEF must be configured on the interface before class-based QoS packet marking can be used.

For information on CEF switching, consult the Cisco Express Forwarding section of the *Cisco IOS Switching Services Configuration Guide*.

Configuration Tasks

See the following sections for configuration tasks for the Class-Based Packet Marking feature. Each task in the list is identified as optional or required.

- [Configuring an IP Precedence Value](#) (Optional)
- [Configuring an IP DSCP Value](#) (Optional)
- [Configuring a QoS Group Value](#) (Optional)

- [Configuring a CoS Value](#) (Optional)
- [Changing an ATM CLP Bit Setting](#) (Optional)
- [Changing a Frame Relay DE Bit Setting](#) (Optional)
- [Verifying the Class-Based Packet Marking Feature](#) (Optional)

To configure the Class-Based Packet Marking feature, you must either configure an IP precedence value or an IP DSCP value.

Configuring an IP Precedence Value

To mark a packet by setting the IP precedence bits in the ToS byte, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the service policy to configure.
Step 2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class, which was defined with the class-map command, included in the service policy.
Step 3	Router(config-pmap-c)# set ip precedence <i>ip-precedence-value</i>	Specifies the IP precedence of packets within a traffic class. The <i>ip-precedence-value</i> is in the range 0 to 7.

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring an IP DSCP Value

To mark a packet by setting the IP DSCP value, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the service policy to configure.
Step 2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class, which was defined with the class-map command, included in the service policy.
Step 3	Router(config-pmap-c)# set ip dscp <i>ip-dscp-value</i>	Specifies the IP DSCP value of packets within a traffic class. The number is in the range 0 to 63. Reserved keywords such as EF (expedited forwarding) and AF11 (assured forwarding class AF11) can be specified instead of numeric values.

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring a QoS Group Value

To associate a local QoS group value with a packet, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the service policy to configure.
Step 2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class, which was defined with the class-map command, included in the service policy.
Step 3	Router(config-pmap-c)# set qos-group <i>qos-group-value</i>	Specifies a QoS group value to associate with the packet. The number is in the range 0 to 99.

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring a CoS Value

To mark a packet with a specific CoS value, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the service policy to configure.
Step 2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class, which was defined with the class-map command, included in the service policy.
Step 3	Router(config-pmap-c)# set cos <i>cos-value</i>	Specifies a CoS value or values to associate with the packet. The number is in the range 0 to 7.

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.



Note

A service policy that contains the **set cos** command can only be attached as an output service policy. The **set cos** command cannot be applied to packets entering an interface.

Changing an ATM CLP Bit Setting

To set the CLP bit to 1 on all packets matching a specified class, use the following commands.

Step	Command	Purpose
1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the policy-map to configure.

Step	Command	Purpose
2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class included in the service policy.
3	Router(config-pmap-c)# set atm-clp	Sets the ATM CLP bit setting for all packets matching the specified class from 0 to 1.

This command is applied when you create a service policy in policy map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Changing a Frame Relay DE Bit Setting

To change the Frame Relay DE bit from the default value of 0 to 1 on classified traffic using the Modular QoS CLI, enter the following commands:

Step	Command	Purpose
1	Router(config)# policy-map <i>policy-name</i>	Specifies the name of the policy-map to configure.
2	Router(config-pmap)# class <i>class-name</i>	Specifies the name of a predefined class included in the service policy.
3	Router(config-pmap-c)# set fr-de	Sets the Frame Relay DE bit setting for all packets matching the specified traffic class from 0 to 1.

This command is applied when you create a service policy in policy map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Verifying the Class-Based Packet Marking Feature

To verify the Class-Based Packet Marking feature and display the configuration of a policy map and retrieve information regarding QoS packet marking features that are configured in policy map configuration mode, use the **show policy-map [interface [interface-spec [input | output [class class-name]]]]** command in EXEC mode.

Command	Purpose
Router# show policy-map	Displays all configured policy maps.
Router# show policy-map <i>policy-map-name</i>	Displays the user-specified policy map.
Router# show policy-map interface	Displays statistics and configurations of all input and output policies that are attached to an interface.
Router# show policy-map interface <i>interface-spec</i>	Displays configuration and statistics of the input and output policies attached to a particular interface.
Router# show policy-map interface <i>interface-spec</i> [<i>input</i>]	Displays configuration and statistics of the input policy attached to an interface.

Command	Purpose
Router# show policy-map interface <i>interface-spec</i> [<i>output</i>]	Displays configuration and statistics of the output policy attached to an interface.
Router# show policy-map <i>interface-spec</i> [<i>input</i> <i>output</i>] [class <i>class-name</i>]	Displays the configuration and statistics for the class name configured in the policy.

Configuration Examples

This section provides the following configuration examples:

- [Configuring an IP Precedence Value Example](#)
- [Configuring an IP DSCP Value Example](#)
- [Configuring a QoS Group Value Example](#)
- [Configuring a Classifying CoS Values Example](#)
- [Changing the ATM CLP Value Example](#)

Configuring an IP Precedence Value Example

In the following example, a service policy called `policy1` is created. This service policy is associated to a previously defined classification policy through the use of the `class` command. This example assumes that a classification policy called `class1` was previously configured.

In this example, the IP precedence bit in the ToS byte is set to 1.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip precedence 1
```

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring an IP DSCP Value Example

In the following example, a service policy called `policy1` is created. This service policy is associated to a previously defined classification policy through the use of the `class` command. This example assumes that a classification policy called `class1` was previously configured.

In the following example, the IP DSCP value in the ToS byte is set to 5.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip dscp 5

Router(config-pmap-c)# class class2
Router(config-pmap-c)# set ip dscp ef
```

After you configure the settings shown for voice packets at the edge, all intermediate routers are configured to provide low latency treatment to the voice packets, as follows:

```
Router(config)# class-map voice
Router(config-cmap)# match ip dscp ef
```

```
Router(config)# policy qos-policy
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 24
```

The service policy configured in this section is not yet attached to an interface. This action is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring a QoS Group Value Example

In the following example, a service policy called policy1 is created. This service policy is associated to a previously defined classification policy through the use of the **class** command. This example assumes that a classification policy called class1 was previously configured.

In the following example, the QoS group value is set to 4.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set qos-group 4
```

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Configuring a Classifying CoS Values Example

In the following example, a service policy called policy1 is created. This service policy is associated to a previously defined classification policy through the use of the **class** command. This example assumes that a classification policy called class1 was previously configured.

In the following example, the CoS value is set to 5.

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set cos 5
```

Changing the ATM CLP Value Example

In the following example, a service policy called policy1 is created. This service policy is associated to a previously defined classification policy through the use of the **class** command. This example assumes that a classification policy called class1 was previously configured.

In this example, all packets with IP precedence values of 0 or 1 are sent with the CLP bit set to 1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class atm-discard
Router(config-pmap-c)# set atm-clp
```

The service policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Changing the Frame Relay DE Bit Value Example

In the following example, a traffic policy called `policy1` is created. This traffic policy is associated to a previously defined traffic class through the use of the `class` command. This example assumes that a traffic class called `class1` was previously configured.

In this example, all packets with IP precedence values of 0 or 1 are sent with the Frame Relay DE bit set to 1:

```
Router(config)# policy-map policy1  
Router(config-pmap)# class fr-discard  
Router(config-pmap-c)# set fr-de
```

The traffic policy configured in this section is not yet attached to an interface. This command is applied when you attach a service policy to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

- [set atm-clp](#)
- [set cos](#)
- [set fr-de](#)
- [set ip dscp](#)
- [set ip precedence](#)
- [set qos-group](#)
- [show policy-map interface](#)

**Note**

These commands are applied using the Modular QoS CLI. For more information on the Modular QoS CLI, including a listing of **match** command options, see the *Modular Quality of Service Command Line Interface* document on CCO and the Documentation CD-ROM.

**Note**

This feature module does not document any information related to MPLS experimental value marking which is applied using the **set mpls experimental** command. For information on MPLS experimental value marking, see the *MPLS Class of Service Enhancements* feature module in the Cisco IOS Release 12.1(5)T new feature documentation index.

set atm-clp

To control the cell loss priority (CLP) bit setting on Cisco routers, use the **set atm-clp** command when configuring a policy map.

set atm-clp

Syntax Description This command has no arguments or keywords.

Defaults The CLP bit is automatically set to 0 when Cisco routers convert packets into ATM cells for ATM networks.

Command Modes Policy map class.

Command History

Release	Modification
12.0(7)S	This command was introduced.
12.1(5)T	This command was introduced on Cisco IOS Release 12.1 T.

Usage Guidelines To disable this command, remove the service policy from the interface.

Examples The following example illustrates a CLP bit set using the **set atm-clp** command in the policy map:

```
Router(config)# class-map ip-prec
Router(config-cmap)# match ip precedence 0 1
Router(config-cmap)# exit
Router(config)# policy-map atm-clp-set
Router(config-pmap)# class ip-prec
Router(config-pmap-c)# set atm-clp
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config)# service-policy output bear
```

Related Commands

Command	Description
policy-map	Specifies the policy map to which the class belongs.
show policy-map	Displays information about the policy-map for an interface.
show atm pvc	Displays information about the PVCs on an interface.

set cos

To set the Layer 2 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
no set cos cos-value
```

Syntax Description	cos	Specifies matching of IEEE 802.1Q/ISL Class of Service values.
	cos-value	Specific IEEE 802.1Q Class of Service value. The <i>cos-value</i> is between 0 and 7.

Defaults Disabled

Command Modes Policy map class configuration

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

Usage Guidelines

CoS packet marking is only supported in the CEF-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 only be used 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 in conjunction to allow routers and switches to interoperate and provide Quality of Service based on the CoS markings.

Layer 2 to Layer 3 mapping can be configured by matching on the CoS value, since switches already have the capability to 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, since the switch can process the layer 2 header.

Examples

In the following example, the cos-set policy map is created to assign different Classes of Service for different types of traffic. This example assumes that the class maps 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)# exit
Router(config-pmap)# exit
```

This command is applied when you create a service policy in policy map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Displays the configuration of classes configured for service policies on the specified interface or PVC.
show policy-map	Displays the configuration of all classes comprising the specified service policy map or all classes for all existing policy maps.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show policy-map interface	Displays the configuration of classes configured for service policies on the specified interface or PVC.

set fr-de

To change the 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** policy map class command. To disable the set fr-de policy map class command, use the **no set fr-de** 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.

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 will be made to the frame.

Examples

The following example illustrates a DE bit that was set using the **set fr-de** command in the traffic policy:

```
Router(config)# class-map ip-prec
Router(config-cmap)# match ip precedence 0 1
Router(config-cmap)# exit
Router(config)# policy-map atm-clp-set
Router(config-pmap)# class ip-prec
Router(config-pmap-c)# set fr-de
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface atm 1/0/0
Router(config)# service-policy output bear
```

Related Commands

Command	Description
policy-map	Specifies the policy map to which the class belongs.
show policy-map	Displays information about the policy-map for an interface.

set ip dscp

To mark a packet by setting the IP differentiated services code point (DSCP) in the type of service (ToS) byte, use the **set ip dscp** policy map configuration command. 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>	A number from 0 to 63 that sets the IP DSCP value. Reserved keywords, such as EF (expedited forwarding) and AF11 (assured forwarding class AF11), can be specified instead of numeric values.
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Defaults	No default behavior or values.
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Command Modes	Policy map configuration
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Command History	Release	Modification
	12.0(5)XE	This command was introduced in policy map configuration mode.
	12.1(2)T	This command was enhanced to include reserved keywords such as EF, AF11, AF12, and so on instead of numeric values.

Usage Guidelines	<p>Once the IP DSCP bit is set, other quality of service (QoS) services can then operate on the bit settings. You cannot mark a packet by the IP precedence with the set ip precedence command and mark the same packet with an IP DSCP value by entering the set ip dscp command. If you are unsure of which method of marking to utilize, utilize IP precedence marking when your</p> <p>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 then 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 times of congestion.</p> <p>Reserved keywords such as EF, AF11, AF12 and so on can be specified instead of numeric values.</p>
-------------------------	---

Examples

In the following example, the IP DSCP ToS byte is set to 8 in the policy map named policy1:

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set ip dscp 8
```

All packets that satisfy the match criteria of class1 are marked with the IP DSCP value of 8. How packets marked with the IP DSCP value of 8 are treated is determined by the network configuration.

After you configure the settings shown for voice packets at the edge, all intermediate routers are then configured to provide low latency treatment to the voice packets, as follows:

```
Router(config)# class-map voice
Router(config-cmap)# match ip dscp ef
Router(config)# policy qos-policy
Router(config-pmap)# class voice
Router(config-pmap-c)# priority 24
```

The **set ip dscp** command is applied when you create a service policy in policy map configuration mode. This service policy is not yet attached to an interface. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy	Displays the configuration of classes configured for service policies on the specified interface or PVC.
show policy-map	Displays the configuration of all classes comprising the specified service policy map or all classes for all existing policy maps.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show policy-map interface	Displays the configuration of classes configured for service policies on the specified interface or PVC.

set ip precedence

To set the precedence value in the IP header, use the **set ip precedence** policy map configuration command. To leave the precedence value as is, use the **no** form of this command.

set ip precedence *ip-precedence-value*

no set ip precedence

Syntax Description	<i>ip-precedence-value</i> A number from 0 to 7 that sets the precedence bit in the IP header.
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Defaults	This command is disabled by default.
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Command Modes	Policy map configuration
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Command History	Release	Modification
	11.0	This command was introduced.
12.0(5)XE	This command was introduced in the modular quality of service (QoS) command-line interface.	

Usage Guidelines	<p>Once the IP precedence bits are set, other QoS services such as weighted fair queuing (WFQ) and weighted random early detection (WRED) then operate on the bit settings.</p> <p>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.</p>
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Examples	The following example sets the IP precedence to 5 for packets that satisfy the match criteria of class map class1:
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```
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 marked with the IP precedence value of 5 are treated is determined by the network configuration.

The **set ip precedence** command is applied when you create a service policy in 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, see the *Modular Quality of Service Command-Line Interface* document.

Related Commands	Command	Description
	policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy	Displays the configuration of classes configured for service policies on the specified interface or PVC.
	show policy-map	Displays the configuration of all classes comprising the specified service policy map or all classes for all existing policy maps.
	show policy-map interface	Displays the configuration of classes configured for service policies on the specified interface or PVC.

set qos-group

To set a group ID that can be used later to classify packets, use the **set qos-group** policy map configuration command. To remove the group ID, use the **no** form of this command.

```
set qos-group group-id
```

```
no set qos-group group-id
```

Syntax Description	<i>group-id</i>	Group ID number in the range 0 to 99.
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Defaults	This command is disabled by default. No group ID is specified.
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Command Modes	Policy map configuration
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Command History	Release	Modification
	11.1 CC	This command was introduced.
12.0(5)XE	This command was introduced in the modular quality of service (QoS) command-line interface.	

Usage Guidelines	<p>This 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 on prefix, autonomous system, and community string.</p> <p>To display QoS group information, use the show ip cef command.</p>
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Examples	<p>The following example sets the QoS group to 1 for all packets that match the class1 class map. These packets are then rate limited based on the QoS group ID.</p>
-----------------	--

```
Router(config)# policy-map policy1
Router(config-pmap)# class class1
Router(config-pmap-c)# set qos-group 1
```

The **set qos-group** command is applied when you create a service policy in policy map configuration mode. This service policy is not yet attached to an interface or an ATM virtual circuit. For information on attaching a service policy to an interface, see the *Modular Quality of Service Command-Line Interface* document.

Related Commands	Command	Description
	policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy	Displays the configuration of classes configured for service policies on the specified interface or PVC.
	show policy-map	Displays the configuration of all classes comprising the specified service policy map or all classes for all existing policy maps.
	show policy-map interface	Displays the configuration of classes configured for service policies on the specified interface or PVC.

show policy-map interface

To display the configuration of all classes configured for all service policies on the specified interface or to display the classes for the service policy for a specific permanent virtual circuit (PVC) on the interface, use the **show policy-map interface** global configuration command.

show policy-map interface *interface-name* [**vc** [*vpi*] *vci*]

Syntax Description	
<i>interface-name</i>	Name of the interface or subinterface whose policy configuration is to be displayed.
vc	(Optional) For ATM interfaces only, shows the policy configuration for a specified 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 "f" and a <i>vpi</i> value defaults the <i>vpi</i> value to 0. On the Cisco 7200 and 7500 series routers, this value ranges from 0 to 255. The arguments <i>vpi</i> and <i>vci</i> 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 atm vc-per-vc command. Typically, lower values 0 to 31 are reserved for specific traffic (for example, 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 arguments <i>vpi</i> and <i>vci</i> cannot both be set to 0; if one is 0, the other cannot be 0.

Defaults There is no default behavior.

Command Modes Global configuration

Command History	Release	Modification
	12.0(5)T	This command was introduced.
	12.1(2)T	This command was modified to display the total number of packets marked by the quality of service (QoS) set action.

Usage Guidelines

This command displays the configuration for classes on the specified interface or the specified PVC only if a service policy has been attached to the interface or the PVC.

You can use the *pvc-name* argument to display output for a PVC only for Enhanced ATM port adapters (PA-A3) that support per-VC queueing.

Examples

The following example displays configurations for classes on the output interface e1/1:

```
Router# show policy-map interface output e1/1
```

```
Ethernet1/1 output : po1
  Class class1
  QoS Set
    Packets marked 10000
  Class class2
  QoS Set
    Packets marked 20000
```