Quality of Service Commands

This module lists quality of service (QoS) commands in alphabetical order.

To use commands of this module, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using any command, contact your AAA administrator for assistance.

For detailed information about QoS concepts, configuration tasks, and examples, see the *Modular QoS Configuration Guide for Cisco CRS Routers*.

bandwidth (QoS)

To specify the minimum bandwidth allocated to a class belonging to a policy map, use the **bandwidth** command in policy map class configuration mode. To remove the bandwidth specified for a class, use the **no** form of this command.

bandwidth {*rate* [*units*] | **percent** *percentage-value*}
no bandwidth {*rate* [*units*] | **percent** *percentage-value*}

Syntax Description		
	rate	Minimum bandwidth, in the units specified, to be assigned to the class. Range is from 1 to 4294967295.
	units	Specifies the units for the bandwidth. Values can be:
		• **bps**—bits per second
		• **gbps**—gigabits per second
		• **kbps**—kilobits per second (default)
		• **mbps**—megabits per second
	percent *percentage-value*	Specifies the amount of guaranteed bandwidth, based on an absolute percentage of available bandwidth. Range is from 1 to 100.

Command Default

The default units is kbps.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The ability to select the units for the bandwidth was added.
	The range of bandwidth values was changed from 8 to 4000000 to 1 to 4294967295.
Release 3.3.1	Minimum rate value changed from 128 kbps to 256 kbps.

Usage Guidelines

The **bandwidth** command is used to specify the minimum guaranteed bandwidth allocated for traffic matching a particular class. Bandwidth may be defined as a specific value or may be set as a percentage of the interface bandwidth.

Note

By default, and without any QoS configuration, the default group of an interface is allowed a minimum bandwidth of either 1 percent of the interface rate or 10 Mbps. This is applicable only on the egress.

The actual bandwidth used is calculated in multiples of 256 kbps, the minimum bandwidth rate. The configured value is rounded to the nearest multiple of 256 kbps. The value shown in the output of the running-configuration shows the configured value as entered by the user.

If a percentage value is set, the accuracy that can be expected is 1 percent.

The **bandwidth** command can be used only within egress service policies. Use within an ingress policy is not supported.

Note The bandwidth value takes into account the Layer 2 encapsulation that is applied to traffic leaving the interface. For POS/SDH transmission, the encapsulation is considered to be 4 bytes. For Ethernet, the encapsulation is 14 bytes; whereas for IEEE 802.1Q, the encapsulation is 18 bytes. The actual bandwidth assigned to a class can be seen in the output of the **show qos interface** command.

Be careful when specifying bandwidth guarantees close to 100 percent, because the Layer 2 encapsulation considered does not include the entire Layer 2 header. This can lead to oversubscription, particularly in the case of small packet sizes.

For bundled interfaces, **bandwidth** can be configured only as a percentage.

A policy map can have a single bandwidth statement per class. Both percentage and actual value bandwidth configurations can be used within a policy map.

The **bandwidth** command does not specify how the bandwidth is to be shared. Instead it specifies how much bandwidth is guaranteed per class, by setting the number of tokens that are assigned to the token bucket of a particular class. For configured behavior to work correctly, you must ensure that the sum of the bandwidths plus any priority traffic is not greater than the bandwidth of the interface itself. If the interface is oversubscribed, unpredictable behavior results.

The bandwidth of the interface is set to be that of the physical interface, unless a hierarchical policy is defined that reduces the bandwidth available to the traffic. The following example shows a hierarchical policy being used to shape traffic to the specified value. The child policy then determines how the shaped bandwidth should be apportioned between the specified classes:

```
policy-map parent
  class match_all
  shape average 1000000
  bandwidth 1000000
    service-policy child

policy-map child
  class gold
    bandwidth percent 20
  class silver
    bandwidth percent 40
  class default
    bandwidth percent 40
```

Note The **bandwidth** command is part of the parent policy. In this instance, the **bandwidth** command not only sets the minimum bandwidth for the class but also resets the reference point for the **bandwidth percent** statements in the child policy.

For main interface service policies:

- If bandwidth is configured in the parent class, parent minimum bandwidth is used as a reference for the child bandwidth percentages.

- If bandwidth is not configured in the parent class, the implicit minimum bandwidth, which is a portion of the total unallocated bandwidth allocated to the class based on the explicit or implicit bandwidth remaining, is used as a reference.

  Implicit bandwidth remaining is an equal share of unallocated bandwidth among all queuing classes without either bandwidth or bandwidth remaining actions.

For subinterface policies:

- If bandwidth is configured in the parent class, parent minimum bandwidth is used as a reference for child bandwidth percentages.

- If bandwidth remaining is configured in the parent class, *bandwidth-remaining-percent * interface-rate* is used as a reference.

- If bandwidth is not configured in the parent class, *shape rate* is used as a reference.

In this example, the hierarchical policy is attached to the main interface, and the parent classes are a mix of bandwidth and shape only classes:

```
policy-map hqos
 class c1
   bandwidth percent 40
     service-policy child
 class c2
   shape average 500000000
     service-policy child
```

The reference for the child policy in class c2 is the implicit bandwidth of class c2 bounded by the shape rate of class c2. Therefore, the reference = (60 percent * interface bandwidth) / 3 bounded by 500000000 kbps.

In this example, the hierarchical policy is a class-default only parent shape configured on subinterfaces:

```
policy-map sub_int_hqos
 class c1ass-default
   shape average 40
     service-policy child
```

The class-default parent shape rate is used as reference.

When the **percent** keyword is used with the **bandwidth** command, the bandwidth of the interface is defined as being the Layer 2 capacity excluding the Gigabit Ethernet or POS encapsulation but including the High-Level Data Link Control (HDLC) flags, frame check sequence (FCS), and so on. These have to be included because they are applied per packet, and the system cannot predict how many packets of a particular packet size are being sent out.

For example, the following policy is applied to an OC-192 interface:

```
policy-map oc-192
  class c1
  bandwidth percent 50
```

The resulting bandwidth reservation for class c1 is 4,792,320 kbps. This equates to 50 percent of the OC-192 bandwidth excluding the GE or POS overhead.

For Clear Channel ATM subinterfaces, the **bandwidth percent** command uses the VC shaping rate as the reference rate. On ATM subinterfaces, only one bandwidth action can be configured in a class.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to guarantee 50 percent of the interface bandwidth to a class called class1 and 10 percent of the interface bandwidth to a class called class2:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth percent 50
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# class class2
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth percent 10
```

bandwidth remaining

To specify how to allocate leftover bandwidth to various classes, use the **bandwidth remaining** command in policy map class configuration mode. To return to the system defaults, use the **no** form of this command.

bandwidth remaining percent *percentage-value*
no bandwidth remaining percent *percentage-value*

Syntax Description

percent *percentage-value*	Specifies the amount of guaranteed bandwidth, based on an absolute percentage of the available bandwidth. Range is from 1 to 100.

Command Default   No bandwidth is specified.

Command Modes   Policy map class configuration

Command History

Release	**Modification**
Release 2.0	This command was introduced.

Usage Guidelines   The **bandwidth remaining** command is used to set the Modified Deficit Round Robin (MDRR) weight for the particular class.

When applied within an egress service policy, the command is used to define how any unallocated bandwidth should be apportioned. It typically is used in conjunction with the **bandwidth** command. In such a combination, if the minimum bandwidth guarantees are met, the remaining bandwidth is shared in the ratio defined by the **bandwidth remaining** command in the class configuration in the policy map.

The available bandwidth is equally distributed among those queueing classes that do not have the remaining bandwidth explicitly configured.

Note   On egress, the actual bandwidth of the interface is determined to be the Layer 2 capacity excluding the Layer 2 encapsulation, but including the HDLC flags, FCS, and so on. These have to be included because they are applied per packet, and the system cannot predict how many packets of a particular packet size are being sent out.

On ingress, you cannot use the **bandwidth** command to set the minimum bandwidth guarantee. Therefore, the **bandwidth remaining** command is used to proportionally allocate bandwidth to the particular classes, but there is no reserved bandwidth capacity.

Note   On ingress, the interface reference value is the Layer 3 capacity of the interface.

On both ingress and egress, if the **bandwidth remaining** command is not present, then the bandwidth is shared equally among the configured queueing classes present in the policy-map. When attempting precise calculations of expected MDRR behavior, you must bear in mind that because you are dealing with the bandwidth remaining on the link, you must convert the values to the bandwidth remaining percentages on the

link, based upon the packet sizes of the traffic within the class. If the packet sizes are the same in all the classes, then the defined ratio is enforced precisely and predictably on the link.

On ATM subinterfaces, only one bandwidth action can be configured in a class.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how the remaining bandwidth is shared by classes class1 and class2 in a 20:80 ratio.

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth remaining percent 20
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# class class2
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth remaining percent 80
```

class (policy-map)

To specify the name of the class whose policy you want to create or change, 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 [**type qos**] {*class-name* | **class-default**}
no class [**type qos**] {*class-name* | **class-default**}

Syntax Description

type qos	(Optional) Specifies a quality-of-service (QoS) class.
class-name	Name of the class for which you want to configure or modify policy.
class-default	Configures the default class.

Command Default

No class is specified.

Type is QoS when not specified.

Command Modes

Policy map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.6.0	The **type qos** keywords were added.

Usage Guidelines

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. The policy map must be identified first.

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 the policy for new classes or modify the policy for any existing classes in that policy map.

Usage Guidelines

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.

The **class-default** keyword is used for configuring default classes. It is a reserved name and cannot be used with user-defined classes. It is always added to the policy map (type qos) even if the class is not configured. For example, the following configuration shows that the class has not been configured, but the running configuration shows 'class class-default'.

```
RP/0/RP0/CPU0:router(config)# policy-map pm1
RP/0/RP0/CPU0:router(config-pmap)# end-policy-map
RP/0/RP0/CPU0:router(config)# end
!
RP/0/RP0/CPU0:router# show running-config
!
policy-map pm1
 class class-default
 !
 end-policy-map
```

!

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to create a policy map called policy1, which is defined to shape class1 traffic at 30 percent and default class traffic at 20 percent.

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match precedence ipv4 3
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:routerconfig-pmap-c)# shape average percent 30
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# class class-default
RP/0/RP0/CPU0:router(config-pmap-c)# shape average percent 20
```

The default class is used for packets that do not satisfy configured match criteria for class1. Class1 must be defined before it can be used in policy1, but the default class can be directly used in a policy map, as the system defines it implicitly.

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

class-map

To define a traffic class and the associated rules that match packets to the class, use the **class-map** command in Global Configuration mode mode. To remove an existing class map from the router, use the **no** form of this command.

class-map [**type** [**traffic** | **qos**]] [**match-all**] [**match-any**] *class-map-name*
no **class-map** [**type** [**traffic** | **qos**]] [**match-all**] [**match-any**] *class-map-name*

Syntax Description		
type qos	(Optional) Specifies a quality-of-service (QoS) class-map.
traffic	(Optional) Specifies traffic type class-map.
match-all	(Optional) Specifies a match on all of the match criteria.
match-any	(Optional) Specifies a match on any of the match criteria. This is the default.
class-map-name	Name of the class for the class map. The class name is used for the class map and to configure policy for the class in the policy map. The class name can be a maximum of 63 characters, must start with an alphanumeric character, and in addition to alphanumeric characters, can contain any of the following characters: . _ @ $ % +	# : ; - =

Command Default
Type is QoS when not specified.

Command Modes
Global Configuration mode

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.6.0	The **type qos** keywords were added.
Release 3.7.0	Support was added for the character '=' in the *class-map-name* argument. The argument accepts a maximum of 63 characters.

Usage Guidelines
The **class-map** command specifies the name of the class for which you want to create or modify class map match criteria. Use of this command enables class map configuration mode in which you can enter any **match** command to configure the match criteria for this class. Packets arriving on the interface are checked against the match criteria configured for a class map to determine if the packet belongs to that class.

These commands can be used in a class map:

- **match access-group**
- **match atm**
- **match [not] cos**
- **match destination-address**
- **match [not] discard-class**
- **match [not] dscp**
- **match frame-relay dlci**
- **match [not] mpls experimental topmost**

- **match [not] precedence**
- **match precedence**
- **match [not] protocol**
- **match [not] qos-group**
- **match source-address**
- **match vlan** *vlan-id*
- **match vpls**

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to specify class101 as the name of a class and defines a class map for this class. The packets that match the access list 101 are matched to class class101.

```
RP/0/RP0/CPU0:router(config)# class-map class101
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 101
```

Related Commands

Command	Description
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
match access-group, on page 28	Identifies a specified access control list (ACL) number as the match criteria for a class map.
match atm, on page 30	Enables packet matching on the basis of the ATM operations, administration, and maintenance (OAM) or cell loss priority (CLP).
match cos, on page 32	Identifies specified class of service (CoS) values as a match criteria in a class map.
match destination-address, on page 35	Identifies a specific destination MAC address explicitly as a match criterion in a class map.
match discard-class, on page 37	Identifies specific discard class values as a match criteria for a class map.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
match mpls experimental topmost, on page 42	Identifies specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map.
match precedence, on page 44	Identifies IP precedence values as match criteria.
match protocol, on page 47	Identifies a specific protocol as the match criterion for a class map.
match qos-group, on page 49	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.

Command	Description
match source-address, on page 51	Identifies a specific source MAC address as match criterion in a class map.
match vlan, on page 53	Identifies selected VLAN IDs as the match criteria for a class map.

clear qos counters interface

To clear QoS counters for a specified interface, use the **clear qos counters interface** command in EXEC mode.

clear qos counters interface *type* *interface-path-id* [{**input** | **output**}]

<table>
<tr><td>**Syntax Description**</td><td>*type*</td><td>Interface type. For more information, use the question mark (?) online help function.</td></tr>
<tr><td></td><td>*interface-path-id*</td><td>Either a physical interface instance or a virtual interface instance as follows:

• Physical interface instance. Naming notation is *rack/slot/module/port* and a slash between values is required as part of the notation.

  • *rack* : Chassis number of the rack.

  • *slot* : Physical slot number of the modular services card or line card.

  • *module* : Module number. A physical layer interface module (PLIM) is always 0.

  • *port* : Physical port number of the interface.

Note In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RSP0RP0 or RP1) and the module is CPU0. Example: interface MgmtEth0/RSP0RP1/CPU0/0.

• Virtual interface instance. Number range varies depending on interface type.

For more information about the syntax for the router, use the question mark (?) online help function.</td></tr>
<tr><td></td><td>**input**</td><td>(Optional) Clears input QoS counters that are attached to the specified interface.</td></tr>
<tr><td></td><td>**output**</td><td>(Optional) Clears output QoS counters that are attached to the specified interface.</td></tr>
</table>

Command Default No default behavior or values

Command Modes EXEC

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.9.0	The **interface** keyword was added.

Usage Guidelines To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

The **clear qos counters interface** command clears all input and output QoS counters that are attached to a specified interface, unless the **input** or **output** keyword is specified. If the **input** or **output** keyword is specified, only counters attached to the interface in a specified direction are cleared.

The MIB counters are not reset with this command.

Task ID

Task ID	Operations
qos	read, write

Examples

The following example shows how to clear QoS counters attached to Gigabit Ethernet interface 0/1/0/9:

```
RP/0/RP0/CPU0:router# clear qos counters interface gigabitethernet 0/1/0/9
```

The following example shows how to clear output QoS counters attached to POS interface 0/7/0/3:

```
RP/0/RP0/CPU0:router# clear qos counters interface pos 0/7/0/3 output
```

conform-action

To configure the action to take on packets that conform to the rate limit, use the **conform-action** command in policy map police configuration mode. To remove a conform action from the policy-map, use the **no** form of this command.

conform-action [{**drop** | **set** *options* | **transmit**}]
no conform-action [{**drop** | **set** *options* | **transmit**}]

drop	(Optional) Drops the packet.
set *options*	(Optional) Configures the specified packet properties. Replace *options* with one of the following keywords or keyword arguments:

- **atm-clp value** —Sets the cell loss priority (CLP) bit.
- **cos value** —Sets the class of service value. Range is 0 to 7.
- **cos** [**inner**]*value* —Sets the class of service value. Range is 0 to 7.
- **discard-class** *value* —Sets the discard class value. Range is 0 to 7.
- **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 1: IP DSCP Reserved Keywords, on page 40 for a list of valid values.
- **dscp** [**tunnel**] *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 1: IP DSCP Reserved Keywords, on page 40 for a list of valid values. With the **tunnel** keyword, the DSCP is set in the outer header.
- **mpls experimental** {**topmost** | **imposition**} *value* —Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost label or imposed label. Range is 0 to 7.
- **precedence** *precedence* —Sets the IP precedence and sends the packet See Table 2 for a list of valid values.
- **precedence** [**tunnel**] *precedence* —Sets the IP precedence and sends the packet. See Table 2: IP Precedence Values and Names, on page 45 for a list of valid values. With the **tunnel** keyword, the precedence is set in the outer header.
- **qos-group** *value* —Sets the QoS group value.
- **srp-priority** *value* —Sets the Spatial Reuse Protocol (SRP) priority. Range is 0 to 7.

transmit	(Optional) Transmits the packets.

Command Default By default, if no action is configured on a packet that conforms to the rate limit, the packet is transmitted.

Command Modes Policy map police configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.4.1	The **set qos-group** keyword was added.
Release 3.6.0	The **srp-priority** *value* keyword and argument were added.

Usage Guidelines   For more information regarding the traffic policing feature, see the police rate, on page 56 command.

The **conform-action** command is used to set the DSCP, the precedence, or the discard class for IP packets, and experimental or discard class values for MPLS packets.

Task ID

Task ID	Operations
qos	read, write

Examples   In this example for MPLS, traffic policing is configured to set the MPLS experimental bit for packets that conform to the rate limit:

```
RP/0/RP0/CPU0:router(config)# class-map class
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map child
RP/0/RP0/CPU0:router(config-pmap)# class prec1
RP/0/RP0/CPU0:router(config-pmap-c)# police rate 100000000 peak-rate 3125000 peak-burst
3125000
RP/0/RP0/CPU0:router(config-pmap-c-police)# conform-action set mpls experimental imp 1
RP/0/RP0/CPU0:router(config-pmap-c-police)# conform-action set qos-group 1
RP/0/RP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if) service-policy input policy1
```

Related Commands

Command	Description
exceed-action, on page 20	Configures the action to take on packets that exceed the rate limit.
police rate, on page 56	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 137	Configures the action to take on packets that violate the rate limit.

end-class-map

To end the configuration of match criteria for the class and to exit class map configuration mode, use the **end-class-map** command in class map configuration mode.

end-class-map

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

Class map configuration

Command History

Release	Modification
Release 3.6.0	This command was introduced.

Usage Guidelines

No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to end the class map configuration and exit class map configuration mode:

```
RP/0/RP0/CPU0:router(config)# class-map class101
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 101
RP/0/RP0/CPU0:router(config-cmap)# end-class-map
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.

end-policy-map

To end the configuration of a policy map and to exit policy map configuration mode, use the **end-policy-map** command in policy map configuration mode.

end-policy-map

Syntax Description	This command has no keywords or arguments.
Command Default	No default behavior or values
Command Modes	Policy map configuration

Command History

Release	Modification
Release 3.6.0	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to end the policy map configuration and exit policy map configuration mode.

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# police cir 250
RP/0/RP0/CPU0:router(config-pmap-c)# set precedence 3
RP/0/RP0/CPU0:router(config-pmap)# end-policy-map
```

Related Commands

Command	Description
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

exceed-action

To configure the action to take on packets that exceed the rate limit, use the **exceed-action** command in policy map police configuration mode. To remove an exceed action from the policy-map, use the **no** form of this command.

exceed-action [{**drop** | **set** *options* | **transmit**}]
no exceed-action [{**drop** | **set** *options* | **transmit**}]

Syntax Description	

drop	(Optional) Drops the packet.
set *options*	Configures the specified packet properties. Replace *options* with one of the following keywords or keyword arguments:

- **atm-clp value** —Sets the cell loss priority (CLP) bit.
- **cos [inner]** *value* —Sets the class of service value. Range is 0 to 7.
- **cos** *value* —Sets the class of service value. Range is 0 to 7.
- **discard-class** *value* —Sets the discard class value. Range is 0 to 7.
- **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 1: IP DSCP Reserved Keywords, on page 40 for a list of valid values.
- **dscp** [**tunnel**] *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 1: IP DSCP Reserved Keywords, on page 40 for a list of valid values. With the **tunnel** keyword, the DSCP is set in the outer header.
- **fr-de** *value* —Sets the Frame Relay discard eligible (DE) bit on the Frame Relay frame then transmits that packet. In congested environments, frames with the DE bit set to 1 are discarded before frames with the DE bit set to 0. The frame relay DE bit has only one bit and has only two settings, 0 or 1. The default DE bit setting is 0.
- **mpls experimental** {**topmost** | **imposition**} *value* —Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost label or imposed label. Range is 0 to 7.
- **precedence** *precedence* —Sets the IP precedence and sends the packet. See Table 2: IP Precedence Values and Names, on page 45 for a list of valid values.
- **precedence** [**tunnel**] *precedence* —Sets the IP precedence and sends the packet. See Table 2: IP Precedence Values and Names, on page 45 for a list of valid values. With the **tunnel** keyword, the precedence is set in the outer header.
- **qos-group** *value* —Sets the QoS group value.
- **qos-group** *value* —Sets the QoS group value. Range is 0 to 63.
- **srp-priority** *value* —Sets the Spatial Reuse Protocol (SRP) priority. Range is 0 to 7.

transmit	(Optional) Transmits the packets.

Command Default	By default, if no action is configured on a packet that exceeds the rate limit, the packet is dropped.
Command Modes	Policy map police configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Release	Modification
Release 3.4.1	The **set qos-group** keyword was added.
Release 3.6.0	The **srp-priority** *value* keyword and argument were added.
Release 3.8.0	**qos group** was supported as an ingress policer action.

Usage Guidelines

For more information regarding the traffic policing feature, see the police rate, on page 56 command.

The **exceed-action** command can be used to set the DSCP, the precedence, or the discard class for IP packets, and experimental or discard-class values for MPLS packets.

Task ID

Task ID	Operations
qos	read, write

Examples

In this example for MPLS, traffic policing is configured to drop traffic that exceeds the rate limit:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RP0/CPU0:router(config-pmap-c-police)# exceed-action drop
RP/0/RP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface pos 0/5/0/0
RP/0/RP0/CPU0:router(config-if) service-policy input policy1
```

Related Commands

Command	Description
conform-action, on page 16	Configures the action to take on packets that conform to the rate limit.
police rate, on page 56	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 137	Configures the action to take on packets that violate the rate limit.

hw-module qos input police granularity location

To configure the policer granularity on input interfaces, use the **hw-module qos input police granularity location** command in Global Configuration mode. To return to the default policer granularity, use the **no** form of this command.

hw-module qos input police granularity [*police-rate-dev-tol*] **location** *interface-path-id*
no hw-module qos input police granularity [*police-rate-dev-tol*] **location** *interface-path-id*

Syntax Description

police-rate-dev-tol	(Optional) Police rate deviation tolerance, as a percentage. Range: 1 to 100.
interface-path-id	Physical interface instance. Naming notation is *rack/slot/module;* a slash between values is required as part of the notation.

- *rack* —Chassis number of the rack.
- *slot* —Physical slot number of the line card.
- *module* —Module number. A physical layer interface module (PLIM) is always 0.

Command Default A default police granularity of 244 kbps is applied.

Command Modes Global Configuration mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines If the *police-rate-dev-tol* argument is not specified, a value of 2% is configured at the specified location.

Policer granularity values, whether default or configured, apply to the SIP and to all SPAs that are installed on the SIP.

The configured policer granularity value will be applied only for all future traffic policies configured on the interface.

Task ID

Task ID	Operation
root-lr	read, write

This example shows how to set the police rate deviation tolerance to 8% on the input interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos input police granularity 8 location 0/1/CPU0
```

This example demonstrates how a default police rate deviation tolerance of 2% is configured on an interface, when the *police-rate-dev-tol* argument is not specified. After performing this configuration step, a police rate deviation tolerance of 2% is applied on the input interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos input police granularity location 0/1/CPU0
```

Related Commands	Command	Description
	show hw-module qos input police granularity location, on page 109	Displays the police granularity information for input interfaces.

hw-module qos output police granularity location

To configure the policer granularity on output interfaces, use the **hw-module qos output police granularity location** command in Global Configuration mode. To return to the default policer granularity, use the **no** form of this command.

hw-module qos output police granularity [*police-rate-dev-tol*] **location** *interface-path-id*
no hw-module qos output police granularity [*police-rate-dev-tol*] **location** *interface-path-id*

Syntax Description

police-rate-dev-tol	(Optional) Police rate deviation tolerance, as a percentage. Range: 1 to 100.
interface-path-id	Physical location of the Shared Interface Processor (SIP). Naming notation is *rack/slot/module;* a slash between values is required as part of the notation. • *rack* —Chassis number of the rack. • *slot* —Physical slot number of the modular services card or line card. • *module* —Module number. A physical layer interface module (PLIM) is always 0.

Command Default   A default police granularity of 244 kbps is applied.

Command Modes   Global Configuration mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines   If the *police-rate-dev-tol* argument is not configured, a value of 2% is configured at the specified location.

Policer granularity values, whether default or configured, apply to the SIP and to all SPAs that are installed on the SIP.

The configured policer granularity value is applied only for all future traffic policies configured on the interface.

Task ID

Task ID	Operation
root-lr	read, write

This example shows how to set the police rate deviation tolerance to 8% on the output interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos output police granularity 8 location 0/1/CPU0
```

This example demonstrates how a default police rate deviation tolerance of 2% is configured on an interface, when the *police-rate-dev-tol* argument is not specified. After performing this configuration step, a police rate deviation tolerance of 2% is applied on the output interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos output police granularity location 0/1/CPU0
```

	Command	Description
Related Commands	**Command**	**Description**
	show hw-module qos output police granularity location, on page 110	Displays the police granularity information for output interfaces.

hw-module qos output shape granularity location

To configure the shape granularity, use the **hw-module qos output shape granularity location** command in Global Configuration mode. To return to the default shape granularity, use the **no** form of this command.

hw-module qos output shape granularity [*granularity*] **location** *interface-path-id*
no hw-module qos output shape granularity [*granularity*] **location** *interface-path-id*

Syntax Description

granularity	(Optional) Shape granularity, in kbps. Valid values are 64, 128 and 256.
interface-path-id	Physical location of the Shared Interface Processor (SIP). Naming notation is *rack/slot/module;* a slash between values is required as part of the notation.

- *rack* —Chassis number of the rack.
- *slot* —Physical slot number of the modular services card or line card.
- *module* —Module number. A physical layer interface module (PLIM) is always 0.

Command Default

The default shape granularity is 256 kbps.

Command Modes

Global Configuration mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines

Shape granularity can only be configured in the egress direction.

Shape granularity values, whether default or configured, apply to the SIP and to all SPAs that are installed on the SIP.

For the configured shape granularity to take effect, the line card must be reloaded. Use the **show hw-module qos output shape granularity location** command to determine if a line card reload is currently required, for the configured shape granularity value to take effect.

The shape rate you set, using the **shape average** command, should be a multiple of the shaper granularity. For example, if the shaper rate is set to 320 kbps but the shaper granularity is configured to 256 kbps, the effective shaper rate is 512 kbps, that is a multiple of 256 kbps. To get an actual shaper rate of 320 kbps, configure the shaper granularity to 64 kbps. Because 320 is a multiple of 64, the shaper rate will be exactly 320 kbps.

If the shape granularity is not configured, a default value of 256 kbps is applied to all output interfaces belonging to a particular line card. If the shape granularity is configured using the **hw-module qos output shape granularity location** command, but the granularity argument is not specified, a shape granularity of 64 kbps will be configured at the specified location.

Using this command does not affect the ingress shaping granularity for the line card.

Task ID

Task ID	Operation
root-lr	read, write

This example shows how to set the shape granularity to 128 kbps on the output interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos output shape granularity 128 location 0/1/CPU0
```

This example demonstrates how a default shape granularity of 64 kbps is configured on an interface, when the *granularity* argument is not specified. After performing this configuration step, a shape granularity of 64 kbps is applied on the output interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router(config)# hw-module qos output shape granularity location 0/1/CPU0
```

Related Commands	Command	Description
	show hw-module qos output shape granularity location, on page 111	Displays shape granularity information.

match access-group

To identify a specified access control list (ACL) number as the match criteria for a class map, 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 [**not**] **access-group** {**ipv4** | **ipv6**} *access-group-name*
no match [**not**] **access-group** {**ipv4** | **ipv6**} *access-group-name*

Syntax Description

not	(Optional) Negates the specified match result.
ipv4	Specifies the name of the IPv4 access group to be matched.
ipv6	Specifies the name of the IPv6 access group to be matched.
access-group-name	ACL whose contents are used as the match criteria against which packets are checked to determine if they belong to this class.

Command Default

By default, if neither IPv6 nor IPv4 is specified as the match criteria for a class map, IPv4 addressing is used.

Command Modes

Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2.2	Support for IPv6 ACLs with source port matching was added in MQC policy maps.

Usage Guidelines

For class-based features (such as marking, Modified Deficit Round Robin [MDRR], and policing), you define traffic classes based on match criteria, including ACLs and input interfaces. Packets satisfying the match criteria for a class constitute the traffic for that class.

The **match access-group** command specifies an 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.

Access Control Entries with TCP fields such as, SYN, ACK and FIN in the corresponding ACL are not supported.

QoS classification based on the packet length or TTL (time to live) field in the IPv4 and IPv6 headers is not supported.

When an ACL list is used within a class-map, the deny action of the ACL is ignored and the traffic is classified based on the specified ACL match parameters.

Note **deny** statements in ACLs used in the **match access-group** command are treated as **permit** statements.

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. You can specify up to eight IPv4 and IPv6 ACLs in a match statement.

QoS classification based on the packet length or TTL (time to live) field in the IPv4 and IPv6 headers is not supported.

When an ACL list is used within a class-map, the deny action of the ACL is ignored and the traffic is classified based on the specified ACL match parameters.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to specify a class map called map1 and configures map1 to be used as the match criteria for this class:

```
RP/0/RP0/CPU0:router(config)# class-map map1
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 map1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

match atm

To enable packet matching on the basis of the ATM operations, administration, and maintenance (OAM) or cell loss priority (CLP), use the **match atm** command in class-map configuration mode. To disable packet matching, use the **no** form of this command.

match atm {**clp** [*clp-bit-value*] | **oam**}
no match atm {**clp** [*clp-bit-value*] | **oam**}

Syntax Description

clp	Configures the ATM CLP bit to be matched. Use either 0 or 1 for *clp-bit-value* .
clp-bit-value	(Optional) Value for the ATM CLP bit. Choose either 0 or 1 as the bit value. If you do not specify a bit value, the default value of 1 is used.
oam	Configures the ATM OAM to be matched.

Command Default   Packets are not matched on the basis of the ATM CLP or OAM.

Command Modes   Class map configuration

Command History

Release	Modification
Release 3.7.0	This command was introduced.
Release 3.8.0	The *clp-bit-value* argument was added.

Usage Guidelines   The **match atm** 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** command) that are attached to these types of ATM interfaces can be input policy maps only.

The **match atm**command can be configured for ingress service policies only.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to specify a class map called map1 and configures map1 to be used as the match criteria for this class:

```
RP/0/RP0/CPU0:router(config)#class-map map1
RP/0/RP0/CPU0:router(config-cmap)# match atm oam
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.

Command	Description
match access-group, on page 28	Identifies a specified access control list (ACL) number as the match criteria for a class map.
match cos, on page 32	Identifies specified class of service (CoS) values as a match criteria in a class map.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
match mpls experimental topmost, on page 42	Identifies specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map.
match precedence, on page 44	Identifies IP precedence values as match criteria.
match qos-group, on page 49	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.
#unique_37	
match vlan, on page 53	Identifies selected VLAN IDs as the match criteria for a class map.

match cos

To identify specified class of service (CoS) values as a match criteria in a class map, use the **match cos** command in class map configuration mode. To remove a specified CoS class value from the matching criteria for a class map, use the **no** form of this command.

match [**not**] **cos** {*cos-value* [*cos-value1* . . . *cos-value7*] | **inner** *inner-cos-value* [*inner cos-value1* . . . *inner cos-value7*]}
no match [**not**] **cos** {*cos-value* [*cos-value1* . . . *cos-value7*] | **inner** *inner-cos-value* [*inner cos-value1* . . . *inner cos-value7*]}

Syntax Description		
not	(Optional) Negates the specified match result.	
cos-value	Identifier that specifies the exact value from 0 to 7. Up to eight CoS identifiers can be specified to match packets.	
inner	(Optional) Specifies the inner CoS value in, for example, a QinQ configuration.	
inner-cos-value	Identifier that specifies the exact value from 0 to 7. Up to eight inner CoS identifiers can be specified to match packets.	

Command Default
No match criteria are specified.

Command Modes
Class map configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
	The **not** keyword was added.
Release 4.0.0	The **inner** keyword was added.

Usage Guidelines
The **match cos** command specifies a class of service that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match cos** 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 specify more than one **match cos** command in a class map, the values of subsequent match statements are added to the first **match cos** command.

The **match cos** command is not supported on an output service policy attached to a Layer 3 interface (POS interface or routed VLAN subinterface).

The **match cos** command is supported on egress Layer 2 interfaces, Layer 2 subinterfaces, and Layer 3 physical interfaces. Layer 3 physical interfaces are supported, because it is possible for a Layer 3 interface to have underlying Layer 2 subinterfaces.

The **match cos inner** command is supported on:

- Ingress and egress
- Layer 2 main interfaces and subinterfaces
- Layer 3 main interfaces

The **match cos inner** command is not supported on Layer 3 subinterfaces or on bundles.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure the service policy called policy1 and attach service policy policy1 to an interface. In this example, class map cos146 evaluates all packets entering HundredGigE interface 0/7/0/0 .100 for class of service values of 1, 4, or 6. If the incoming packet has been marked with any of these CoS values, the packet is queued to the class queue with the bandwidth setting of 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map cos146
RP/0/RP0/CPU0:router(config-cmap)# match cos 1 4 6
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class cos146
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/7/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

In this example, traffic with an outer VLAN ID of 2 and an inner VLAN ID of 3 enters the QinQ attachment circuit (AC). If traffic has a CoS value of 1, 3, or 5 based on the inner VLAN tag, it matches class ic.

```
RP/0/RP0/CPU0:router(config)#policy-map p2
RP/0/RP0/CPU0:router(config-pmap)#class ic
RP/0/RP0/CPU0:router(config-pmap-c)#police rate percent 30
RP/0/RP0/CPU0:router(config-pmap-c-police)#bandwidth remaining percent 40
RP/0/RP0/CPU0:router(config-pmap-c)#class class-default
RP/0/RP0/CPU0:router(config-pmap-c)#end-policy-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)#class-map match-any ic
RP/0/RP0/CPU0:router(config-cmap)#match cos inner 1 3 5
RP/0/RP0/CPU0:router(config-cmap)#end-class-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)#interface gigabitethernet 0/6/5/0.2 l2transport
RP/0/RP0/CPU0:router(config-subif)#dot1q vlan 2 3
RP/0/RP0/CPU0:router(config-subif)#service-policy input 2
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
match access-group, on page 28	Identifies a specified access control list (ACL) number as the match criteria for a class map.

Command	Description
match atm, on page 30	Enables packet matching on the basis of the ATM operations, administration, and maintenance (OAM) or cell loss priority (CLP).
match destination-address, on page 35	Identifies a specific destination MAC address explicitly as a match criterion in a class map.
match cos, on page 32	Identifies specified class of service (CoS) values as a match criteria in a class map.
match discard-class	Identifies specific discard class values as a match criteria for a class map.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
match precedence, on page 44	Identifies IP precedence values as match criteria.
match protocol, on page 47	Identifies a specific protocol as the match criterion for a class map.
match qos-group, on page 49	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.
match source-address, on page 51	Identifies a specific source MAC address as match criterion in a class map.
match vlan, on page 53	Identifies selected VLAN IDs as the match criteria for a class map.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set cos, on page 83	Sets the Layer 2 class of service (CoS) value of an outgoing packet.

match destination-address

To identify a specific destination MAC address explicitly as a match criterion in a class map, use the **match destination-address** command in class map configuration mode. To remove a specific destination MAC address from the matching criteria for a class map, use the **no** form of this command.

match **destination-address** **mac** *address*
no **match** **destination-address** **mac** *address*

Syntax Description	**mac**	Specifies a MAC address.
	address	Specifies a destination MAC address.

Command Default   No default behavior or values

Command Modes   Class map configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines   The **match destination-address** command specifies a destination address that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match destination-address** 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 specify more than one **match destination-address** command in a class map, only the last command entered applies.

The **match destination-address** command is supported only on an output service policy.

Layer 2 match criteria on a Layer 3 target, or Layer 3 match criteria on a Layer 2 target, is not allowed. The **match destination-address** command is supported on egress Layer 2 interfaces, Layer 2 subinterfaces, and Layer 3 physical interfaces. Layer 3 physical interfaces are supported, because it is possible for a Layer 3 interface to have underlying Layer 2 subinterfaces.

The command is allowed on a policy map that is attached to an Ethernet interface. The command is invalid on a policy that is attached to a Packet-over-SONET/SDH (POS) interface or a routed VLAN subinterface.

The match 48-bit MAC address is specified in xxxx.xxxx.xxxx format on L2VPN PE interfaces.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to match a destination MAC address:

```
RP/0/RP0/CPU0:router(config)#class-map match-any A
RP/0/RP0/CPU0:router(config-cmap)# match destination-address mac 000.f0d0.2356
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
match atm, on page 30	Enables packet matching on the basis of the ATM operations, administration, and maintenance (OAM) or cell loss priority (CLP).
match cos, on page 32	Identifies specified class of service (CoS) values as a match criteria in a class map.
match discard-class	Identifies specific discard class values as a match criteria for a class map.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
match mpls experimental topmost, on page 42	Identifies specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map.
match precedence, on page 44	Identifies IP precedence values as match criteria.
match protocol, on page 47	Identifies a specific protocol as the match criterion for a class map.
match qos-group, on page 49	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.
match source-address, on page 51	Identifies a specific source MAC address as match criterion in a class map.
match vlan, on page 53	Identifies selected VLAN IDs as the match criteria for a class map.

match discard-class

To identify specific discard class values as a match criteria for a class map, use the **match discard-class** command in class map configuration mode. To remove specified discard class values from the matching criteria for a class map, use the **no** form of this command.

match [**not**] **discard-class** *discard-class-value* [*discard-class-value1* ... *discard-class-value7*]
no match [**not**] **discard-class** *discard-class-value* [*discard-class-value1* ... *discard-class-value7*]

Syntax Description

not	(Optional) Negates the specified match result.
discard-class-value	Discard class identifier. You can specify up to eight discard class identifiers to match packets. Class identifiers are separated by spaces. Range is 0 to 7.

Command Default   No default behavior or values

Command Modes   Class map configuration

Command History

Command	Description
Release 2.0	This command was introduced.
Release 3.3.0	The **not** keyword was added.

Usage Guidelines   The **match discard-class** command specifies a discard class that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match discard-class** 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 specify more than one **match discard-class** command in a class map, the new values are added to the existing match statement.

The **match discard-class** command sets the match criteria for examining discard classes marked on the packet. Up to eight discard class values can be matched in one match statement. For example, **match discard-class 0 1 2 3 4 5 6 7** returns matches for discard class values 0, 1, 2, 3, 4, 5, 6, and 7. Only one of the seven values is needed to yield a match (OR operation).

The discard class value is used as a matching criterion only. The value has no mathematical significance. For instance, the discard class value 2 is not greater than 1. The value simply indicates that a packet marked with the discard class of 2 should be treated differently than a packet marked with a discard class value of 1.

The **match discard-class** command is not supported on the Asynchronous Transfer Mode (ATM) interfaces.

Note   The **match discard-class** command is applied only for egress policies.

Task ID	Task ID	Operations
	qos	read, write

Examples

This example shows a service policy called policy1 attached to an interface. In this example, class map discard class5 is created to evaluate all packets leaving GigabitEthernet 0/1/0/9 interface for a discard-class value of 5. Packets marked with the discard class value of 5 are queued to a class queue with the bandwidth setting 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map discard-class5
RP/0/RP0/CPU0:router(config-cmap)# match discard-class 5
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class discard-class5
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy output policy1
```

match dscp

To identify specific IP differentiated services code point (DSCP) values as match criteria for a class map, use the **match dscp** command in class map configuration mode. To remove a DSCP value from a class map, use the **no** form of this command.

match **dscp** {[{**ipv4**|**ipv6**}] *dscp-value* [*dscp-value1* ... *dscp-value7*] |[*min-value* − *max-value*]}
no **match** **dscp** {[{**ipv4**|**ipv6**}] *dscp-value* [*dscp-value1* ... *dscp-value7*] |[*min-value* −
max-value]}

Syntax Description		
not	(Optional) Negates the specified match result.	
ipv4	(Optional) Specifies the IPv4 DSCP value.	
ipv6	(Optional) Specifies the IPv6 DSCP value.	
dscp-value	IP DSCP value identifier that specifies the exact value or a range of values. Range is 0 - 63. Up to eight IP DSCP values can be specified to match packets. Reserved keywords can be specified instead of numeric values. Table 1: IP DSCP Reserved Keywords, on page 40 describes the reserved keywords.	
min-value	Lower limit of DSCP range to match. Value range is 0 - 63.	
max-value	Upper limit of DSCP range to match. Value range is 0 - 63.	

Command Default   Matching on IP Version 4 (IPv4) and IPv6 packets is the default.

Command Modes   Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	The **ipv6** and **ipv4** keywords were added.
Release 3.3.0	The **not** keyword was added.
Release 5.2.0	The *min-value* and *max-value* variables were added.

Usage Guidelines   The **match dscp** command specifies a DSCP value that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match dscp** 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 specify more than one **match dscp** command in a class map, only the last command entered applies.

The **match dscp** command examines the higher-order six bits in the type of service (ToS) byte of the IP header. Only one of the eight values is needed to yield a match (OR operation).

The command supports only eight IP DSCP values. If you try to configure more match statements after all the eight values are matched, the statements get rejected.

The IP DSCP value is used as a matching criterion only. The value has no mathematical significance. For instance, the IP DSCP value 2 is not greater than 1. The value simply indicates that a packet marked with the IP DSCP value of 2 should be treated differently than a packet marked with an IP DSCP value of 1. The treatment of these marked packets is defined by the user through the setting of policies in policy map class configuration mode.

Table 1: IP DSCP Reserved Keywords

DSCP Value	Reserved Keyword
0	default
10	AF11
12	AF12
14	AF13
18	AF21
20	AF22
22	AF23
26	AF31
28	AF32
30	AF33
34	AF41
36	AF42
38	AF43
46	EF
8	CS1
16	CS2
24	CS3
32	CS4
40	CS5
48	CS6
56	CS7
ipv4	ipv4 dscp

DSCP Value	Reserved Keyword
ipv6	ipv6 dscp

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure the service policy called policy1 and attach service policy policy1 to an interface. In this example, class map dscp14 evaluates all packets entering Packet-over-SONET/SDH (POS) interface 0/1/0/0for an IP DSCP value of 14. If the incoming packet has been marked with the IP DSCP value of 14, the packet is queued to the class queue with the bandwidth setting of 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map dscp14
RP/0/RP0/CPU0:router(config-cmap)# match dscp ipv4 14
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class dscp14
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface pos 0/1/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

match mpls experimental topmost

To identify specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map, use the **match mpls experimental topmost** command in class map configuration mode. To remove experimental field values from the class map match criteria, use the **no** form of the command.

match [**not**] **mpls experimental topmost** *exp-value* [*exp-value1* . . . *exp-value7*]
no match [**not**] **mpls experimental topmost** *exp-value* [*exp-value1* . . . *exp-value7*]

Syntax Description		
not	**not**	
exp-value	Experimental value that specifies the exact value from 0 to 7. Up to eight experimental values can be specified to match MPLS headers.	

Command Default No default behavior or values

Command Modes Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The **not** keyword was added.

Usage Guidelines The **match mpls experimental topmost** command is used by the class map to identify MPLS experimental values matching on a packet.

To use the **match mpls experimental topmost** 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 specify more than one **match mpls experimental topmost** command in a class map, the new values are added to the existing match statement.

This command examines the three experimental bits contained in the topmost label of an MPLS packet. Up to eight experimental values can be matched in one match statement. For example, **match mpls experimental topmost 2 4 5 7** returns matches for experimental values of 2, 4, 5, and 7. Only one of the four values is needed to yield a match (OR operation).

The experimental values are used as a matching criterion only. The value has no mathematical significance. For instance, the experimental value 2 is not greater than 1. The value indicates that a packet marked with the experimental value of 2 should be treated differently than a packet marked with the EXP value of 1. The treatment of these different packets is defined by the user through the setting of QoS policies in policy map class configuration mode.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure the service policy called policy1 and attach service policy policy1 to an interface. In this example, class map mplsmap1 evaluates all packets entering GigabitEthernet interface 0/1/0/9 for an MPLS experimental value of 1. If the incoming packet has been marked with the MPLS experimental value of 1, the packet is queued to the class queue with the bandwidth setting of 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map mplsmap1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 1
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class mplsmap1
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set mpls experimental, on page 89	Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost or imposition labels.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

match precedence

To identify IP precedence values as match criteria, use the **match precedence** command in class map configuration mode. To remove precedence values from a class map, use the **no** form of this command.

match [**not**] **precedence** [{**ipv4** | **ipv6**}] *precedence-value* [*precedence-value1* . . . *precedence-value7*]
no match [**not**] **precedence** [{**ipv4** | **ipv6**}] *precedence-value* [*precedence-value1* . . . *precedence-value7*]

Syntax Description		
not	(Optional) Negates the specified match result.	
ipv4	(Optional) Specifies the IPv4 precedence value.	
ipv6	(Optional) Specifies the IPv6 precedence value.	
precedence-value	An IP precedence value identifier that specifies the exact value. Range is from 0 to 7. Reserved keywords can be specified instead of numeric values. Table 2: IP Precedence Values and Names, on page 45 describes the reserved keywords.	
	Up to eight precedence values can be matched in one match statement.	

Command Default   Matching on both IP Version 4 (IPv4) and IPv6 packets is the default.

Command Modes   Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	The **ipv6** and **ipv4** keywords were added.
Release 3.3.0	The **not** keyword was added.

Usage Guidelines   The **match precedence** command specifies a precedence value that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match precedence** 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 specify more than one **match precedence** command in a class map, only the last command entered applies.

The **match precedence** command examines the higher-order three bits in the type of service (ToS) byte of the IP header. Up to eight precedence values can be matched in one match statement. For example, **match precedence ipv4 0 1 2 3 4 5 6 7** returns matches for IP precedence values of 0, 1, 2, 3, 4, 5, 6, and 7. Only one of the eight values is needed to yield a match (OR operation).

The precedence values are used as a matching criterion only. The value has no mathematical significance. For instance, the precedence value 2 is not greater than 1. The value simply indicates that a packet marked with the precedence value of 2 is different than a packet marked with the precedence value of 1. The treatment of these different packets is defined by the user through the setting of QoS policies in policy map class configuration mode.

This table lists the IP precedence value number and associated name in descending order of importance.

Table 2: IP Precedence Values and Names

Value	Name
0	routine
1	priority
2	immediate
3	flash
4	flash-override
5	critical
6	internet
7	network
ipv4	ipv4 precedence
ipv6	ipv6 precedence

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure the service policy called policy1 and attach service policy policy1 to an interface. In this example, class map ipprec5 evaluates all packets entering GigabitEthernet interface 0/1/0/9 for a precedence value of 5. If the incoming packet has been marked with the precedence value of 5, the packet is queued to the class queue with the bandwidth setting 300 kbps.

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# class-map ipprec5
RP/0/RP0/CPU0:router(config-cmap)# match precedence ipv4 5
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class ipprec5
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy  input policy1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set precedence, on page 91	Sets the precedence value in the IP header.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

match protocol

To identify a specific protocol as the match criterion for a class map, use the **match protocol** command in class map configuration mode. To remove protocol-based match criteria from a class map, use the **no** form of this command.

match [**not**] **protocol** {*protocol-value* [*protocol-value1* ... *protocol-value7*] |[*min-value* – *max-value*]}

no match [**not**] **protocol** {*protocol-value* [*protocol-value1* ... *protocol-value7*] |[*min-value* – *max-value*]}

Syntax Description		
not	(Optional) Negates the specified match result.	
protocol-value	A protocol identifier. A single value for *protocol-value* (any combination of numbers and names) can be matched in one match statement.	
min-value	Lower limit of protocol range to match. Value range is 0 - 255.	
max-value	Upper limit of protocol range to match. Value range is 0 - 255.	

Command Default   No default behavior or values

Command Modes   Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The **not** keyword was added.
Release 5.2.0	The *min-value* and *max-value* variables were added.

Usage Guidelines   Definitions of traffic classes are based on match criteria, including protocols, access control lists (ACLs), input interfaces, 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. Available protocol names are listed in the table that follows.

The *protocol-value* argument supports a range of protocol numbers. After you identify the class, you may use the **match protocol** command to configure its match criteria.

Table 3: Protocol Names and Descriptions

Name	Description
ahp	Authentication Header Protocol
eigrp	Cisco Enhanced Interior Gateway Routing Protocol

Name	Description
esp	Encapsulation Security Payload
gre	Cisco Generic Routing Encapsulation Tunneling
icmp	Internet Control Message Protocol
igmp	Internet Gateway Message Protocol
igrp	Cisco IGRP Routing protocol
ipinip	IP in IP tunneling
ipv4	Any IPv4 protocol
ipv6	Any IPv6 protocol
mpls	Any MPLS packet
nos	KA9Q NOS Compatible IP over IP Tunneling
ospf	Open Shortest Path First, Routing Protocol
pcp	Payload Compression Protocol
pim	Protocol Independent Multicast
sctp	Stream Control Transmission Protocol
tcp	Transport Control Protocol
udp	User Datagram Protocol

Task ID

Task ID	Operations
qos	read, write

Examples

In this example, all TCP packets belong to class class1:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match protocol tcp
```

match qos-group

To identify specific quality-of-service (QoS) group values as match criteria in a class map, use the **match qos-group** command in class map configuration mode. To remove a specific QoS group value from the matching criteria for a class map, use the **no** form of this command.

match [**not**] **qos-group** [*qos-group-value 1* . . . *qos-group-value7*]
no match [**not**] **qos-group**

Syntax Description		
not	(Optional) Negates the specified match result.	
qos-group-value	QoS group value identifier that specifies the exact value from 0 to 31 or a range of values from 0 to 31. Up to eight values can be entered in one match statement.	

Command Default No match criteria are specified.

Command Modes Class map configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The **not** keyword was added.
Release 3.4.0	The *qos-group-value* argument was deleted from the **no match** command.
Release 3.7.0	Up to eight values or ranges on a single match statement, and up to 32 values or ranges specified on up to eight match statements for *qos-group-value* , were supported.

Usage Guidelines The **match qos-group** command sets the match criteria for examining QoS groups marked on the packet. Up to eight QoS group values can be matched in one match statement. For example, **match qos-group 4 9 11 15 16 21 30 31** returns matches for QoS group values of 4, 9, 11, 15, 16, 21, 30, and 31. Only one of the eight values is needed to yield a match (OR operation).

The **match qos-group** command is used on the ingress match to support QoS Policy Propagation using BGP (QPPB). To use this 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 specify more than one **match qos-group** command in a class map, the subsequent match statements are added to the first **match qos-group** command.

The QoS group value is used as a matching criterion only. The value has no mathematical significance. For instance, the QoS group value 2 is not greater than 1. The value simply indicates that a packet marked with the QoS group value of 2 should be treated differently than a packet marked with a QoS group value of 1. The treatment of these different packets is defined using the **service-policy** command in policy map class configuration mode.

Note The router supports up to eight values or ranges on a single match statement, and up to 32 values or ranges specified on up to eight match statements.

The QoS group setting is limited in scope to the local router. Typically, the QoS group is set on the local router and is used in conjunction with WRED or MDRR to give differing levels of service based on the group identifier.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows a service policy called policy1 attached to an interface. In this example, class map qosgroup5 will evaluate all packets leaving GigabitEthernet interface 0/1/0/9 for a QoS group value of 5. If the packet has been marked with the QoS group value of 5, the packet is queued to the class queue with the bandwidth setting 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map qosgroup5
RP/0/RP0/CPU0:router(config-cmap)# match qos-group 5
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class qosgroup5
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set discard-class, on page 85	Sets the discard class and Quality of Service (QoS) group identifiers on IP Version 4 (IPv4) or Multiprotocol Label Switching (MPLS) packets.
set qos-group, on page 99	Sets the quality of service (QoS) group identifiers on packets.

match source-address

To identify a specific source MAC address as match criterion in a class map, use the **match source-address** command in class map configuration mode. To remove a specific source MAC address from the matching criteria for a class map, use the **no** form of this command.

match source-address mac *address*
no match source-address mac *address*

Syntax Description

mac	Specifies a MAC address
address	Specifies a source MAC address.

Command Default   No default behavior or values

Command Modes   Class map configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.

Usage Guidelines   The **match source-address** command specifies a source address that is 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 source-address** 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 specify more than one **match source-address** command in a class map, only the last command entered applies.

This command is supported on an input service policy only.

Layer 2 match criteria on a Layer 3 target, or Layer 3 match criteria on a Layer 2 target is not allowed.

The **match source-address** command is supported on egress Layer 2 interfaces, Layer 2 subinterfaces, and Layer 3 physical interfaces. Layer 3 physical interfaces are supported, because it is possible for a Layer 3 interface to have underlying Layer 2 subinterfaces.

The **match source-address** command is allowed on a policy map that is attached to an Ethernet interface. The command is invalid on a policy that is attached to a Packet-over-SONET/SDH (POS) interface or a routed VLAN subinterface.

The match 48-bit MAC address is specified in xxxx.xxxx.xxxx format on L2VPN PE interfaces.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to match a source MAC address:

```
RP/0/RP0/CPU0:router(config)# class-map match-any A
RP/0/RP0/CPU0:router(config-cmap)# match source-address mac 0003.f0d0.2356
```

Related Commands	Command	Description
	class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.

match vlan

To identify selected VLAN IDs as the match criteria for a class map, use the **match vlan** command in class map configuration mode. To remove VLAN ID match criteria from a class map, use the **no** form of this command.

match vlan [**inner**] *vlanid* [*vlanid1* . . . *vlanid7*]
no match vlan [**inner**] *vlanid* [*vlanid1* . . . *vlanid7*]

Syntax Description	**inner**	(Optional) Specifies the inner VLAN for the match in, for example, a QinQ configuration.

Command Default   No match criteria are specified.

Command Modes   Class map configuration

Command History

Release	Modification
Release 3.3.0	This command was introduced.
Release 3.4.0	Changed the range value from 0 to 8096. to 1 to 4094.
Release 3.7.0	Up to eight values or ranges on a single match statement, and up to 300 values or ranges specified on up to eight match statements for *vlanid,* were supported.
Release 4.0.0	The **inner** keyword was added.

Usage Guidelines   The **match vlan** command specifies a VLAN ID that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match vlan** 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 specify more than one **match vlan** command in a class map, up to eight values of the subsequent match statements are added to the first **match vlan** command, exceeding which, the statement is rejected.

The **match vlan inner** command is supported on:

- Ingress and egress
- Layer 2 main interfaces and subinterfaces
- Layer 3 main interfaces

The **match vlan inner** command is not supported on Layer 3 subinterfaces or on bundles.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure the service policy called policy1 and attach service policy policy1 to an interface. In this example, class map vlan1 evaluates all packets entering GigabitEthernet interface 0/1/0/0 for VLAN IDs of 1234, 1698, and all the VLAN IDs in the range 3000 to 4000. If the incoming packet has been marked with any of these VLAN IDs, the packet is queued to the class queue with the bandwidth setting of 300 kbps.

```
RP/0/RP0/CPU0:router(config)# class-map vlan1
RP/0/RP0/CPU0:router(config-cmap)# match vlan 1234 1698 3000-4000
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class vlan1
RP/0/RP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

In this example, all traffic with an outer VLAN ID of 1 enters the Q-in-Any attachment circuit (AC), but the inner VLAN ID can be any value. However, only the traffic with an inner VLAN ID of 1, 2, or 3 matches class iv.

```
RP/0/RP0/CPU0:router(config)# policy-map p1
RP/0/RP0/CPU0:router(config-pmap)# class iv
RP/0/RP0/CPU0:router(config-pmap-c)# shape average percent 30
RP/0/RP0/CPU0:router(config-pmap-c)# set qos-group 1
RP/0/RP0/CPU0:router(config-pmap-c)# class class-default
RP/0/RP0/CPU0:router(config-pmap-c)# end-policy-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)# class-map match-any iv
RP/0/RP0/CPU0:router(config-cmap)# match vlan inner 1 2 3
RP/0/RP0/CPU0:router(config-cmap)# end-class-map
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/6/5/0.2 l2transport
RP/0/RP0/CPU0:router(config-subif)# dot1q vlan 1 any
RP/0/RP0/CPU0:router(config-subif)# service-policy input p1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.

match vpls

To identify selected virtual private LAN service (VPLS) fields as the match criteria for a class map, use the **match vpls** command in class map configuration mode. To remove the VPLS fields match criteria from a class map, use the **no** form of this command.

match vpls *vpls_field*
no match vpls *vpls_field*

Syntax Description	*vpls_field*	VPLS field that specifies the broadcast, MAC address on the router. Values can be:
		• **Broadcast** —Match on the broadcast MAC address.

Command Default   No match criteria are specified.

Command Modes   Class map configuration

Command History

Release	Modification
Release 3.6.0	This command was introduced.
Release 3.7.0	The **broadcast** keyword was added.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to configure VPLS:

```
RP/0/RP0/CPU0:router(config)# class-map vpls1
RP/0/RP0/CPU0:router(config-cmap)# match vpls multicast
RP/0/RP0/CPU0:router(config-cmap)# exit
```

police rate

To configure traffic policing and enter policy map police configuration mode, use the **police rate** command in policy map class configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

police rate {*value* [*units*] | **percent** *percentage* | **per-thousand** *value* | **per-million** *value*} [**burst** *burst-size* [*burst-units*]] [**peak-rate** {*value* [*units*] | **percent** *percentage*}] [**peak-burst** *peak-burst* [*burst-units*]]

no police rate {*value* [*units*] | **percent** *percentage* | **per-thousand** *value* | **per-million** *value*} [**burst** *burst-size* [*burst-units*]] [**peak-rate** {*value* [*units*] | **percent** *percentage*}] [**peak-burst** *peak-burst* [*burst-units*]]

Syntax Description

value	Committed information rate (CIR). Range is from 1 to 4294967295.
units	(Optional) Unit of measurement for the CIR. Values can be: • **bps** —bits per second (default) • **gbps** —gigabits per second • **kbps** —kilobits per second • **mbps** —megabits per second
percent *percentage*	Specifies the police rate as a percentage of the CIR. Range is from 1 to 100. See the Usage Guidelines for information on how to use this keyword.
per-thousand *value*	Specifies the committed information rate in per thousand of the link bandwidth.
per-million *value*	Specifies the committed information rate in per million of the link bandwidth.
burst *burst-size*	(Optional) Specifies the burst size (in the specified *burst-units*). Range is from 1 to 4294967295.
burst-units	(Optional) Unit of measurement for the burst values. Values can be: • **bytes** —bytes (default) • **gbytes** —gigabytes • **kbytes** —kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **us** —microseconds
peak-rate *value*	(Optional) Specifies the Peak Information Rate (PIR) in the specified *units*. Range is from 1 to 4294967295.
peak-burst *peak-burst*	(Optional) Specifies the peak burst size in the specified *burst-units*. The range is from 1 to 4294967295.

Command Default
No restrictions on the flow of data are applied to any interface.

Command Modes
Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The command name was changed from **police cir** to **police rate** .
	The keywords **bc** , **be** , and **pir** were changed to **burst** , **peak-burst** , and **peak-rate** , respectively.
	The *units* argument was added.
	The default units for the rate, peak rate, and burst rate changed from kbps to bps.
	The keywords **mpls** , **experimental** , **imposition** were added to the *action* argument.
Release 3.4.0	This command now enters policy-map police configuration mode.
	The **conform-action** , **exceed-action** , and **violate-action** keywords changed into commands within the policy-map police configuration mode.
	The **cos** and **transmit** keywords were added to the *action* argument.
Release 3.6.0	The **packets** burst value option was removed.
Release 4.3.1	The **per-million** and **per-thousand** keywords were added.

Usage Guidelines

The traffic policing feature works with a two-token bucket algorithm.

The **police rate** can set the DSCP, the precedence, or the discard class for IP packets, and experimental and discard-class values for MPLS packets.

For bundled interfaces, traffic policing can be configured only as a percentage.

If no violate-action is specified, a default action of **drop** is applied, thereby activating two token buckets.

Policing can be applied in both ingress and egress directions.

The parameters set by the action keywords are rounded by the hardware. To check the actual values programmed in the hardware use the **show qos interface** command.

For **police rate** commands, interpret the **percent** keyword in this way:

- For a one-level policy, the **percent** keyword specifies the CIR as a percentage of the link rate. For example, the command **police rate percent 35** configures the CIR as 35% of the link rate.

- For a two-level policy, in the parent policy, the **percent** keyword specifies the parent CIR as a percentage of the link rate. In the child policy, the percent keyword specifies the child CIR as a percentage of the maximum policing or shaping rate of the parent. If traffic policing or shaping is not configured on the parent, the parent inherits the interface policing or shaping rate.

Note Configured values take into account the Layer 2 encapsulation applied to traffic. This applies to both ingress and egress policing. For POS/SDH transmission, the encapsulation is considered to be 4 bytes. For Ethernet, the encapsulation is 14 bytes; whereas for 802.1Q, the encapsulation is 18 bytes.

The policer uses an incremental step size of 256 kbps. The configured value is rounded down to the nearest 256 kbps. The value shown in the output of the running-configuration shows the configured value as entered by the user.

If the burst value is not specifically configured, it is automatically set to equate to 250 msec-worth of the CIR value. For example, if a CIR value of 1000000 kbps is entered, the burst value is calculated to be 32000000 bytes. However, the maximum burst value supported is 2,097,120 bytes.

Hierarchical policing is also supported. In such a configuration, both parent and child policies have class-maps containing policing statements, as in this example:

```
!
policy-map child
 class gold
  police rate percent 50
  conform-action set precedence immediate
  exceed-action drop
 !
!
policy-map parent
 class match_all
  police rate 10000 kbps burst 15000
  exceed-action drop
  service-policy child
 !
```

For more information, see the "Committed Bursts and Excess Bursts" section in the *Modular QoS Configuration Guide for Cisco CRS Routers*.

Task ID

Task ID	Operations
qos	read, write

In this example for MPLS, traffic policing is configured with the average rate at 250 kbps, and the normal burst size at 50 bytes for all packets leaving GigabitEthernet interface 0/1/0/9:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RP0/CPU0:router(config-pmap-c-police)#conform-action set mpls experimental topmost 4
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if) service-policy input policy1
```

Related Commands

Command	Description
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

Command	Description
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

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 mode. To delete a policy map, use the **no** form of this command.

policy-map [**type qos**] *policy-name*
no policy-map [**type qos**] *policy-name*

Syntax Description

type qos	(Optional) Specifies type of the service policy.
qos	(Optional) Specifies a quality-of-service (QoS) policy map.
pbr	(Optional) Specifies a policy-based routing (PBR) policy map.
policy-name	Name of the policy map.

Command Default

A policy map does not exist until one is configured. Because a policy map is applied to an interface, no restrictions on the flow of data are applied to any interface until a policy map is created.

Type is QoS when not specified.

Command Modes

Global Configuration mode

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	Maximum number of classes permitted per policy map was increased to 32.
Release 3.6.0	The **type qos** keywords were added.
	Maximum number of classes permitted per policy map was increased to 512.
Release 5.2.0	The **pbr** keyword was added.

Usage Guidelines

Use the **policy-map** command to specify the name of the policy map to be created, added to, or modified before you can configure policies for classes whose match criteria are defined in a class map. Entering the **policy-map** command enables 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. Use the **class-map** and **match** commands to configure the match criteria for a class. Because you can configure a maximum of 1024 classes in one policy map, no policy map can contain more than 1024 class policies. The maximum number of 1024 classes per policy includes the implicit default class and its child policies.

A single policy map can be attached to multiple interfaces concurrently.

Task ID

Task ID	Operations
qos	read, write

Examples

These examples show how to create a policy map called policy1 and configures two class policies included in that policy map. The policy map is defined to contain policy specification for class1 and the default class (called class-default) to which packets that do not satisfy configured match criteria are directed. Class1 specifies policy for traffic that matches access control list 136.

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 136

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1

RP/0/RP0/CPU0:router(config-pmap-c)# police cir 250
RP/0/RP0/CPU0:router(config-pmap-c)# set precedence 3
RP/0/RP0/CPU0:router(config-pmap-c)# exit

RP/0/RP0/CPU0:router(config-pmap)# class class-default
RP/0/RP0/CPU0:router(config-pmap-c)# queue-limit bytes 1000000
```

priority (QoS)

To assign priority to a traffic class based on the amount of available bandwidth within a traffic policy, 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 [**level** *priority-level*]
no priority

Syntax Description

level *priority-level*	(Optional) Sets multiple levels of priority to a traffic class. Values are 1, 2, or 3. Default level is 1. Level 1 traffic has higher priority.
	The **level** keyword is not supported on ATM subinterfaces. The default is priority level 1.

Command Default

If a priority action is not configured in a class, traffic in that class is not serviced with strict priority— it is serviced after priority classes are serviced.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 4.0.0	The **level** keyword was added.
Release 5.0.0	This command was introduced.
Release 5.3.2	Priority levels 4, 5, 6 and 7 are added.

Usage Guidelines

The **priority** command configures low-latency queueing (LLQ), providing strict priority queueing (PQ). Strict PQ allows delay-sensitive data such as voice to be dequeued and sent before packets in other queues are dequeued. When a class is marked as high priority using the **priority** command, we recommend that you configure a policer to limit the priority traffic. This policer ensures that the priority traffic does not starve all other traffic on the line card, which protects low-priority traffic from starvation. Use the **police rate** to explicitly configure the policer.

The **priority** command sets up classes based on a variety of criteria (not just User Datagram Protocol [UDP] ports) and assigns a priority to them.

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 .

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 at same priority level is queued to the same priority queue. There is one priority queue per level in a group.

Modifying CRS-MSC-40G QoS Configurations for CRS-MSC-140G

On the Cisco CRS Series Modular Services Card 40G (CRS-MSC-40G), a priority action can be configured with or without a police action in the same class.

On the Cisco CRS Series Modular Services Card 140G (CRS-MSC-140G), a police action must be configured in the same class as the priority action. A class configuration that includes a priority action but no police action is not valid. Such a configuration is rejected.

To use existing CRS-MSC-40G QoS configurations on the CRS-MSC-140G, add a police action to all classes that have a priority action.

Priority assignment at the group level for an egress interface policy is not supported.

Note   The requirement to configure a policer does not apply to fabric QoS polices, because police actions in fabric QoS policies are not supported.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to configure priority queuing for the policy map named policy1:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1


RP/0/RP0/CPU0:router(config-pmap-c)# priority level 1


RP/0/RP0/CPU0:router(config-map-c)#police rate percent 20
```

Related Commands

Command	Description
bandwidth (QoS), on page 3	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

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 policy map class configuration mode. To remove the queue packet limit from a class, use the **no** form of this command.

queue-limit *value* [*unit*]
no queue-limit

Syntax Description	

value Maximum threshold for tail drop in bytes. Range is from 1 to 4294967295.

unit (Optional) Units for the queue limit value. Values can be:

- **bytes** —bytes
- **cells** —cells (ATM subinterfaces only)
- **ms** —milliseconds
- **packets** —packets (default)
- **us** —microseconds

> **Note** When the specified *units* is packets, packets are assumed to be 256 bytes in size.

Command Default 100 milliseconds: maximum threshold for tail drop

10 milliseconds: maximum threshold for high-priority queues

Maximum threshold units are in packets.

> **Note** The default queue limit is set to bytes of 100 ms of queue bandwidth. This formula is used to calculate the default queue limit in bytes: bytes = (100 ms * queue bandwidth kbps) / 8.

Command Modes Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	Command name changed from **queue-limit bytes** to **queue-limit**.
	Command order modified to place value before units.
	The *units* argument was added.
	Default units was changed from bytes to packets.
Release 3.6.0	The *value* range of 1 to 1000000000 has changed to 1 to 4294967295.
	The default threshold for tail drop changed from 200 milliseconds to 100 milliseconds.
Release 3.9.2	The **cells** *unit* was added.

Usage Guidelines Packets satisfying the match criteria for a class accumulate in the queue reserved for the class until they are serviced by the scheduling mechanism. The **queue-limit** command defines the maximum threshold for a class. When that threshold is reached, enqueued packets to the class queue result in tail drop (packet drop). Tail drop is a congestion avoidance technique that drops packets when an output queue is full, until congestion is eliminated.

Use the **show qos interface** command to display the queue limit and other policer values.

Queue Limit Default Values

These default values are used when **queue-limit** is not configured in the class:

- If QoS is not configured:
    - The queue limit is 100 ms at the interface rate.

- If QoS is configured and Weighted Random Early Detection (WRED) is not configured:
    - Queue limit is 100 ms at the guaranteed service rate of the queue for non-priority queues.
    - Queue limit is 10 ms at the interface rate for Level 1 priority classes.
    - Queue limit is 10 ms at parent guaranteed service rate for Level 2 priority classes.

- If QoS is configured and WRED is configured:
    - Queue limit is two times the WRED maximum threshold. The maximum threshold can be an explicitly configured value or an implicit 100 ms.
    - If more than one WRED profile is configured in the class, the maximum threshold is the maximum for all profiles.
    - When the **queue-limit** is configured in time units, the guaranteed service rate is used to compute the queue limit.

These restrictions apply to queue limits:

- Queue limit should be at least the maximum MTU size, which is 9 * 1024 bytes = 9kb.
- Queue limit cannot exceed 1 GB, which is the maximum packet buffer size in ingress and egress queuing ASICs.
- Only time-based units are allowed on bundle targets.

Guaranteed Service Rate

The guaranteed service rate is defined as the service rate of the queue when all queues are backlogged and derived as:

minimum_bandwidth + (bandwidth_remaining_percent * unallocated_bandwidth)

This example shows the guaranteed service rate calculation:

```
policy-map sample_policy
  class c1
    bandwidth percent 30
    bandwidth remaining percent 40
  class c2
```

```
  bandwidth percent 20
class class-default
```

guaranteed service rate of c1 = 30 percent LR + (40 percent * 50 percent * LR)

guaranteed service rate of c2 = 20 percent LR + (30 percent * 50 percent * LR)

guaranteed service rate of class-default = 30 percent * 50 percent * LR

- Where LR is line rate of the target on which service policy "sample_policy" is attached.
- 50 percent is unallocated bandwidth.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to set the queue limit for a class to 1000000 packets for policy map policy1:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# queue-limit 1000000
```

Related Commands

Command	Description
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show qos interface (BNG), on page 123	Displays QoS information for a specific interface.

random-detect

To enable random early detection (RED), use the **random-detect** command in policy map class configuration mode. To remove RED, use the **no** form of this command.

Syntax Description		
cos *value*	COS-based WRED.	
default	Enables RED with default minimum and maximum thresholds.	
discard-class *value*	Discard-class based WRED.	
dscp *value*	DSCP-based WRED.	
exp *value*	MPLS Experimental-based WRED.	
precedence *value*	Precedence-based WRED. Values can be: • 0 or routine • 1 or priority • 2 or immediate • 3 or flash • 4 or flash-override • 5 or critical • 6 or internet • 7 or network	
min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823 in bytes.	
max-threshold	Maximum threshold the units specified. The value range of this argument is from the value of the *min-threshold* argument or 23, whichever is larger, to 1073741823. When the queue length exceeds the maximum threshold, RED drops all packets with the specified discard class value.	
units	(Optional) Units for the threshold values. Values can be: • **bytes**—bytes • **gbytes**—gigabytes • **cells**—cells (ATM subinterfaces only) • **kbytes**—kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **packets** —packets (default) • **us** —microseconds	

Command Default

Default unit for *max-threshold* and *min-threshold* is **packets**.

Command Modes

Policy map class configuration

Command History	Release	Modification
	Release 2.0	This command was introduced.
	Release 3.2	Range of values for the thresholds changed from 512 to 1073741823 to 0 to 1073741823.
	Release 3.3.0	The *units* argument was added to allow specifying the units of the thresholds.
	Release 3.9.0	For the **random-detect** command to take effect, there is no longer a requirement to configure the **shape average** , **bandwidth (QoS)** , or **bandwidth remaining** commands in the user-defined policy map class.
	Release 3.9.2	The **cells** *unit* was added.

Usage Guidelines

The RED congestion avoidance technique takes advantage of the congestion control mechanism of TCP. By randomly dropping packets before periods of high congestion, RED tells the packet source to decrease its transmission rate. Assuming the packet source is using TCP, it decreases its transmission rate until all the packets reach their destination, indicating that the congestion is cleared. You can use RED as a way to cause TCP to slow transmission of packets. TCP not only pauses, but it also restarts quickly and adapts its transmission rate to the rate that the network can support.

RED distributes losses in time and maintains normally low queue depth while absorbing traffic bursts. When enabled on an interface, RED begins dropping packets when congestion occurs at a rate you select during configuration.

When time units are used, the guaranteed service rate is used to compute thresholds.

The default values for RED are calculated as follows:

default min_threshold = 0.03 * B

default max_threshold = 0.1 * B

where B is the bandwidth for the queue. When all the queues are congested, the bandwidth for the queue is equal to the guaranteed service rate of the queue.

The mark probability is always set to 1.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Weighted Random Early Detection

The following restrictions apply to Weighted Random Early Detection (WRED):

- For thresholds in time units, the guaranteed service rate is used to calculate the thresholds in bytes.
- Default RED minimum threshold—30 ms at the guaranteed service rate.
- Default RED maximum threshold—100 ms as the guaranteed service rate.

For bundles, queue limit and WRED thresholds are supported in time units only.

Note   RED is enabled when you configure any of the supported **random-detect** commands.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to enable RED using a minimum threshold value of 1000000 and a maximum threshold value of 2000000:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# random-detect 1000000 2000000
```

Related Commands

Command	Description
random-detect precedence, on page 78	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect cos

To configure Weighted Random Early Detection (WRED) thresholds for packets with a specific class of service (CoS) value, use the **random-detect cos** command in policy map class configuration mode. To return the thresholds to the default for the CoS, use the **no** form of this command.

random-detect cos *cos-value min-threshold* [*units*] *max-threshold* [*units*]
no random-detect cos *cos-value min-threshold* [*units*] *max-threshold* [*units*]

Syntax Description

cos-value	CoS value. Valid values are from 0 to 7. Up to eight values can be entered separated by commas.
min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823 in bytes.
max-threshold	Maximum threshold in number of packets. The value range of this argument is from the value of the *min-threshold* argument to 1073741823.
units	(Optional) Units for the threshold values. Values can be: • **bytes** —bytes • **gbytes** —gigabytes • **kbytes** —kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **packets** —packets (default) • **us** —microseconds

Command Default

Default unit for *max-threshold* and *min-threshold* is **packets**.

min-threshold: 30 ms

max-threshold: 100 ms

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.4.0	This command was introduced.
Release 3.6.0	The *cos-value* argument can accept up to eight values separated by commas. The default *min-threshold* was set to 30 ms and the default *max-threshold* was set to 100 ms.
Release 3.9.0	For the **random-detect cos** command to take effect, there is no longer a requirement to configure the **shape average**, **bandwidth (QoS)**, or **bandwidth remaining** commands in the user-defined policy map class.

Usage Guidelines   The **random-detect cos** command is allowed in a service policy attached to a Layer 2 VPN attachment circuit or physical Ethernet interface only. (The command in invalid in a policy attached to a Layer 3 interface.)

Note   Only time-based units are allowed on bundle targets.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to configure CoS:

```
RP/0/RP0/CPU0:router(config)# policy-map map1
RP/0/RP0/CPU0:router(config-pmap)# class c
RP/0/RP0/CPU0:router(config-pmap-c)# random-detect cos 3 1000 bytes 2000 bytes
```

random-detect discard-class

To configure the Weighted Random Early Detection (WRED) thresholds for packets with a specific discard class value, use the **random-detect discard-class** command in policy map class configuration mode. To return the thresholds to the default for the discard class, use the **no** form of this command.

random-detect discard-class *discard-value min-threshold* [*units*] *max-threshold* [*units*]
no random-detect discard-class *discard-value min-threshold* [*units*] *max-threshold* [*units*]

Syntax Description	
discard-value	Discard class value. Valid values are from 0 to 7. Up to eight values can be entered separated by commas.
min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823 in bytes.
max-threshold	Maximum threshold in number of packets. The value range of this argument is from the value of the *min-threshold* argument to 1073741823. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified discard class value.
units	(Optional) Units for the threshold values. Values can be: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes** —megabytes • **ms**—milliseconds • **packets**—packets (default) • **us**—microseconds

Command Default Default unit for *max-threshold* and *min-threshold* is **packets**.

Command Modes Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Range of values for the thresholds changed from 512 to 1073741823 to 0 to 1073741823.
Release 3.4.0	The *units* argument was added to allow specifying the units of the thresholds. The *discard-value min-threshold max-threshold* arguments were deleted from the **no random-detect discard-class** command.
Release 3.6.0	The *discard-value* argument can accept up to eight values separated by commas.
Release 3.9.0	For the **random-detect discard-class** command to take effect, there is no longer a requirement to configure the **shape average**, **bandwidth (QoS)**, or **bandwidth remaining** commands in the user-defined policy map class.

Usage Guidelines   WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. WRED is most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.

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.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Task ID

Task ID	Operations
qos	read, write

Examples   This example shows how to set the discard class values for discard class 3 to a minimum byte threshold of 1000000 and a maximum byte threshold of 2000000:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# random-detect discard-class 3 1000000 2000000
```

Related Commands

Command	Description
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
random-detect precedence, on page 78	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect dscp

To configure the Weighted Random Early Detection (WRED) thresholds for packets with a specific differentiated services code point (DSCP) value, use the **random-detect dscp** command in policy map class configuration mode. To return the thresholds to the default for the DSCP value, use the **no** form of this command.

random-detect dscp *dscp-value min-threshold* [*units*] *max-threshold* [*units*]
no random-detect dscp *dscp-value min-threshold* [*units*] *max-threshold* [*units*]

Syntax Description		
dscp-value	DSCP value. Up to eight *dscp-values* (any combination of numbers, ranges, and reserved keywords) can be used separated by commas. The following arguments are supported:	

    • Number from 0 to 63 that sets the DSCP value.
    • Range of DSCP values. Range is from 0 to 63.
    • Reserved keywords can be specified instead of numeric values. Table 1: IP DSCP Reserved Keywords, on page 40 describes the reserved keywords.

Note   The *range* argument is not supported.

min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823. When the average queue length reaches the minimum threshold, WRED randomly drops some packets with the specified DSCP value.
max-threshold	Maximum threshold in number of packets. The value range of this argument is from the value of the *min-threshold* argument to 1073741823. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified DSCP value.
units	(Optional) Units for the threshold values. Values can be:

    • **bytes**—bytes
    • **gbytes**—gigabytes
    • **kbytes**—kilobytes
    • **mbytes** —megabytes
    • **ms**—milliseconds
    • **packets**—packets (default)
    • **us**—microseconds

Command Default

Match packets with default DSCP (000000).

Default unit for *max-threshold* and *min-threshold* is **packets**.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Range of values for the thresholds changed from 512 to 1073741823 to 0 to 1073741823.

Release	Modification
Release 3.4.0	The *units* argument was added to allow specifying the units of the thresholds.
	The *dscp-value min-threshold max-threshold* arguments were deleted from the **no random-detect dscp** command.
Release 3.6.0	Up to eight *dscp-values* are supported.
Release 3.9.0	For the **random-detect dscp** command to take effect, there is no longer a requirement to configure the **shape average**, **bandwidth (QoS)**, or **bandwidth remaining** commands in the user-defined policy map class.
Release 3.6.0	Up to eight *dscp-values* are supported.
	The **cells** *unit* was added.

Usage Guidelines

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. WRED is most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.

Reserved keywords can be specified instead of numeric values. See Table 1: IP DSCP Reserved Keywords, on page 40 for the list of keywords.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows that for packets with DSCP AF11, the WRED minimum threshold is 1,000,000 bytes and the maximum threshold is 2,000,000 bytes:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# random-detect dscp AF11 1000000 2000000
```

Related Commands

Command	Description
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
random-detect precedence, on page 78	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect exp

To configure the Weighted Random Early Detection (WRED) thresholds for packets marked with a specific MPLS experimental (EXP) bit value, use the **random-detect exp** command in policy map class configuration mode. To return the value to the default, use the **no** form of this command.

random-detect **exp** *exp-value* *min-threshold* [*units*] *max-threshold* [*units*]
no **random-detect** **exp** *exp-value* *min-threshold* [*units*] *max-threshold* [*units*]

Syntax Description

exp-value	MPLS experimental value. Valid values are from 0 to 7. Up to eight values can be entered separated by commas.
min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823 in bytes.
max-threshold	Maximum threshold in units specified. The value range of this argument is from the value of the *min-threshold* argument to 1073741823. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified experimental value.
units	(Optional) Units for the threshold values. Values can be: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes** —megabytes • **ms**—milliseconds • **packets**—packets (default) • **us**—microseconds

Command Default Default unit for *max-threshold* and *min-threshold* is **packets**.

Command Modes Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Range of values for the thresholds was changed from 512 to 1073741823 to 0 to 1073741823.
Release 3.3.0	The *units* argument was added to allow specifying the units of the thresholds.
Release 3.4.0	The *exp-value min-threshold max-threshold* arguments were deleted form the **no random-detect exp** command.
Release 3.6.0	The *exp-value* argument can accept up to eight values separated by commas.
Release 3.9.0	For the **random-detect exp** command to take effect, there is no longer a requirement to configure the **shape average**, **bandwidth (QoS)**, or **bandwidth remaining** commands in the user-defined policy map class.

Usage Guidelines

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. WRED is most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows that for Multiprotocol Label Switching (MPLS) packets with an EXP field value of 4, the WRED minimum threshold is 1,000,000 bytes and the maximum threshold is 2,000,000 bytes:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# random-detect exp 4 1000000 20000
```

Related Commands

Command	Description
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
random-detect dscp, on page 74	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a specific differentiated services code point (DSCP) value.
random-detect precedence, on page 78	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect precedence

To configure the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence, use the **random-detect precedence** command in policy map class configuration mode. To return the thresholds to the default for the precedence, use the **no** form of this command.

random-detect precedence *precedence-value min-threshold* [*units*] *max-threshold* [*units*]
no random-detect precedence *precedence-value min-threshold* [*units*] *max-threshold* [*units*]

Syntax Description		
precedence-value	An IP precedence value identifier that specifies the exact value. Range is from 0 to 7. Reserved keywords can be specified instead of numeric values. Table 2: IP Precedence Values and Names, on page 45 describes the reserved keywords. Up to eight values or reserved keywords can be entered separated by commas.	
min-threshold	Minimum threshold in number of packets. Range is from 0 to 1073741823 in bytes.	
max-threshold	Maximum threshold in the units specified. Range is from the value of the *min-threshold* argument to 1073741823. When the average queue length exceeds the maximum threshold, WRED drops all packets with the specified precedence value.	
units	(Optional) Units for the threshold values. Values can be: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes** —megabytes • **ms**—milliseconds • **packets**—packets (default) • **us**—microseconds	

Command Default

Default unit for *max-threshold* and *min-threshold* is **packets**.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.2	Range of values for the thresholds changed from 512 to 1073741823 to 0 to 1073741823.
Release 3.3.0	The *units* argument was added to allow specifying the units of the thresholds.
Release 3.4.0	The *precedence-value min-threshold max-threshold* arguments were deleted from the **no random-detect precedence** command.

Release	Modification
Release 3.6.0	The *precedence-value* argument can accept up to eight values or reserved keywords separated by commas.
Release 3.9.0	For the **random-detect precedence** command to take effect, there is no longer a requirement to configure the **shape average**, **bandwidth (QoS)**, or **bandwidth remaining** commands in the user-defined policy map class.

Usage Guidelines

WRED is a congestion avoidance mechanism that slows traffic by randomly dropping packets when congestion exists. WRED is most useful with protocols like TCP that respond to dropped packets by decreasing the transmission rate.

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.

When the value of the *units* argument is packets, packets are assumed to be 256 bytes in size.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows that for packets with precedence 3, the WRED minimum threshold is 1,000,000 bytes and maximum threshold is 2,000,000 bytes:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)#random-detect precedence 3 1000000 2000000
```

Related Commands

Command	Description
bandwidth (QoS), on page 3	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
class (policy-map), on page 9	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
random-detect dscp, on page 74	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a specific differentiated services code point (DSCP) value.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

service-policy (interface BNG)

To attach a policy map to an input interface or output interface to be used as the service policy for that interface, use the **service-policy** command in the appropriate configuration mode. To remove a service policy from an input or output interface, use the **no** form of the command.

service-policy {**input** | **output**} *policy-map*

Syntax Description

input	Attaches the specified policy map to the input interface.
output	Attaches the specified policy map to the output interface.
policy-map	Name of a service policy map (created using the **policy-map** command) to be attached.

Command Default

No service policy is specified.

Command Modes

Interface configuration. This does not apply to BNG.

Layer 2 transport configuration. This does not apply to BNG.

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.6.0	The command was supported in Layer 2 transport configuration mode.
Release 4.3.0	The command was supported in dynamic template configuration mode in BNG.

Usage Guidelines

You can attach a single policy map to one or more interfaces to specify the service policy for those interfaces. The class policies composing the policy map are then applied to packets that satisfy the class map match criteria for the class. To apply a new policy to an interface, you must remove the previous policy. A new policy cannot replace an existing policy.

Task ID

Task ID	Operations
qos	read, write

Examples

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 [**type qos**] *policy-map-name*
no service-policy [**type qos**] *policy-map-name*

Syntax Description		
	type qos	(Optional) Specifies a QoS service policy.
	policy-map-name	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 policy is specified.

Type is QoS when not specified.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.6.0	The **type qos** keywords were added.

Usage Guidelines

The **service-policy (policy-map class)** command creates hierarchical service policies in policy-map class configuration mode.

This command is different from the **service-policy (interface)** command used in interface configuration mode.

The child policy is the previously defined service policy that is being associated with the class default of the parent policy-map. The new service policy using the preexisting service policy is the parent policy.

The **service-policy (policy-map class)** command has these restrictions:

- The **priority** command can be used in either the parent or the child policy, but not both policies simultaneously.
- 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.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to create a hierarchical service policy in the service policy called parent:

```
RP/0/RP0/CPU0:router(config)# policy-map child
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# priority
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map parent
RP/0/RP0/CPU0:router(config-pmap)# class class-default
RP/0/RP0/CPU0:router(config-pmap-c)# shape average 10000000
RP/0/RP0/CPU0:router(config-pmap-c)# service-policy child
```

Related Commands	**Command**	**Description**
	bandwidth (QoS), on page 3	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
	class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
	policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	priority (QoS), on page 62	Assigns a priority to a class of traffic belonging to a policy map.
	service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that 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 [**inner**] *cos-value*
no set cos [**inner**] *cos-value*

Syntax Description		
	inner	(Optional) Specifies the inner CoS in, for example, a QinQ configuration.
	cos-value	Specific IEEE 802.1Q CoS value from 0 to 7.

Command Default No Layer 2 CoS value of an outgoing packet is set.

Command Modes Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 4.0.0	The **inner** keyword was added.

Usage Guidelines Use the **set cos** command to mark a packet that is being sent to a switch. Switches can leverage Layer 2 header information, including a CoS value marking.

For Layer 3, 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 **set cos inner** command is supported on:

- Egress only: conditional and unconditional marking
- Layer 2 main interfaces and subinterfaces
- Layer 3 main interfaces

The **set cos inner** command is not supported on Layer 3 subinterfaces or on bundles.

Task ID

Task ID	Operations
qos	read, write

Examples In this example, the policy map called cos-set is created to assign different CoS values for different service classes, and then is attached to the output GigabitEthernet subinterface 0/1/0/9.100 VLAN.

```
RP/0/RP0/CPU0:router(config)# policy-map cos-set
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set cos 1
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# class class2
```

```
RP/0/RP0/CPU0:router(config-pmap-c)# set cos 2
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9.100
RP/0/RP0/CPU0:router(config-subif)# service-policy output cos-set
```

In this example, traffic with outer VLAN ID of 3 and inner VLAN ID of 2 exits through the QinQ attachment circuit (AC). If the traffic matches class qg1 or class qg2, it is marked with the inner CoS value specified in class qg1 or class qg2, respectively.

```
RP/0/RP0/CPU0:router(config)# policy-map p3
RP/0/RP0/CPU0:router(config-pmap)# class qg1
RP/0/RP0/CPU0:router(config-pmap-c)# police rate percent 30 peak-rate percent 50
RP/0/RP0/CPU0:router(config-pmap-c-police)# conform-action set cos inner 1
RP/0/RP0/CPU0:router(config-pmap-c-police)# exceed-action set cos inner 2
RP/0/RP0/CPU0:router(config-pmap-c-police)# violate-action set cos inner 3
RP/0/RP0/CPU0:router(config-pmap-c-police)#
RP/0/RP0/CPU0:router(config-pmap-c-police)# class qg2
RP/0/RP0/CPU0:router(config-pmap-c)# set cos inner 4
RP/0/RP0/CPU0:router(config-pmap-c)#
RP/0/RP0/CPU0:router(config-pmap-c)# end-policy-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)# class-map match-any qg1
RP/0/RP0/CPU0:router(config-cmap)# match qos-group 1
RP/0/RP0/CPU0:router(config-cmap)# end-class-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)# class-map match-any qg2
RP/0/RP0/CPU0:router(config-cmap)# match qos-group 2
RP/0/RP0/CPU0:router(config-cmap)# end-class-map
RP/0/RP0/CPU0:router(config)#
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/6/5/0.3 l2transport
RP/0/RP0/CPU0:router(config-subif)# dot1q vlan 3 2
RP/0/RP0/CPU0:router(config-subif)# service-policy output p3
RP/0/RP0/CPU0:router(config-subif)#
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

set discard-class

To set the discard class and Quality of Service (QoS) group identifiers on IP Version 4 (IPv4) or Multiprotocol Label Switching (MPLS) packets, use the **set discard-class** command in policy map class configuration mode. To leave the discard-class values unchanged, use the **no** form of this command.

set **discard-class** *discard-class-value*
no **set** **discard-class** *discard-class-value*

Syntax Description

discard-class-value	Discard class ID. An integer from 0 to 7, to be marked on the packet.

Command Default

No group ID is specified.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.

Usage Guidelines

The **set discard-class** command associates a discard class ID with a packet. After the discard class and QoS group IDs are set, other QoS services such as Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) can operate on the bit settings.

Discard-class indicates the discard portion of the per hop behavior (PHB). The **set discard-class** command is typically used in Pipe mode. Discard-class is required when the input PHB marking is used to classify packets on the output interface.

The discard-class values can be used to specify the type of traffic that is dropped when there is congestion.

Note Marking of the discard class and the QoS group has only local significance on a node.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to set the discard class value to 5 for packets that match the MPLS experimental bits 1:

```
RP/0/RP0/CPU0:router(config)# class-map cust1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 1
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy2
RP/0/RP0/CPU0:router(config-pmap)# class cust1
RP/0/RP0/CPU0:router(config-pmap-c)# set discard-class 5
RP/0/RP0/CPU0:router(config-pmap-c)# exit
```

```
RP/0/RP0/CPU0:router(config-pmap)# exit
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy input policy2
```

Related Commands	Command	Description
	class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
	policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

set dscp

To mark a packet by setting the IP differentiated services code point (DSCP) 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 **dscp** [**tunnel**] *dscp-value*
no **set** **dscp** [**tunnel**] *dscp-value*

Syntax Description		
tunnel	(Optional) Sets the DSCP on the outer IP header. This command is available on Layer 2 (Ethernet only) and Layer 3 interfaces in the ingress direction.	
	(Optional) Sets the DSCP on the outer IP header for IPsec tunnels.	
dscp-value	Number from 0 to 63 that sets the DSCP value. Reserved keywords can be specified instead of numeric values. Table 1: IP DSCP Reserved Keywords, on page 40 describes the reserved keywords.	

Command Default   No default behavior or values

Command Modes   Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.8.0	The **tunnel** keyword is supported for QoS in a Multicast Virtual Private Network (mVPN) enabled network that requires both conditional and unconditional marking of DSCP bits on the tunnel header.
Release 3.9.0	Support for the **tunnel** keyword on Layer 2 interfaces was added.

Usage Guidelines   After the DSCP bit is set, other quality-of-service (QoS) services can then operate on the bit settings.

Conditional marking marks the DSCP values on the tunnel header as a policer action. Unconditional marking marks the DSCP tunnel as a policy action. Both conditional and unconditional markings are supported only in the ingress direction.

The **tunnel** keyword is available on Layer 2 (Ethernet only) and Layer 3 interfaces in the ingress direction.

The network gives priority (or some type of expedited handling) to marked traffic. Typically, you set the DSCP value at the edge of the network (or administrative domain); data then is queued based on the DSCP value. Modified Deficit Round Robin (MDRR) can speed up handling for high DSCP traffic at congestion points. Weighted Random Early Detection (WRED) ensures that high DSCP traffic has lower loss rates than other traffic during times of congestion.

Reserved keywords can be specified instead of numeric values. Table 1: IP DSCP Reserved Keywords, on page 40 describes the reserved keywords.

Task ID

Task ID	Operations
qos	read, write

Examples

In this example, the DSCP ToS byte is set to 8 in the policy map called policy1. All packets that satisfy the match criteria of class1 are marked with the DSCP value of 8. The network configuration determines how packets are marked.

```
RP/0/RP0/CPU0:router (config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set dscp 8
```

Related Commands

Command	Description
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.
set precedence, on page 91	Sets the precedence value in the IP header.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

set mpls experimental

To set the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost or imposition labels, use the **set mpls experimental** command in policy map configuration mode. To leave the EXP value unchanged, use the **no** form of this command.

set mpls experimental {**imposition** | **topmost**} *exp-value*
no set mpls experimental {**imposition** | **topmost**} *exp-value*

Syntax Description		
	imposition	Specifies to set the EXP value of the imposition label.
	topmost	Specifies to set the EXP value of the topmost label.
	exp-value	Value of the MPLS packet label. Range is 0 to 7.

Command Default

No MPLS experimental value is set

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	Added the **imposition** keyword and changed overall command name from **set mpls experimental topmost** to **set mpls experimental**.
Release 3.4.0	Added the range for the *exp-value* argument.

Usage Guidelines

After the MPLS experimental bits are set, other QoS services such as Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) then operate on the bit settings.

The network gives priority (or some type of expedited handling) to the marked traffic through the application of MDRR or WRED at points downstream in the network. Typically, the MPLS experimental value is set at the edge of the network (or administrative domain) and queuing is acted on it thereafter. MDRR can speed up handling for high-priority traffic at congestion points. WRED ensures that high-priority traffic has lower loss rates than other traffic during times of congestion.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to set the MPLS experimental to 5 for packets that match access list 101:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 acl101
RP/0/RP0/CPU0:router(config-cmap)# exit
```

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set mpls experimental topmost 5
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface HundredGigE 0/1/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy output policy1
```

Related Commands	**Command**	**Description**
	class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
	policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
	service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

set precedence

To set the precedence value in the IP header, use the **set precedence** command in policy map class configuration mode. To leave the precedence value unchanged, use the **no** form of this command.

set precedence [**tunnel**] *value*
no set precedence [**tunnel**] *value*

Syntax Description		
tunnel		(Optional) Sets the IP precedence on the outer IP header. This command is available on Layer 2 (Ethernet only) and Layer 3 interfaces in the ingress direction.
value		Number or name that sets the precedence bits in the IP header. Range is from 0 to 7. Reserved keywords can be specified instead of numeric values. Table 2: IP Precedence Values and Names, on page 45 describes the reserved keywords.

Command Default

No default behavior or values

Command Modes

Policy map class configuration

Command History

Release 2.0	This command was introduced.
Release 3.8.0	The **tunnel** keyword is supported for QoS in a Multicast Virtual Private Network (mVPN) enabled network that requires both conditional and unconditional marking of precedence bits on the tunnel header.
Release 3.9.0	Support for the **tunnel** keyword on Layer 2 interfaces was added.

Usage Guidelines

Precedence can be set using a number or corresponding name. After IP Precedence bits are set, other QoS services such as Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED) then operate on the bit settings.

Conditional marking marks the precedence values on the tunnel header as a policer action. Unconditional marking marks the precedence tunnel as a policy action. Both conditional and unconditional markings are supported only in an ingress direction. The **tunnel** keyword is available on Layer 2 (Ethernet only) and Layer 3 interfaces in the ingress direction.

The network gives priority (or some type of expedited handling) to the marked traffic through the application of MDRR or WRED at points downstream in the network. IP precedence can be set at the edge of the network (or administrative domain) and have queueing act on it thereafter. MDRR can speed handling for high-precedence traffic at congestion points. WRED ensures that high-precedence traffic has lower loss rates than other traffic during times of congestion.

The mapping from keywords such as 0 (routine) and 1 (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 high-end Internet QoS, IP precedences can be used to establish classes of service that do not necessarily correspond numerically to better or worse handling in the network.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows how to set the IP precedence to 5 (critical) for packets that match the access control list named customer1:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match access-group ipv4 customer1
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set precedence 5
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if)# service-policy output policy1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

ntp(ipv4/ipv6)

To configure DSCP for source address (IPv4/IPv6) to mark NTP packets. The NTP packets are treated according to DSCP marking.

{**ntp ipv4** | **ntp ipv6**}

Syntax Description	DSCP	Differentiated Services Code Point (DSCP) is a field in an IP packet that enables service(different levels) to be allocated to network traffic. DSCP is the combination of IP Precedence and Type of Service fields.
	Set Precendence	setting levels for IP packets.

Command Modes	NTP Configuration mode

Command History	Release	Modification
	Release 5.3.2	This command was introduced

Usage Guidelines	It sets NTP packets with DSCP field and NTP packets can be V4 and V6 based respectively it set DSCP/TOS field in v4 or v6 IP headers.

Task ID	Task ID	Operation
	IP Services	read, write

Example

```
RP/0/RP0/CPU0:router(config)#ntp ipv4 ?
  dscp        Set IP DSCP (DiffServ CodePoint)
  precedence  Set precedence

RP/0/RP0/CPU0:router(config)#ntp ipv6 ?
  dscp        Set IP DSCP (DiffServ CodePoint)
  precedence  Set precedence
```

dscp(ntp)

To configure DSCP for source address (IPv4/IPv6) to mark NTP packets and these NTP packets are treated according to DSCP marking.

{**ntp ipv4** | **ipv6** } *dscp*

Syntax Description		
	<0-63>	Differentiated services codepoint value
	af11	Match packets with AF11 dscp (001010)
	af12	Match packets with AF12 dscp (001100)
	af13	Match packets with AF13 dscp (001110)
	af21	Match packets with AF21 dscp (010010)
	af22	Match packets with AF22 dscp (010100)
	af23	Match packets with AF23 dscp (010110)
	af31	Match packets with AF31 dscp (011010
	af32	Match packets with AF32 dscp (011100)
	af33	Match packets with AF33 dscp (011110)
	af41	Match packets with AF41 dscp (100010)
	af42	Match packets with AF42 dscp (100100)
	af43	Match packets with AF43 dscp (100110)
	cs1	Match packets with CS1(precedence 1) dscp (001000)
	cs2	Match packets with CS2(precedence 2) dscp (010000)
	cs3	Match packets with CS3(precedence 3) dscp (011000)
	cs4	Match packets with CS4(precedence 4) dscp (100000)
	cs5	Match packets with CS5(precedence 5) dscp (101000)
	cs6	Match packets with CS6(precedence 6) dscp (110000)
	cs7	Match packets with CS7(precedence 7) dscp (111000)
	default	Match packets with default dscp (000000)
	ef	Match packets with EF dscp (101110)

Command Default The default IPv4/IPv6 packets are matched with default dscp (000000).

Command Modes   NTP Configuration mode.

Command History

Release	Modification
Release 5.3.2	This command was introduced.

Usage Guidelines   Use **DSCP** level to configure levels for the NTP packets at IP layer.

Task ID

Task ID	Operation
IP Services	read, write

Example

```
RP/0/RP0/CPU0:router(config-ntp)#ntp ipv4 dscp
 <0-63>   Differentiated services codepoint value
 af11     Match packets with AF11 dscp (001010)
 af12     Match packets with AF12 dscp (001100)
 af13     Match packets with AF13 dscp (001110)
 af21     Match packets with AF21 dscp (010010)
 af22     Match packets with AF22 dscp (010100)
 af23     Match packets with AF23 dscp (010110)
 af31     Match packets with AF31 dscp (011010)
 af32     Match packets with AF32 dscp (011100)
 af33     Match packets with AF33 dscp (011110)
 af41     Match packets with AF41 dscp (100010)
 af42     Match packets with AF42 dscp (100100)
 af43     Match packets with AF43 dscp (100110)
 cs1      Match packets with CS1(precedence 1) dscp (001000)
 cs2      Match packets with CS2(precedence 2) dscp (010000)
 cs3      Match packets with CS3(precedence 3) dscp (011000)
 cs4      Match packets with CS4(precedence 4) dscp (100000)
 cs5      Match packets with CS5(precedence 5) dscp (101000)
 cs6      Match packets with CS6(precedence 6) dscp (110000)
 cs7      Match packets with CS7(precedence 7) dscp (111000)
 default  Match packets with default dscp (000000)
 ef       Match packets with EF dscp (101110)


RP/0/RP0/CPU0:router(config-ntp)#ntp ipv6 dscp
 <0-63>   Differentiated services codepoint value
 af11     Match packets with AF11 dscp (001010)
 af12     Match packets with AF12 dscp (001100)
 af13     Match packets with AF13 dscp (001110)
 af21     Match packets with AF21 dscp (010010)
 af22     Match packets with AF22 dscp (010100)
 af23     Match packets with AF23 dscp (010110)
 af31     Match packets with AF31 dscp (011010)
 af32     Match packets with AF32 dscp (011100)
 af33     Match packets with AF33 dscp (011110)
 af41     Match packets with AF41 dscp (100010)
 af42     Match packets with AF42 dscp (100100)
 af43     Match packets with AF43 dscp (100110)
 cs1      Match packets with CS1(precedence 1) dscp (001000)
 cs2      Match packets with CS2(precedence 2) dscp (010000)
 cs3      Match packets with CS3(precedence 3) dscp (011000)
```

```
cs4      Match packets with CS4(precedence 4) dscp (100000)
cs5      Match packets with CS5(precedence 5) dscp (101000)
cs6      Match packets with CS6(precedence 6) dscp (110000)
cs7      Match packets with CS7(precedence 7) dscp (111000)
default  Match packets with default dscp (000000)
ef       Match packets with EF dscp (101110)
```

dscp precedence(ntp)

To configure DSCP Prcedence for the IPv4/IPv6 NTP packets, enter Network Time Protocol (NTP) configuration mode and run NTP configuration commands, use the DSCP Prcedence(NTP) command.

{**ntp ipv4** | **ipv6**} *dscp*

Syntax Description		
	<0-7>	Precedence value
	critical	Match packets with critical precedence (5)
	flash	Match packets with flash precedence (3)
	flash-override	Match packets with flash override precedence (4)
	immediate	Match packets with immediate precedence (2)
	internet	Match packets with internetwork control precedence (6)
	network	Match packets with network control precedence (7)
	priority	Match packets with priority precedence (1)
	routine	Match packets with routine precedence (0)

Command Modes   NTP Configuration mode.

Command History

Release	Modification
Release 5.3.2	This command was introduced.

Usage Guidelines   Use **Prcedence** values to set the configuration levels for the NTP packets at IP layer.

Task ID

Task ID	Operation
IP Services	read, write

Example

```
RP/0/RP0/CPU0:router(config-ntp)#ntp ipv4 precedence ?
<0-7>          Precedence value
critical       Match packets with critical precedence (5)
flash          Match packets with flash precedence (3)
flash-override  Match packets with flash override precedence (4)
immediate      Match packets with immediate precedence (2)
internet       Match packets with internetwork control precedence (6)
network        Match packets with network control precedence (7)
priority       Match packets with priority precedence (1)
```

```
routine          Match packets with routine precedence (0)



RP/0/RP0/CPU0:router(config-ntp)#ntp ipv6 precedence ?
<0-7>            Precedence value
critical         Match packets with critical precedence (5)
flash            Match packets with flash precedence (3)
flash-override   Match packets with flash override precedence (4)
immediate        Match packets with immediate precedence (2)
internet         Match packets with internetwork control precedence (6)
network          Match packets with network control precedence (7)
priority         Match packets with priority precedence (1)
routine          Match packets with routine precedence (0)
```

set qos-group

To set the quality of service (QoS) group identifiers on packets, use the **set qos-group** command in policy map class configuration mode. To leave the QoS group values unchanged, use the **no** form of this command.

set qos-group qos-group-value
no set qos-group qos-group-value

Syntax Description

qos-group-value	QoS group ID. An integer from 0 to 31, to be marked on the packet.

Command Default

No group ID is specified.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.

Usage Guidelines

The **set qos-group** command associates a QoS group ID with a packet. After the QoS group ID is set, other QoS services, such as Modified Deficit Round Robin (MDRR) and Weighted Random Early Detection (WRED), can operate on the QoS group setting.

The QoS group setting is limited in scope to the local router. Typically, the QoS group is set on the local router and used in conjunction with WRED or MDRR to give differing levels of service based on the group identifier.

Task ID

Task ID	Operations
qos	read, write

Examples

This example sets the QoS group to 5 for packets that match the MPLS experimental bit 1:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 1
RP/0/RP0/CPU0:router(config-cmap)# exit

RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set qos-group 5
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface pos 0/7/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy input policy1
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
match dscp, on page 39	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

set srp-priority

To set the Spatial Reuse Protocol (SRP) priority value of an outgoing packet, use the **set srp-priority** command in policy map class configuration mode. To remove a specific SRP priority setting, use the **no** form of this command.

set srp-priority *priority-value*
no set srp-priority *priority-value*

Syntax Description	**priority-value**	Specific SRP CoS value from 0 to 7.

Command Default No SRP CoS value of an outgoing packet is set.

Command Modes Policy map class configuration

Command History

Release	Modification
Release 3.2.2	This command was introduced.
Release 3.3.0	This command was not supported.
Release 3.4.0	This command was supported.

Usage Guidelines The **set srp-priority** command can be used only in service policies that are attached in the output direction of an interface.

Task ID

Task ID	Operations
qos	read, write

Examples In the following example, the policy map called srp-set is created to assign different SRP CoS values for different types of traffic, and then is attached to output SRP interface 0/2/0/0:

```
RP/0/RP0/CPU0:router(config)# policy-map srp-set
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# set srp-priority 5
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit

RP/0/RP0/CPU0:router(config)# interface srp 0/2/0/0
RP/0/RP0/CPU0:router(config-if)# service-policy output srp-set
```

Related Commands

Command	Description
class-map, on page 11	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
service-policy (interface BNG), on page 80	Attaches a policy map to an input interface or output interface to be used as the service policy for that interface.

shape average (BNG)

To shape traffic to the indicated bit rate according to the algorithm specified, use the **shape average** command in policy map class configuration mode. To remove traffic shaping, use the **no** form of this command.

shape average {percent {*percentage* **} |** *rate* [*units*] **| per-thousand** *value* **| per-million** *value* **}**

Syntax Description		
	percent *percentage*	Specifies the interface bandwidth in percentage. Values can be from 1 to 100.
	rate	Average shaping rate in the specified units. Values can be from 1 to 4294967295.
	units	(Optional) Units for the bandwidth. Values can be: • **Excess burst size**—values can be from 1 to 4294967295 • **bps**—bits per second (default) • **gbps**—gigabits per second • **kbps**—kilobits per second • **mbps**—megabits per second
	per-thousand *value*	Specifies shape rate as parts per thousand of the available bandwidth.
	per-million *value*	Specifies shape rate as parts per million of the available bandwidth.

Command Default *units*: **bps**

Command Modes Policy map class configuration

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.1	Minimum rate value changed from 128 kbps to 256 kbps.
Release 4.3.1	The **per-million** and **per-thousand** keywords were added.

Usage Guidelines When you use the **shape average** command, egress shaping is done at the Layer 2 level and includes the Layer 2 header in the rate calculation. Ingress shaping is done at the Layer 3 level and does not include the Layer 2 header in the rate calculation. Shaping is performed in multiples of 256 kbps, the minimum shaping rate.

For **shape average** commands in the child policy, the reference used for percentage parameters is relative to the maximum rate of the parent. If shaping or policing is not configured on the parent, then the parent inherits the interface rate.

For bundled interfaces, **shape average** can be configured only as a percentage.

If you have both shape and bandwidth configured for a class, ensure that the shape percent value is always greater than the percent value for bandwidth.

Task ID

Task ID	Operations
qos	read, write

Examples

This example sets traffic shaping to 50 milliseconds:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# shape average percent 50
```

This example shows how to set traffic shaping to 5,000,000 kbps:

```
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# shape average 5000000 kbps
```

show fmgr fabqos

To display the fabric entries for QoS, use the **show fmgr fabqos** command in EXEC mode.

show fmgr fabqos {**hw** | **sw**} **location** *node-id*

Syntax Description		
hw	Reads from the hardware.	
sw	Reads from the software.	
location *node-id*	Identifies the location of the interface whose fabric entries you want to display.	

Command Default   No default behavior or values

Command Modes   EXEC

Command History

Release	Modification
Release 3.8.0	This command was introduced.

Usage Guidelines   To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

To see the location of all nodes installed in the router, use the **show platform** command.

Task ID

Task ID	Operations
qos	read

Examples   The following sample output shows the fabric QoS entries from the software:

```
RP/0/RP0/CPU0:router# show fmgr fabqos sw location 0/1/CPU0

FABQOS ENTRIES
===============================================================================
Interface = FABQOS Feature = fabqos Direction = in
TCAM Fields:
protocol qos-group dscp exp dc cos
===============================================================================
Zero entries found
```

Related Commands

Command	Description
show fmgr interface, on page 106	Displays ternary content addressable memory (TCAM) feature entries for QoS.

show fmgr interface

To display ternary content addressable memory (TCAM) feature entries for QoS, use the **show fmgr interface** command in EXEC mode.

show fmgr interface *type interface-path-id* **feature** {**policer** | **qos** | **qos-all**} {**input** | **output**} [{**all** | **dup-bank** | **hw** | **ipv4-mpls** | **ipv6** | **l2** | **location** *node-id* | **sw**}]

Syntax Description		
type	Interface type. For more information, use the question mark (?) online help function.
interface-path-id	Physical interface or virtual interface.
	Note Use the **show interfaces** command to see a list of all interfaces currently configured on the router.
	For more information about the syntax for the router, use the question mark (?) online help function.
feature	Displays feature specific information.
policer	Displays policer entries.
qos	Displays QoS entries.
qos-all	Displays entries for both QoS and policer.
input	Specifies the ingress direction.
output	Specifies the egress direction.
all	(Optional) Displays all TCAM entries.
dup-bank	(Optional) Displays entries from the duplicate bank in turbo mode.
hw	(Optional) Reads from the hardware.
ipv4-mpls	(Optional) Displays ipv4-mpls entries.
ipv6	(Optional) Displays ipv6 entries.
l2	(Optional) Displays Layer 2 entries.
location *node-id*	(Optional) Identifies the location of the interface whose TCAM information you want to display. The *node-id* is expressed in the *rack/slot/module* notation.
	Note Use the **show platform** command to see the location of all nodes installed in the router.
sw	(Optional) Reads from the software.

Command Default   No default behavior or values

| **Command Modes** | EXEC mode |

Command History

Release	Modification
Release 3.2	This command was introduced.
Release 3.5.0	The **in** keyword was replaced with the **input** keyword.
	The **out** keyword was replaced with the **output** keyword.
	The **l2** keyword was added.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
qos	read

Examples The following sample output shows how to display all ingress QoS and policer TCAM entries for a Gigabit Ethernet interface:

```
RP/0/RP0/CPU0:router# show fmgr interface GigabitEthernet 0/1/5/0 feature qos-all in

QOS ENTRIES
================================================================================
Interface = GigabitEthernet0_1_5_0     Feature = qos     Direction = in
TCAM Fields:
ip/mpls  bndl  vlg_id  cid  dscp  exp  dc  qos-id

CSRAM Fields:
prio sh_q red_ctr qos_grp dc l2_mark l3_mark l3_mark_val max_th seg_size min_th
1st_seg pol_has_hpq
================================================================================
No QoS configured on this interface


POLICER ENTRIES
================================================================================
Interface = GigabitEthernet0_1_5_0     Feature = policer     Direction = in
TCAM Fields:
IPv4: ip/mpls vlg_id l2_cos drid ip_src l4_proto frag dscp ip_dest qos_grp dc d
st_port qos-id
MPLS: ip/mpls vlg_id l2_cos label exp qos_grp dc qos-id

CSRAM Fields:
cid token1 stats_ptr conform1 exceed1 violate1 token2 conform2 exceed2 violate2
================================================================================
No QoS configured on this interface


POLICER ENTRIES
================================================================================
Interface = GigabitEthernet0_1_5_0     Feature = policer     Direction = in
TCAM Fields:
IPv6: ipv6 vlg_id l2_cos dest_port src_port ip_dest ip_src ext_dst ext_rtg ext_
h ext_frag dest_rng_id dc qos_grp l4_proto dscp/prec qos-id
```

```
CSRAM Fields:
cid token1 stats_ptr conform1 exceed1 violate1 token2 conform2 exceed2 violate2
================================================================================
No QoS configured on this interface

RP/0/RP0/CPU0:router#
```

The following table describes the significant fields shown in the display.

Table 4: show fmgr interface Field Descriptions

Field	Description
QOS ENTRIES	Displays the following QoS information: • Interface—Interface type and identifier. • Feature—Feature currently running on the specified interface. • Direction—Direction of interface (ingress or egress).
CSRAM Fields	General CSRAM information.
POLICER ENTRIES	General policer and TCAM information for the specified interface.

show hw-module qos input police granularity location

To display the police granularity information for input interfaces, use the **show hw-module qos input police granularity location** command in EXEC mode.

show hw-module qos input police granularity location {**all**_interface-path-id_}

Syntax Description	**all**	Displays police granularity information for all input interfaces.
	interface-path-id	Physical location of the Shared Interface Processor (SIP). Naming notation is _rack/slot/module;_ a slash between values is required as part of the notation.

• _rack_ —Chassis number of the rack.
• _slot_ —Physical slot number of the modular services card or line card.
• _module_ —Module number. A physical layer interface module (PLIM) is always 0.

Command Default   None

Command Modes   EXEC mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

This sample output shows how to display police granularity information for the input interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router# show hw-module qos input police granularity location 0/1/CPU0

===========================
    QOS POLICE GRANULARITY
===========================

 Location      Rate Deviation
               Tolerance (%)
==========    =============
 0/1/CPU0          10
---------------------------
```

Related Commands

Command	Description
hw-module qos input police granularity location, on page 22	Configures the policer granularity on input interfaces.

show hw-module qos output police granularity location

To display the police granularity information for output interfaces, use the **show hw-module qos output police granularity location** command in EXEC mode.

show hw-module qos output police granularity location {**all***interface-path-id*}

Syntax Description		
all		Displays police granularity information for all output interfaces.
interface-path-id		Physical location of the Shared Interface Processor (SIP). Naming notation is *rack/slot/module;* a slash between values is required as part of the notation.
		• *rack* —Chassis number of the rack.
		• *slot* —Physical slot number of the modular services card or line card.
		• *module* —Module number. A physical layer interface module (PLIM) is always 0.

Command Default None

Command Modes EXEC mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Example

This sample output shows how to display police granularity information, for the output interface at location :

```
RP/0/RP0/CPU0:router# show hw-module qos output police granularity location 0/1/CPU0

==========================
    QOS POLICE GRANULARITY
==========================

 Location     Rate Deviation
              Tolerance (%)
==========   ==============
 0/1/CPU0         10
--------------------------
```

Related Commands

Command	Description
hw-module qos output police granularity location, on page 24	Configures the policer granularity on output interfaces.

show hw-module qos output shape granularity location

To display shape granular information, use the **show hw-module qos output shape granularity location** command in EXEC mode.

show hw-module qos output shape granularity location {**all***interface-path-id*}

<table>
<tr><td>**Syntax Description**</td><td>**all**</td><td>Displays shape granularity information for all interfaces.</td></tr>
<tr><td></td><td>*interface-path-id*</td><td>Physical location of the Shared Interface Processor (SIP). Naming notation is *rack/slot/module;* a slash between values is required as part of the notation.

• *rack* —Chassis number of the rack.
• *slot* —Physical slot number of the modular services card or line card.
• *module* —Module number. A physical layer interface module (PLIM) is always 0.</td></tr>
</table>

Command Default   None

Command Modes   EXEC mode

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Example

This sample output shows how to display shape granularity for the output interface at location 0/1/CPU0:

```
RP/0/RP0/CPU0:router# show hw-module qos output shape granularity location 0/1/CPU0

============ ====================================
              QOS SHAPING GRANULARITY
             ====================================
             Configured   HW            LC
 Location    Shape        Programmed    reload
             Granularity  Granularity   (Y / N)
============ ==========   ===========  ========
 0/1/CPU0      ---          256Kbps        N
---------------------------------------------------
```

Table 5: show hw-module qos output shape granularity location Field Descriptions, on page 111 describes the significant fields shown in the display.

Table 5: show hw-module qos output shape granularity location Field Descriptions

Field	Description
Configured Shape Granularity	User-configured shape granularity for the specified location.

Field	Description
HW Programmed Granularity	Hardware programmed shape granularity for the specified location.
LC reload (Y/N)	Specifies whether a line card reload will be required to enable the user configured shape granularity.

show policy-map interface

To display policy configuration information for all classes configured for all service policies on the specified interface, use the **show policy-map interface** command in EXEC mode.

show policy-map interface *interface type* *interface-path-id* [{**input** | **output** [**member** *interface type* *interface-path-id*]}]

Syntax Description		
	interface type	Interface type. For more information, use the question mark (?) online help function.
	interface-path-id	Physical interface instance. Naming notation is *rack/slot/module/port* and a slash between values is required as part of the notation. • *rack*—Chassis number of the rack. • *slot*—Physical slot number of the line card. • *module*—Module number. A physical layer interface module (PLIM) is always 0. • *port*—Physical port number of the interface. **Note** In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RP0 or RP1) and the module is CPU0. Example: interface MgmtEth0/RP1/CPU0/0. For more information about the syntax for the router, use the question mark (?) online help function.
	input	(Optional) Displays per class statistics on inbound traffic for the specified policy map and interface.
	output	(Optional) Displays per class statistics on outbound traffic for the specified policy map and interface.
	member	(Optional) Specifies the bundle member's interface or PWHE member interface name.

Command Default None

Command Modes EXEC mode

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.3.0	The **combined**, **hw**, and **sw** keywords were added.
Release 3.4.0	The **combined**, **hw**, and **sw** keywords were deleted.

Release	Modification
Release 3.4.1	The **combined**, **hw**, and **sw** keywords were added.
Release 3.5.0	The **pre-decrypt**, **post-decrypt**, **post-encrypt**, and **pre-decrypt** keywords were removed.
Release 3.6.0	The **combined**, **hw**, and **sw** keywords were removed.
	The **member** *type interface-path-id* keyword and arguments were added.
Release 4.3.0	The command output displays ECN-based WRED details.

Task ID

Task ID	Operations
qos	read

Examples

This sample output shows how to display policy statistics information for all classes on the TenGigE interface 0/6/1/0 that are in the output and input direction:

```
RP/0/RP0/CPU0:router# show policy-map interface tengige 0/6/1/0

TenGigE0/6/1/0 input: policy1

Class class1
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched                 :                   0/0                   0
    Transmitted             :                   0/0                   0
    Total Dropped           :                   0/0                   0
  Policing statistics                (packets/bytes)     (rate - kbps)
    Policed(conform)        :                   0/0                   0
    Policed(exceed)         :                   0/0                   0
    Policed(violate)        :                   0/0                   0
    Policed and dropped :                       0/0
  Queueing statistics
    Queue ID                              : 44
    Taildropped(packets/bytes)            : 0/0
Class class-default
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched                 :                   0/0                   0
    Transmitted             :                   0/0                   0
    Total Dropped           :                   0/0                   0
  Queueing statistics
    Queue ID                              : 44
    High watermark  (bytes)/(ms)          : 0/0
    Inst-queue-len  (bytes)/(ms)          : 0/0
    Avg-queue-len   (bytes)/(ms)          : 0/0
    Taildropped(packets/bytes)            : 0/0

TenGigE0/6/1/0 output: policy4

Class class1
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched                 :                   0/0                   0
    Transmitted             :                   0/0                   0
    Total Dropped           :                   0/0                   0
  Policing statistics                (packets/bytes)     (rate - kbps)
    Policed(conform)        :                   0/0                   0
```

```
      Policed(exceed)     :               0/0                        0
      Policed(violate)    :               0/0                        0
      Policed and dropped :               0/0
    Queueing statistics
      Queue ID                          : 51
      Taildropped(packets/bytes)        : 0/0
Class class-default
  Classification statistics        (packets/bytes)      (rate - kbps)
    Matched             :               0/0                        0
    Transmitted         :               0/0                        0
    Total Dropped       :               0/0                        0
  Queueing statistics
    Queue ID                          : 51
    High watermark  (bytes)/(ms)      : 0/0
    Inst-queue-len  (bytes)/(ms)      : 0/0
    Avg-queue-len   (bytes)/(ms)      : 0/0
    Taildropped(packets/bytes)        : 0/0
```

This example shows how to display the pbr information for a policy-map:

```
RP/0/RP0/CPU0:router # show policy-map type pbr int gig 0/1/0/29
GigabitEthernet0/0/0/2 input: policy1
Class class1
  Classification statistics        (packets/bytes)      (rate - kbps)
    Matched             :             100/800                     100
 PBTS statistics                     (packets/bytes)
    Total marked        :             100/800                     100
Class class-default
  Classification statistics        (packets/bytes)      (rate - kbps)
    Matched             :             100/800                     100
```

The sample output shows how to display policy statistics information for all classes on the Serial
interface 0/0/3/0/3:0 that are in the output direction:

```
RP/0/RP0/CPU0:router# show policy-map interface TenGigE 0/4/0/0/7 output

Thu Sep  5 10:01:58.535 UTC

TenGigE0/4/0/0/7 output: egress-8q

Class prec-1
  Classification statistics        (packets/bytes)      (rate - kbps)
    Matched             :               0/0                        0
    Transmitted         :               0/0                        0
    Total Dropped       :               0/0                        0
  Queueing statistics
    Queue ID                          : 50
    High watermark  (bytes)/(ms)      : 1256996/100
    Inst-queue-len  (bytes)/(ms)      : 1256996/100
    Avg-queue-len   (bytes)/(ms)      : 1249924/99
    Taildropped(packets/bytes)        : 0/0
Class prec-2
  Classification statistics        (packets/bytes)      (rate - kbps)
    Matched             :               0/0                        0
    Transmitted         :               0/0                        0
    Total Dropped       :               0/0                        0
  Policing statistics                 (packets/bytes)      (rate - kbps)
    Policed(conform)    :               0/0                        0
    Policed(exceed)     :               0/0                        0
    Policed(violate)    :               0/0                        0
```

```
        Policed and dropped :                0/0
      Queueing statistics
        Queue ID                          : 51
        High watermark  (bytes)/(ms)      : 0/0
        Inst-queue-len  (bytes)/(ms)      : 0/0
        Avg-queue-len   (bytes)/(ms)      : 0/0
        Taildropped(packets/bytes)        : 0/0
    Class prec-3
      Classification statistics         (packets/bytes)     (rate - kbps)
        Matched             :                0/0                    0
        Transmitted         :                0/0                    0
        Total Dropped       :                0/0                    0
      Queueing statistics
        Queue ID                          : 54
        High watermark  (bytes)/(ms)      : 0/0
        Inst-queue-len  (bytes)/(ms)      : 0/0
        Avg-queue-len   (bytes)/(ms)      : 0/0
        Taildropped(packets/bytes)        : 0/0
    Class prec-5
      Classification statistics         (packets/bytes)     (rate - kbps)
        Matched             :                0/0                    0
        Transmitted         :                0/0                    0
        Total Dropped       :                0/0                    0
      Queueing statistics
        Queue ID                          : 55
        High watermark  (bytes)/(ms)      : 383712/30
        Inst-queue-len  (bytes)/(ms)      : 383712/30
        Avg-queue-len   (bytes)/(ms)      : 368071/29
        Taildropped(packets/bytes)        : 0/0
        RED random drops(packets/bytes)   : 0/0
        RED maxthreshold drops(packets/bytes): 0/0

        RED profile (default)
        RED Transmitted (packets/bytes)   : 0/0
        RED random drops(packets/bytes)   : 0/0
        RED maxthreshold drops(packets/bytes): 0/0
    Class prec-6
      Classification statistics         (packets/bytes)     (rate - kbps)
        Matched             :                0/0                    0
        Transmitted         :                0/0                    0
        Total Dropped       :                0/0                    0
      Policing statistics               (packets/bytes)     (rate - kbps)
        Policed(conform)    :                0/0                    0
        Policed(exceed)     :                0/0                    0
        Policed(violate)    :                0/0                    0
        Policed and dropped :                0/0
      Queueing statistics
        Queue ID                          : 58
        High watermark  (bytes)/(ms)      : 192/0
        Inst-queue-len  (bytes)/(ms)      : 0/0
        Avg-queue-len   (bytes)/(ms)      : 0/0
        Taildropped(packets/bytes)        : 0/0
    Class prec-7
      Classification statistics         (packets/bytes)     (rate - kbps)
        Matched             :                0/0                    0
        Transmitted         :                0/0                    0
        Total Dropped       :                0/0                    0
      Policing statistics               (packets/bytes)     (rate - kbps)
        Policed(conform)    :                0/0                    0
        Policed(exceed)     :                0/0                    0
        Policed(violate)    :                0/0                    0
        Policed and dropped :                0/0
      Queueing statistics
        Queue ID                          : 59
```

```
      High watermark  (bytes)/(ms)        : 0/0
      Inst-queue-len  (bytes)/(ms)        : 0/0
      Avg-queue-len   (bytes)/(ms)        : 0/0
      Taildropped(packets/bytes)          : 0/0
Class prec-0
  Classification statistics          (packets/bytes)      (rate - kbps)
    Matched            :                    0/0                      0
    Transmitted        :                    0/0                      0
    Total Dropped      :                    0/0                      0
  Policing statistics                (packets/bytes)      (rate - kbps)
    Policed(conform)   :                    0/0                      0
    Policed(exceed)    :                    0/0                      0
    Policed(violate)   :                    0/0                      0
    Policed and dropped :                   0/0
  Queueing statistics
    Queue ID                              : 62
    Taildropped(packets/bytes)            : 0/0
Class class-default
  Classification statistics          (packets/bytes)      (rate - kbps)
    Matched            :                    0/0                      0
    Transmitted        :                    0/0                      0
    Total Dropped      :                    0/0                      0
  Queueing statistics
    Queue ID                              : 62
    High watermark  (bytes)/(ms)          : 1254960/100
    Inst-queue-len  (bytes)/(ms)          : 1249980/99
    Avg-queue-len   (bytes)/(ms)          : 1249980/99
    Taildropped(packets/bytes)            : 0/0
```

Note   In Classification Statistics, the total dropped packets are calculated based on the total number of policed-dropped packets and the queueing tail dropped packets. Currently, for ATM interfaces in the egress direction, the queueing tail dropped packets are not added to the classification total dropped packets.

This table describes the significant fields shown in the display.

Table 6: show policy-map interface Field Descriptions

Field	Description
Classification statistics	
Matched	Number of packets or bytes that matched this class.
Transmitted	Number of packets or bytes transmitted for this class.
Total Dropped	Number of packets or bytes dropped for this class.
Policing statistics	
Policed(conform)	Number of packets or bytes that conformed to the police rate for this class.
Policed(exceed)	Number of packets or bytes that exceeded the police rate for this class.
Policed(violate)	Number of packets or bytes that violated the police rate for this class.
Policed and dropped	Number of packets or bytes dropped by the policer of this class.

Field	Description
Queuing statistics	
Queue ID	Queue number of the packet in this class.
High watermark (bytes)/(ms)	Maximum length of the queue.
Inst-queue-len (bytes)/(ms)	Instantaneous length of the queue.
Avg-queue-len (bytes)/(ms)	Average length of the queue.
Taildropped (bytes)	Number of bytes taildropped for this queue.

show policy-map targets

To display information about the interfaces on which policy maps are applied, use the **show policy-map targets** command in EXEC mode.

show policy-map targets [{**location** *node-id* | **pmap-name** *name* | **type** [**pbr** | **performance-traffic** | **redirect** | **traffic**][{**location** *node-id* | **pmap-name** *name*}] | **type qos** [{**location** *node-id* | **pmap-name** *name*}]}]

Syntax Description		
location *node-id*	(Optional) Displays information about the interfaces on which policy maps are applied for the specified location. The *node-id* argument is entered in the *rack/slot/module* notation.
pmap-name *name*	(Optional) Displays information about the interfaces on which the specified policy map is applied.
type pbr	(Optional) Displays information about Policy-based routing (PBR).
type performance-traffic	(Optional) Displays information about the interfaces on which Realtime Application Flow Monitoring policy maps are applied.
type qos	(Optional) Displays information about the interfaces on which QoS policy maps are applied. This is the default type.

Command Default

The default QoS policy type is QoS.

Command Modes

EXEC mode

Command History

Release	Modification
Release 3.8.0	This command was introduced.

Usage Guidelines

For a short period of time while a QoS policy is being modified, no QoS policy is active on the interface. For these reasons, modify QoS policies that affect the fewest number of interfaces at a time. Use the **show policy-map targets** command to identify the number of interfaces that will be affected during policy map modification.

Task ID

Task ID	Operations
qos	read

Examples

In this example, the Gigabit Ethernet interface 0/1/0/0 has one policy map attached as a main policy. Outgoing traffic on this interface will be affected if the policy is modified:

```
RP/0/RP0/CPU0:router# show policy-map targets

Fri Jul 16 16:38:24.789 DST
```

```
1) Policymap: policy1    Type: qos
      Targets (applied as main policy):
        GigabitEthernet0/1/0/0 output
      Total targets: 1

      Targets (applied as child policy):
      Total targets: 0
```

Related Commands

Command	Description
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.

show qos ea trace

To display the processing information of the QoS component on the line card, use the **show qos ea trace** command in EXEC mode mode.

show qos ea trace [**all**] [**file** *name* **original location** *node-id*] [**hexdump**] [**last** *entries*] [**location** *node-id*] [**tailf**] [**misc**] [**reverse**] [**stats**] [**unique**] [**verbose**] [**wrapping**] [**internal**] [**external**] [**errors**] [**qfifo**]

Syntax Description		
	all	(Optional) Specifies all trace entries.
	file *name* **original location** *node-id*	(Optional) Specifies the original location of a file.
	hexdump	(Optional) Displays trace entries in hexidecimal format.
	last *entries*	(Optional) Displays a specified number of the most recent trace entries.
	location *node-id*	(Optional) Displays trace entries associated with a designated node. The *node-id* argument is entered in the *rack/slot/module* notation.
	tailf	(Optional) Displays new trace entries as they are added.
	misc	(Optional) Displays miscellaneous trace entries.
	reverse	(Optional) Displays the most recent trace entries first.
	stats	(Optional) Displays trace entry statistics.
	unique	(Optional) Displays unique trace entries with counts.
	verbose	(Optional) Displays internal trace entry debugging information.
	wrapping	(Optional) Displays wrapping trace entries.
	internal	(Optional) Displays internal trace entries.
	external	(Optional) Displays external events received.
	errors	(Optional) Displays error traces.
	qfifo	(Optional) Displays QFIFO component interface events.

Command Default   No default behavior or values

Command Modes   EXEC mode

Command History

Release	Modification
Release 3.6.0	This command was introduced.
Release 3.8.0	The **qfifo** keyword was added.

Usage Guidelines   If you do not enter a *node-id* value, all configured interfaces are displayed.

Task ID

Task ID	Operations
qos	read

Examples   This example shows how to display QoS trace entry information:

```
RP/0/RP0/CPU0:router# show qos ea trace
```

This table describes the significant fields shown in the display.

Table 7: show qos ea-trace Field Descriptions

Field	Description
Timestamp	Time when the trace message is captured.
Process Name	Name of the process responsible for the trace.
Location	Card or slot which executes the process.
Message	Trace message.

show qos interface (BNG)

To display QoS information for a specific interface, use the **show qos interface** command in the EXEC mode.

show qos interface *type interface-path-id* {**input**|**output**} {**member** *type interface-path-id*}[**host-link** *interface-path-id*| **location** *node-id*]

Syntax Description		
type		Interface type. For more information, use the question mark (?) online help function.
interface-path-id		Either a physical interface instance or a virtual interface instance as follows:
		• Physical interface instance. Naming notation is *rack/slot/module/port* and a slash between values is required as part of the notation.
		• *rack* : Chassis number of the rack.
		• *slot* : Physical slot number of the modular services card or line card.
		• *module* : Module number. A physical layer interface module (PLIM) is always 0.
		• *port* : Physical port number of the interface.
	Note	In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RSP0 RP0 or RP1) and the module is CPU0. Example: interface MgmtEth0/ RSP0 RP1 /CPU0/0.
		• Virtual interface instance. Number range varies depending on interface type.
		For more information about the syntax for the router, use the question mark (?) online help function.
input		Attaches the specified policy map to the input interface.
output		Attaches the specified policy map to the output interface.
member		Specifies member of bundle interface or pin-down (generic list) interface of PWHE interface.
	Note	This keyword is applicable only for bundle and PWHE interface.

host-link	(Optional) Specifies the host-link.
	Note This keyword is applicable only for satellite information.
location *node-id*	(Optional) Displays detailed QoS information for the designated node. The *node-id* argument is entered in the rack/slot/module notation.

Command Default

No default behavior or values

Command Modes

EXEC mode

Command History

Release	Modification
Release 2.0	This command was introduced.
Release 3.4.1	L2VPN QoS policy configuration sample output was added.
Release 3.5.0	The **pre-decrypt**, **post-decrypt**, **post-encrypt,** and **pre-decrypt** keywords were removed.
Release 3.6.0	The command output now includes the following: • User-configured values are shown in parentheses. • Guaranteed service rate value. • Weight for each class.
Release 5.1.1	The **show qos interface** command output was updated to display Flow Aware call admission control (CAC) and user based rate limiting (UBRL) information. The **show qos interface** command output was updated to display QoS Offload on satellite information. PWHE interface type **PW-Ether** and **PW-IW** were added. The show output was updated for PWHE interface details.

Usage Guidelines

The **show qos interface** command displays configuration for all classes in the service policy that is attached to an interface.

Use this command to check the actual values programmed in the hardware from the action keywords in the **police rate** command.

(Only BNG) To enter the dynamic template configuration mode, run **dynamic-template** command in the Global Configuration mode.

Task ID

Task ID	Operations
qos	read

Examples

This is the sample output shows the L2VPN QoS information on a GigabitEthernet interface:

```
RP/0/RP0/CPU0:router# show qos interface GigabitEthernet 0/2/0/0 output

NOTE:- Configured values are displayed within parentheses
Interface GigE0_2_0_0  --   output policy
Total number of classes:   3
----------------------------------------------------------
Level1 class                        =   c1
Egressq Queue ID                    =   25 (LP queue)
Queue belongs to Group              =   9
Queue Max. BW.                      =   999936 kbps (10 %)
Queue Min. BW.                      =   0 kbps (default)
Weight                              =   10 (BWR not configured)
Shaper burst                        =   31248 bytes
Guaranteed service rate             =   1000000 kbps
TailDrop Threshold                  =   12500000 bytes / 100 ms (default)
Policer not configured for this class
WRED not configured for this class

Level1 class                        =   c2
Egressq Queue ID                    =   26 (LP queue)
Queue belongs to Group              =   9
Queue Max. BW.                      =   10000128 kbps (default)
Queue Min. BW.                      =   2000128 kbps (20 %)
Weight                              =   10 (BWR not configured)
Guaranteed service rate             =   4666666 kbps
TailDrop Threshold                  =   58333325 bytes / 100 ms (default)
Policer not configured for this class
WRED not configured for this class

Level1 class                        =   class-default
Egressq Queue ID                    =   9 (Group default LP queue)
Queue belongs to Group              =   9
Queue Max. BW.                      =   10000128 kbps (default)
Queue Min. BW.                      =   0 kbps (default)
Weight                              =   10 (BWR not configured)
Guaranteed service rate             =   1000000 kbps
TailDrop Threshold                  =   12500000 bytes / 100 ms (default)

Policer slot #                      =   224
Policer committed rate              =   1000000 kbps (10 %)
Policer conform burst               =   2097120 bytes (default)
Policer conform action              =   Just TX
Policer exceed  action              =   DROP PKT
WRED not configured for this class
```

This example shows the L2VPN QoS information on TenGigE 0/4/0/0/7 interface:

```
RP/0/RP0/CPU0:router# show qos interface TenGigE 0/4/0/0/7 output
Thu Sep  5 10:02:14.217 UTC
NOTE:- Configured values are displayed within parentheses
Interface TenGigE0/4/0/0/7 ifh 0x2000048  -- output policy
NPU Id:         0
Total number of classes:       8
Interface Bandwidth:           10000000 kbps
Accounting Type:               Layer2 (Include Layer 2 encapsulation and above)
-----------------------------------------------
Level1 Class                        =   prec-1
Schedule entry ID                   =   0x32 (0x10001)
Egressq Queue ID                    =   50 (LP queue)
Queue Max. BW.                      =   100000 kbps (1 %)
Queue Min. BW.                      =   0 kbps (default)
Weight                              =   25 (BWR not configured)
```

```
Guaranteed service rate              =    100000 kbps
TailDrop Threshold                   =    1250000 bytes / 100 ms (default)
Policer not configured for this class
WRED not configured for this class

Level1 Class (HP2)                   =    prec-2
Schedule entry ID                    =    0x33 (0x10002)
Egressq Queue ID                     =    51 (HP2 queue)
Guaranteed service rate              =    10000000 kbps
TailDrop Threshold                   =    12500000 bytes / 10 ms (default)

Policer Bucket Id                    =    0x9000100095103
Policer committed rate               =    99968 kbps (1 %)
Policer conform burst                =    124928 bytes (default)
Policer conform action               =    Just TX
Policer exceed action                =    DROP PKT
WRED not configured for this class

Level1 Class                         =    prec-3
Schedule entry ID                    =    0x36 (0x10003)
Egressq Queue ID                     =    54 (LP queue)
Queue Max. BW.                       =    100000 kbps (1 %)
Queue Min. BW.                       =    100000 kbps (1 %)
Weight                               =    25 (BWR not configured)
Guaranteed service rate              =    100000 kbps
TailDrop Threshold                   =    13750 bytes / 1 ms (1100 us)
Policer not configured for this class
WRED not configured for this class

Level1 Class                         =    prec-5
Schedule entry ID                    =    0x37 (0x10004)
Egressq Queue ID                     =    55 (LP queue)
Queue Max. BW.                       =    100000 kbps (1 %)
Queue Min. BW.                       =    0 kbps (default)
Weight                               =    25 (BWR not configured)
Guaranteed service rate              =    100000 kbps
TailDrop Threshold                   =    1250000 bytes / 100 ms (default)
Policer not configured for this class

WRED table handle                    =    0x0

RED profile
WRED Min. Threshold                  =    249856 bytes (20 ms)
WRED Max. Threshold                  =    374784 bytes (30 ms)
WRED First Segment                   =    1334
WRED Segment Size                    =    11

Level1 Class (HP1)                   =    prec-6
Schedule entry ID                    =    0x3a (0x10005)
Egressq Queue ID                     =    58 (HP1 queue)
Guaranteed service rate              =    10000000 kbps
TailDrop Threshold                   =    12500000 bytes / 10 ms (default)

Policer Bucket Id                    =    0x90001000a5103
Policer committed rate               =    99968 kbps (1 %)
Policer conform burst                =    124928 bytes (default)
Policer conform action               =    Just TX
Policer exceed action                =    DROP PKT
WRED not configured for this class

Level1 Class (HP1)                   =    prec-7
Schedule entry ID                    =    0x3b (0x10006)
Egressq Queue ID                     =    59 (HP1 queue)
Guaranteed service rate              =    10000000 kbps
```

```
TailDrop Threshold                   =    12500000 bytes / 10 ms (default)

Policer Bucket Id                    =    0x90001000b5103
Policer committed rate               =    99968 kbps (1 %)
Policer conform burst                =    124928 bytes (default)
Policer conform action               =    Just TX
Policer exceed action                =    DROP PKT
WRED not configured for this class

Level1 Class                         =    prec-0
Egressq Queue ID                     =    62 (Default LP queue)

Policer Bucket Id                    =    0x90001000c5103
Policer committed rate               =    99968 kbps (1 %)
Policer conform burst                =    1245184 bytes (default)
Policer conform action               =    Just TX
Policer exceed action                =    DROP PKT
WRED not configured for this class

Level1 Class                         =    class-default
Schedule entry ID                    =    0x3e (0x10008)
Egressq Queue ID                     =    62 (Default LP queue)
Queue Max. BW.                       =    100000 kbps (1 %)
Queue Min. BW.                       =    0 kbps (default)
Weight                               =    25 (BWR not configured)
Guaranteed service rate              =    100000 kbps
TailDrop Threshold                   =    1250000 bytes / 100 ms (default)
Policer not configured for this class
WRED not configured for this class
```

This table describes the significant fields shown in the display.

Note User-configured values are displayed within parentheses in the command output.

Table 8: show QoS interface Field Descriptions

Field	Description
RED on Multicast Traffic	Indicates if Random Early Detection (RED) is being performed on multicast traffic. Multicast RED is not performed if the configuration restrictions are not satisfied.
LEVEL1 class	Level 1 class identifier.
Queue Max. BW.	Maximum bandwidth allowed on this queue.
Queue Min. BW	Minimum bandwidth allowed on this queue.
class name	Name that was assigned to this class with the **class** command.
new dscp	New IP DSCP value assigned to this interface.
Weight	Weight assigned to the specified class.
Guaranteed service rate	Service rate of the queue when all queues are backlogged.

Field	Description
TailDrop Threshold(bytes)	Tail drop threshold for the sharq queue. Once the packets in the buffer is more than the value of the TailDrop Threshold, the incoming packets are dropped. The TailDrop Threshold value is a percentage of the full queue buffer.
WRED	Weighted Random Early Detection (WRED) assigned to the specified class. If no weight has been assigned, the **show policy-map interface** command output shows "WRED not configured for this class."
Egressq Queue ID	Egressq Queue ID.
Queue belongs to group	Identifies the host port for the specified queue.
Policer slot	Slot Identifier for the policer.
Policer committed rate	Committed Information Rate (CIR) in bits per second (bps), gigabits per second (gbps), kilobits per second (kbps), or megabits per second (mbps).
Policer avg. kbps	Average Committed Information Rate (CIR) in bits per second (bps), gigabits per second (gbps), kilobits per second (kbps), or megabits per second (mbps).
Policer peak rate	Peak CIR in bps, gbps, kbps, or mbps.
Policer conform burst	Programmed burst size, expressed in bytes, gigabytes (GB), kilobytes (KB), megabytes (MB), milliseconds (ms), or microseconds (us). The user-configured value is in parentheses.
Policer conform action	Policer conform action. The user-configured value is in parentheses.
Policer exceed action	Indicates whether the device supports excess burst size configuration. In the example, excess burst size configuration is supported for transmitted cells only.
Policer violate action	Policer violate action.

Use the **host-link** option to display the output for the desired Bundle ICL. In cases when the Satellite is hosted on a redundant (Bundle ICL), the qos command to check for the qos programming also needs to include the host-link option.

The host-link is the underlying ICL Bundle member, this output can be executed for all the members belonging to the ICL Bundle via the host-link option.

For eg, Bundle ICL, Bundle-ether 2, hosting the sat-ether interface gig 100/0/0/34 has a member tengige 0/3/0/7. The qos command to check for the qos programming would be:

```
RP/0/RP0/CPU0:router # sh qos inter gigabitEthernet 100/0/0/34 output host-link tenGigE
0/3/0/7 location 0/3/CPU0

Interface: GigabitEthernet100_0_0_34 output
Bandwidth configured: 500000 kbps Bandwidth programed: 500000 kbps
ANCP user configured: 0 kbps ANCP programed in HW: 0 kbps
Port Shaper programed in HW: 500000 kbps
Policy: grand Total number of classes: 10
-------------------------------------------------------------------
Level: 0 Policy: grand Class: class-default
QueueID: N/A
```

```
Shape CIR : ALL
Shape PIR Profile : 2/4(S) Scale: 488 PIR: 499712 kbps  PBS: 6246400 bytes
WFQ Profile: 2/9 Committed Weight: 10 Excess Weight: 10
Bandwidth: 0 kbps, BW sum for Level 0: 0 kbps, Excess Ratio: 1
----------------------------------------------------------------------
Level: 1 Policy: parent Class: class-default
Parent Policy: grand Class: class-default
QueueID: N/A
Shape CIR : NONE
Shape PIR Profile : 2/4(S) Scale: 244 PIR: 249856 kbps  PBS: 3123200 bytes
WFQ Profile: 2/9 Committed Weight: 10 Excess Weight: 10
Bandwidth: 0 kbps, BW sum for Level 1: 0 kbps, Excess Ratio: 1
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec1
Parent Policy: parent Class: class-default
QueueID: 131264 (Priority 1)
Queue Limit: 2496 kbytes Abs-Index: 89 Template: 0 Curve: 6
Shape CIR Profile: INVALID
Policer Profile: 54 (Single)
Conform: 50000 kbps (20 percent) Burst: 625000 bytes (0 Default)
Child Policer Conform: set dscp 46  set cos 7
Child Policer Exceed: DROP
Child Policer Violate: DROP
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec2
Parent Policy: parent Class: class-default
QueueID: 131265 (Priority 2)
Queue Limit: 624 kbytes (100 ms) Abs-Index: 59 Template: 0 Curve: 6
Shape CIR Profile: INVALID
Shape PIR Profile : 2/0(E) PIR: 50000 kbps PBS: 624992 bytes
Child Mark: set dscp 46  set cos 7
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec3
Parent Policy: parent Class: class-default
QueueID: 131267 (Priority 3)
Queue Limit: 472 kbytes (100 ms) Abs-Index: 53 Template: 0 Curve: 6
Shape CIR Profile: INVALID
Shape PIR Profile : 2/1(E) PIR: 37496 kbps PBS: 468736 bytes
Child Mark: set dscp 46  set cos 7
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec4
Parent Policy: parent Class: class-default
QueueID: 131266 (Priority Normal)
Queue Limit: 60 kbytes Abs-Index: 18 Template: 0 Curve: 0
Shape CIR Profile: INVALID
Child Mark: set dscp 46  set cos 7
WFQ Profile: 2/39 Committed Weight: 40 Excess Weight: 40
Bandwidth: 0 kbps, BW sum for Level 2: 0 kbps, Excess Ratio: 4
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec5
Parent Policy: parent Class: class-default
QueueID: 131268 (Priority Normal)
Queue Limit: 44 kbytes Abs-Index: 15 Template: 0 Curve: 0
Shape CIR Profile: INVALID
WFQ Profile: 2/29 Committed Weight: 30 Excess Weight: 30
Bandwidth: 0 kbps, BW sum for Level 2: 0 kbps, Excess Ratio: 3
----------------------------------------------------------------------
Level: 2 Policy: child Class: prec6
Parent Policy: parent Class: class-default
QueueID: 131269 (Priority Normal)
Queue Limit: 28 kbytes Abs-Index: 11 Template: 0 Curve: 0
Shape CIR Profile: INVALID
WFQ Profile: 2/19 Committed Weight: 20 Excess Weight: 20
Bandwidth: 0 kbps, BW sum for Level 2: 0 kbps, Excess Ratio: 2
```

```
------------------------------------------------------------------------
Level: 2 Policy: child Class: prec7
Parent Policy: parent Class: class-default
QueueID: 131270 (Priority Normal)
Queue Limit: 16 kbytes Abs-Index: 8 Template: 0 Curve: 0
Shape CIR Profile: INVALID
Child Mark: set cos 5
WFQ Profile: 2/9 Committed Weight: 10 Excess Weight: 10
Bandwidth: 0 kbps, BW sum for Level 2: 0 kbps, Excess Ratio: 1
------------------------------------------------------------------------
Level: 2 Policy: child Class: class-default
Parent Policy: parent Class: class-default
QueueID: 131271 (Priority Normal)
Queue Limit: 16 kbytes Abs-Index: 8 Template: 0 Curve: 0
Shape CIR Profile: INVALID
WFQ Profile: 2/9 Committed Weight: 10 Excess Weight: 10
Bandwidth: 0 kbps, BW sum for Level 2: 0 kbps, Excess Ratio: 1
```

This is the sample output of the **show qos interface** command for CAC:

```
RP/0/RP0/CPU0:router# show qos interface gigabitEthernet 0/1/0/0 input

Interface: GigabitEthernet0_1_0_0 input
Bandwidth configured: 1000000 kbps Bandwidth programed: 1000000 kbps
ANCP user configured: 0 kbps ANCP programed in HW: 0 kbps
Port Shaper programed in HW: 0 kbps
Policy: premium_services (Flow Aware Policy) Total number of classes: 5
------------------------------------------------------------------------
Level: 0 Policy: premium_services Class: dscp_cs5
QueueID: 98 (Port Default)
Policer Profile: 56 (Single)
Conform: 100000 kbps (100 mbps) Burst: 1250000 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 0 Policy: premium_services Class: dscp_cs6
Flow QoS Info: CAC  Cac Action
CAC Flow Mask Mode: 5-Tuple (0x20)
CAC Flow Rate: 128 kbps
CAC Rate: 896 kbps
CAC Max Flow Count: 7
CAC Flow Age: 20 Seconds
QueueID: N/A
------------------------------------------------------------------------
Level: 1 Policy: video_flows Class: video_admitted
Flow QoS Info: CAC Admit Class
CAC Flow Mask Mode: 5-Tuple (0x20)
CAC Max Flow Count: 7
CAC Flow Age: 20 Seconds
CAC Reject Action: Redirect
Number of CAC flows admitted: 0Parent Policy: premium_services Class: dscp_cs6
QueueID: 98 (Port Default)
Child Mark: set disc 1
------------------------------------------------------------------------
Level: 1 Policy: video_flows Class: class-default
Flow QoS Info: CAC Redirect Class
Parent Policy: premium_services Class: dscp_cs6
QueueID: 98 (Port Default)
Child Mark: set dscp 32
------------------------------------------------------------------------
Level: 0 Policy: premium_services Class: class-default
QueueID: 98 (Port Default)
Policer Profile: 54 (Single)
```

```
Conform: 30000 kbps (30 mbps) Burst: 375000 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
-----------------------------------------------------------------------
```

This is the sample output of the **show qos interface** command for UBRL:

```
RP/0/RP0/CPU0:router# show qos interface gigabitEthernet 0/1/0/0 input

Interface: GigabitEthernet0_1_0_0 input
Bandwidth configured: 1000000 kbps Bandwidth programed: 1000000 kbps
ANCP user configured: 0 kbps ANCP programed in HW: 0 kbps
Port Shaper programed in HW: 0 kbps
Policy: voice_flow (Flow Aware Policy) Total number of classes: 3
-----------------------------------------------------------------------
Level: 0 Policy: voice_flow Class: voice_prec6
QueueID: 98 (Port Default)
Policer Profile: 56 (Single)
Conform: 5000 kbps (5 mbps) Burst: 62500 bytes (0 Default)
Child Policer Conform: set dscp 34
Child Policer Exceed: DROP
Child Policer Violate: DROP
-----------------------------------------------------------------------
Level: 0 Policy: voice_flow Class: ubrl1
Flow QoS Info: UBRL
UBRL Flow Mask Mode: src-ip (0x80)
UBRL Flow Age: 200 Seconds
Number of UBRL flows learnt: 0
QueueID: 98 (Port Default)
Flow Policer Profile: 58 (Single)
Conform: 10000 kbps (10 mbps) Burst: 125000 bytes (0 Default)
Catch-all Policer Profile: 57 (Single)
Conform: 100000000 kbps (100000000 kbps) Burst: 12500000 bytes (12500000 bytes)
Child Policer Conform: set dscp 34
Child Policer Exceed: DROP
Child Policer Violate: DROP
-----------------------------------------------------------------------
Level: 0 Policy: voice_flow Class: class-default
QueueID: 98 (Port Default)
Policer Profile: 54 (Single)
Conform: 30000 kbps (30 mbps) Burst: 375000 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
-----------------------------------------------------------------------
```

This is the sample output of the **show qos interface** command for PW-HE subinterfaces.

```
RP/0/RP0/CPU0:router# show qos interface  pw-ether1.1 input member tengige0/2/0/5
Interface: TenGigE0_2_0_5 input
Bandwidth configured: 10000000 kbps Bandwidth programed: 10000000 kbps
ANCP user configured: 0 kbps ANCP programed in HW: 0 kbps
Port Shaper programed in HW: 0 kbps
Policy: PW-HE-Ingress Total number of classes: 9
-----------------------------------------------------------------------
Level: 0 Policy: PW-HE-Ingress Class: class-default
QueueID: N/A
Policer Profile: 55 (Single)
Conform: 2000000 kbps (2 gbps) Burst: 25000000 bytes (0 Default)
-----------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: 3play-voip
```

```
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 160 (Port Priority 1)
Policer Profile: 56 (Single)
Conform: 20000 kbps (1 percent) Burst: 125000 bytes (50 ms)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: multicast_limit
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 161 (Port Priority 2)
Policer Profile: 57 (SrTCM)
Conform: 40000 kbps (2 percent) Burst: 128000 bytes (128000 bytes)
Peak Burst: 128000 bytes (256000 bytes)
Child Policer Conform: set prec 5
Child Policer Exceed: set prec 4
Child Policer Violate: set prec 4
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: dscp_EF_ipprec_5
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 58 (Single)
Conform: 100000 kbps (5 percent) Burst: 256000 bytes (256000 bytes)
Child Policer Conform: set exp-imp 5
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: dscp_AF4x_ipprec_4
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 59 (Single)
Conform: 200000 kbps (10 percent) Burst: 2500000 bytes (100 ms)
Child Policer Conform: set exp-imp 4
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: dscp_AF3x_ipprec_3_6_7
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 60 (Single)
Conform: 400000 kbps (20 percent) Burst: 5000000 bytes (0 Default)
Child Policer Conform: set exp-imp 3
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: dscp_AF2x_ipprec_2
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 61 (Single)
Conform: 440000 kbps (22 percent) Burst: 5500000 bytes (0 Default)
Child Policer Conform: set exp-imp 2
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: ip_best_effort_BE
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 62 (Single)
Conform: 300000 kbps (15 percent) Burst: 3750000 bytes (0 Default)
Child Policer Conform: set exp-imp 0
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: DSCP_CE-PE_ETM Class: class-default
```

```
Parent Policy: PW-HE-Ingress Class: class-default
QueueID: 162 (Port Default)
Policer Profile: 63 (Single)
Conform: 500000 kbps (25 percent) Burst: 6250000 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
```

show qos redq

To display the information for a queue from the packets switching engine (PSE) random early detection queue (REDQ) memory, use the **show qos redq** command in EXEC mode mode.

show qos redq *queue-number* {**input** | **output**} **location** *node-id*

Syntax Description

queue-number	Number for the queue. Range is from 0 to 4294967295.
input	Attaches the specified policy map to the input interface.
output	Attaches the specified policy map to the output interface.
location *node-id*	Displays detailed information for a queue from the PSE REDQ memory for the designated node.

Command Default No default behavior or values

Command Modes EXEC mode

Command History

Release	Modification
Release 3.5.0	This command was introduced.

Usage Guidelines No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
qos	read

Examples The following sample output is from the **show qos redq** command:

```
RP/0/RP0/CPU0:router# show qos redq 5000 input location 0/1/CPU0

Tue Nov 11 03:31:02.370 PST DST
node 11  --   queue 5000 -- direction input policy
-----------------------------------------------------
weight                   = 0
avg_frac                 = 0
drop threshold           = 0
average length           = 0
instantaneous length     = 0
high watermark           = 0
```

The following table describes the significant fields shown in the display.

Table 9: show qos redq Field Descriptions

Field	Description
weight	Weight assigned to the specified class. If no weight has been assigned, the **show policy-map interface** command output shows "No explicit weight assigned for this class."
avg_frac	Remainder accrued in the calculation of the average queue length.
drop threshold	Drop threshold of the queue.
average length	Average length of the queue.
instantaneous length	Instantaneous length of the queue.
high watermark	Maximum length of the queue.

show qos wred-curve

To display the QoS Weighted Random Early Detection (WRED) curve data point information, use the **show qos wred-curve** command in EXEC mode.

show qos wred-curve {**input** | **output**} **location** *node-id*

Syntax Description

input	Attaches the specified policy map to the input interface.
output	Attaches the specified policy map to the output interface.
location *node-id*	Displays detailed QoS WRED curve information for the designated node. The *node-id* argument is entered in the rack/slot/module notation.

Command Default   No default behavior or values

Command Modes   EXEC mode

Command History

Release	Modification
Release 3.6.0	This command was introduced.

Usage Guidelines   No specific guidelines impact the use of this command.

Task ID

Task ID	Operations
qos	read

Examples   The following example shows how to display QoS WRED curve information:

```
RP/0/RP0/CPU0:router# show qos wred-curve input location 0/1/0
```

violate-action

To configure the action to take on packets that violate the rate limit, use the **violate-action** command in policy map police configuration mode. To remove a conform action from the policy-map, use the **no** form of this command.

violate-action {**drop** | **set** *options* | **transmit**}
no **violate-action** {**drop** | **set** *options* | **transmit**}

Syntax Description	**drop**	Drops the packet.
		• **srp-priority** *value*—Sets the Spatial Reuse Protocol (SRP) priority. Range is 0 to 7
	transmit	Transmits the packets.

Command Default   No default behavior or values

Command Modes   Policy map police configuration

Command History

Release	**Modification**
Release 3.4.0	This command was introduced.
Release 3.4.1	The **set qos-group** keyword was added.

Usage Guidelines   For more information regarding the traffic policing feature refer to the command.

The **violate-action** command can set the DSCP, the precedence, or the discard class for IP packets, and experimental and discard-class values for MPLS packets.

Task ID

Task ID	**Operations**
qos	read, write

Examples   In this example for MPLS, traffic policing is configured to drop packets that violate the rate limit:

```
RP/0/RP0/CPU0:router(config)# class-map class1
RP/0/RP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RP0/CPU0:router(config-cmap)# exit
RP/0/RP0/CPU0:router(config)# policy-map policy1
RP/0/RP0/CPU0:router(config-pmap)# class class1
RP/0/RP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RP0/CPU0:router(config-pmap-c-police)# violate-action drop
RP/0/RP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RP0/CPU0:router(config-pmap-c)# exit
RP/0/RP0/CPU0:router(config-pmap)# exit
```

```
RP/0/RP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RP0/CPU0:router(config-if) service-policy input policy1
```

Related Commands

Command	Description
conform-action, on page 16	Configures the action to take on packets that conform to the rate limit.
exceed-action, on page 20	Configures the action to take on packets that exceed the rate limit.
police rate, on page 56	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 60	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map interface, on page 113	Displays policy configuration information for all classes configured for all service policies on the specified interface.