

# Modular QoS Command Reference for Cisco ASR 9000 Series Routers

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# Preface

From Release 6.1.2 onwards, Cisco introduces support for the 64-bit Linux-based IOS XR operating system. Extensive feature parity is maintained between the 32-bit and 64-bit environments. Unless explicitly marked otherwise, the contents of this document are applicable for both the environments. For more details on Cisco IOS XR 64 bit, refer to the Release Notes for Cisco ASR 9000 Series Routers, Release 6.1.2 document.

This reference describes the Cisco IOS XR Quality of Service commands. The preface for *Modular Quality of Service Command Reference for Cisco ASR 9000 Series Routers* contains these sections:


- Changes to This Document, on page ix
- Communications, Services, and Additional Information, on page x


# Changes to This Document

This table lists the technical changes made to this document since it was first published.

***Table 1: Changes to this Document***

| | **Change Summary** |
|---|---|
| May 2015 | Initial release of the cumulative command reference document that covers all updates from Release 4.3.0 onwards. |
| September 2015 | Republished with documentation updates for Cisco IOS XR Release 5.3.2 features. |
| April 2016 | Republished with documentation updates for Cisco IOS XR Release 6.0.1 features. |
| November 2016 | Republished with documentation updates for Cisco IOS XR Release 6.1.2 features. |
| March 2018 | Republished for Release 6.3.2. |
| July 2018 | Republished for Release 6.5.1. |
| April 2019 | Republished for Release 6.6.2 |

| | Change Summary |
|---|---|
| January 2020 | Republished with documentation updates for Release 7.1.1 features. |
| July 2021 | Republished for Release 7.4.1. |
| November 2021 | Republished with documentation updates for Release 7.5.1 features. |

# Communications, Services, and Additional Information

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# ANCP Commands

This module describes the commands used to configure Access Node Control Protocol (ANCP).

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 regarding ANCP concepts, configuration tasks and examples, see the Configuring ANCP chapter in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*


- ancp, on page 2
- ancp an-port circuit-id, on page 3
- ancp neighbor, on page 5
- ancp rate-adjustment, on page 7
- ancp server sender-name, on page 8
- clear ancp an-port, on page 9
- clear ancp neighbor, on page 11
- clear ancp summary statistics, on page 13
- show ancp an-port, on page 14
- show ancp an-port circuit-id, on page 16
- show ancp an-port interface, on page 18
- show ancp an-port neighbor, on page 21
- show ancp an-port state, on page 23
- show ancp neighbor, on page 25
- show ancp neighbor summary, on page 28
- show ancp redundancy iccp, on page 30
- show ancp redundancy iccp group, on page 33
- show ancp summary, on page 39

# ancp

To enable Access Node Control Protocol (ANCP), use the **ancp** command in Global Configuration mode. To disable ANCP and delete the ANCP configuration, use the **no** form of the command.

**ancp**
**no ancp**

## Syntax Description

This command has no keywords or arguments.

## Command Default

Disabled

## Command Modes

Global Configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to enable ANCP and enter ANCP configuration mode:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# ancp
RP/0/RSP0/CPU0:router(config-ancp)#
```

## Related Commands

| Command | Description |
|---|---|
| show ancp summary, on page 39 | Displays information about ANCP configuration, including server sender name and neighbor and port counts by state. |

# ancp an-port circuit-id

To define a unique access node ID for each access port, use the **ancp an-port circuit-id** command in the appropriate configuration mode . This information is included in the ANCP Port Up and Port Down messages.

**ancp an-port circuit-id** *Access-Loop-Circuit-Id* [**interface** *type interface-path-id* | **interface Bundle-Ether** *bundle-id*]
**no ancp an-port circuit-id** *Access-Loop-Circuit-Id* [**interface** *type interface-path-id* | **interface Bundle-Ether** *bundle-id*]

## Syntax Description

| | |
|---|---|
| *Access-Loop-Circuit-Id* | Unique access loop circuit ID name identifying the access port. Maximum 63 characters. |
| **interface** | Describes the access node (AN) port. |
| *type* | Interface type:<br>• **GigabitEthernet** (GigabitEthernet/IEEE 802.3 interface)<br>• **TenGigE** (TenGigabitEthernet/IEEE 802.3 interface) |
| *interface-path-id* | Physical interface instance. Naming notation is *slot / module / port / interface* **.** *subinterface* . |
| **interface Bundle-Ether** | Identifies a Bundle-Ether (Aggregated Ethernet) interface. |
| *bundle-id* | Bundle-Ether interface instance. Range is a number from 1 through 65535. Naming notation is *interface.subinterface* . |

## Command Default

No default behavior or values

## Command Modes

Global Configuration mode

ANCP configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |

## Usage Guidelines

Only subinterfaces of Ethernet and Ethernet bundle interfaces can be mapped to AN ports.

The circuit ID must be supplied before an access node port configuration can be committed.

When using a shared policy instance in subinterfaces with ANCP, the same AN port circuit ID must be mapped to all subinterfaces that have the same shared policy instance.

Circuit ID information can be displayed using the **show ancp an-port** command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows a unique access node ID being defined:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# ancp an-port circuit-id circuit1 interface gigabitethernet
2/0/1/1.1
```

## Related Commands

| Command | Description |
|---|---|
| clear ancp an-port, on page 9 | Clears access node (AN) ports of dynamic data or statistics. |
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |

# ancp neighbor

To map a neighbor configuration to the respective TCP connection, use the **ancp neighbor** commanding the appropriate configuration mode. To remove the map, use the **no** form of the command.

**ancp neighbor sender-name** {*H.H.HA.B.C.D*} {**description** *string* | **adjacency-timer** *interval*}
**no ancp neighbor sender-name** {*H.H.HA.B.C.D*} {**description** *string* | **adjacency-timer** *interval*}

## Syntax Description

| | |
|---|---|
| **sender-name** | ANCP neighbor identification. |
| *H.H.H* | MAC address of the sending interface. |
| *A.B.C.D* | IP address of the sending interface. |
| **description** *string* | Identifier of ANCP neighbor. General string up to 63 characters. |
| **adjacency-timer** *interval* | The adjacency timer controls the frequency of adjacency protocol messages sourced by the ANCP server. Use the **adjacency-timer** keyword to define the maximum delay between different stages of ANCP session establishment and the period of ANCP keepalive. The adjacency-timer interval is measured in milliseconds. Replace the interval argument with a number between 100 and 255 (10 to 25.5 seconds). Defaults to 100 ms (10 seconds). |

## Command Default

Adjacency timer interval default is 10 seconds.

## Command Modes

Global Configuration mode

ANCP configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

The TCP connection from any neighbor is accepted on any interface that is IP enabled. To match the neighbor configuration to a respective TCP connection, ANCP neighbors are identified by a sender name that must match the corresponding field in adjacency protocol messages.

To configure both **description** and **adjacency-timer** parameters, use two separate command lines as shown in the Examples section. If a neighbor session is already established, it resets so that the adjacency timer can take affect.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to map a neighbor configuration to its respective connection:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# ancp neighbor sender-name 0001.2222.3333 description VendorA-1

RP/0/RSP0/CPU0:router(config)# ancp neighbor sender-name 0001.2222.3333 adjacency-timer 20
```

## Related Commands

| Command | Description |
|---|---|
| clear ancp neighbor, on page 11 | Clears the adjacency connection with the neighbor. |
| clear ancp summary statistics, on page 13 | Clears aggregate message statistics only, without modifying individual neighbor or port statistics. |
| show ancp neighbor, on page 25 | Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies. |
| show ancp neighbor summary, on page 28 | Displays adjacency counts by state. |

# ancp rate-adjustment

To apply a mathematical correction to the ANCP rate update prior to applying it as a shaper rate, use the **ancp rate-adjustment** command in the appropriate configuration mode. To disable the rate adjustment, use the **no** form of the command.

**ancp rate-adjustment** *dsl-type access-loop-type* **percent-factor** *factor*
**no ancp rate-adjustment** *dsl-type access-loop-type* **percent-factor** *factor*

## Syntax Description

| | |
|---|---|
| *dsl-type* | Sets DSL type. Possible values are:<br>**adsl1 adsl2 adsl2+ vdsl1 vdsl2 sdsl** |
| *access-loop-type* | Sets the access loop type, either **Ethernet** or **ATM** . |
| **percent-factor** *factor* | Sets the percentage of the ANCP rate. This value should be applied to the ANCP reported rate update prior to configuring it as a shaping rate. |

## Command Default

No default behavior or values

## Command Modes

Global Configuration mode

ANCP configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

Both *dsl-type* and *access-loop-type* must be specified in order to configure rate adjustment. *access-loop-type* and *dsl-type* are compared to appropriate values in optional TLVs in the ANCP Port Up message. The ANCP rate is adjusted by a configured factor in case of a match.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to configure a percent factor of 90 with DSL type ADSL2, and an access loop type of Ethernet:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# ancp rate-adjustment adsl2 ethernet percent-factor 90
```

## Related Commands

| Command | Description |
|---|---|
| show ancp summary, on page 39 | Displays information about ANCP configuration, including server sender name and neighbor and port counts by state. |

# ancp server sender-name

To configure a local sender name to be used by the ANCP server in adjacency protocol messages toward DSLAMs, use the **ancp server sender-name** command in the appropriate configuration mode. To return the local sender name to its default value, use the **no** form of the command.

**ancp server sender-name** {*H.H.HA.B.C.D*}
**no ancp server sender-name** {*H.H.HA.B.C.D*}

## Syntax Description

| | |
|---|---|
| *H.H.H* | MAC address of the sending interface. |
| *A.B.C.D* | IP address of the sending interface. |

## Command Default

By default, the local sender name is set to the MAC address of a Management Ethernet port.

## Command Modes

Global Configuration mode

ANCP configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to configure a local sender name:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# ancp server sender-name 0013.1aff.c2bd
```

## Related Commands

| Command | Description |
|---|---|
| show ancp summary, on page 39 | Displays information about ANCP configuration, including server sender name and neighbor and port counts by state. |

# clear ancp an-port

To clear access node (AN) ports of dynamic data or statistics, either individually or in groups, use the **clear ancp an-port** command in EXEC mode mode.

**clear ancp an-port** {**all** | **circuit-id** *Access-Loop-Circuit* | **interface** *type interface-path-id* | **interface Bundle-Ether** *bundle-id* | **neighbor** {**description** *string* | **sender-name** {*H.H.HA.B.C.D*}}} [**statistics**]

## Syntax Description

| | |
|---|---|
| **statistics all** | Clears dynamic data or statistics on all ports. |
| **circuit-id** | A single access node port. |
| *Access-Loop-Circuit-Id* | Unique access loop circuit ID name identifying the access port. Maximum 63 characters. |
| **interface** | Describes the AN port. |
| *type* | Interface type:<br>• **statistics GigabitEthernet** (Gigabit Ethernet/IEEE 802.3 interface)<br>• **TenGigE** (TenGigabitEthernet/IEEE 802.3 interface) |
| *interface-path-id* | Physical interface instance. Naming notation is *slot/module/port/interface.subinterface* . |
| **interface Bundle-Ether** | Identifies a Bundle-Ether (Aggregated Ethernet) interface. |
| *bundle-id* | Bundle-Ether interface instance. Range is a number from 1 to 65535. Naming notation is *interface.subinterface* . |
| **neighbor** | Access node with an established adjacency with an ANCP server. |
| **description** *string* | Description associated with the ANCP neighbor. General string up to 63 characters. |
| **sender-name** | ANCP neighbor identification. |
| *H.H.H* | MAC address of the sending interface. |
| *A.B.C.D* | IP address of the sending interface. |
| **statistics** | (Optional) Resets statistics for the specified set of ports. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

| Release | Modification |
|---|---|
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |

## Usage Guidelines

Individual ports can be identified by circuit ID or mapped interfaces, as with **show** commands.

Dynamic data or statistics can be cleared for all ports or for all ports for just a given neighbor.

When used without the **statistics** keyword, the **clear ancp an-port** command clears dynamic data, including all rate information, for the selected AN ports. Ports that are not mapped to any local interface are removed from the ANCP port database. When used with the **statistics** keyword, statistics for the selected ports will be reset.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Related Commands

| Command | Description |
|---|---|
| clear ancp neighbor, on page 11 | Clears the adjacency connection with the neighbor. |
| clear ancp summary statistics, on page 13 | Clears aggregate message statistics only, without modifying individual neighbor or port statistics. |

# clear ancp neighbor

To clear the adjacency connection with the neighbor, use the **clear ancp neighbor** command in EXEC mode mode.

**clear ancp neighbor** {**all** | **description** *string* | **sender-name** {*H.H.HA.B.C.D*}} [**state** | **statistics**]

## Syntax Description

| | |
|---|---|
| all | Clears all ANCP neighbors. |
| **description** *string* | Identifies an ANCP neighbor. General string of up to 63 characters. |
| **sender-name** | ANCP neighbor identification. |
| *H.H.H* | MAC address of the sending interface. |
| *A.B.C.D* | IP address of the sending interface. |
| **state** | (Optional) Resets adjacencies. |
| **statistics** | (Optional) Resets only adjacency message statistics. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

Neighbor data or statistics can be cleared individually or as a list.

If the **state** keyword is specified, adjacencies are not cleared, they are reset. ANCP adjacency protocol restarts, but TCP connections remain open. Unmapped ports belonging to the adjacency are removed.

If the **statistics** keyword is specified, the adjacency state remains intact and only adjacency message statistics are reset.

If neither option is specified, selected adjacencies are cleared, and if no description for these adjacencies is present, they are removed from the ANCP neighbor database. Whether the neighbor is reset or fully cleared, all unmapped ports belonging to this neighbor are removed. Mapped ports are placed in a down state and rates remain intact.



**Note** Mapped access node port data is not affected by this operation.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to clear all neighbor data and statistics:

```
RP/0/RSP0/CPU0:router# clear ancp neighbor all
```

The following example shows how to clear a specific neighbor:

```
RP/0/RSP0/CPU0:router# clear ancp neighbor description vendor1a
```

## Related Commands

| Command | Description |
|---|---|
| clear ancp an-port, on page 9 | Clears access node (AN) ports of dynamic data or statistics. |
| clear ancp summary statistics, on page 13 | Clears aggregate message statistics only, without modifying individual neighbor or port statistics. |

# clear ancp summary statistics

To clear aggregate message statistics only, without modifying individual neighbor or port statistics, use the **clear ancp summary statistics** command in EXEC mode mode.

**clear ancp summary statistics**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows how to clear aggregate message statistics:

```
RP/0/RSP0/CPU0:router# clear ancp summary statistics
```

## Related Commands

| Command | Description |
|---|---|
| clear ancp an-port, on page 9 | Clears access node (AN) ports of dynamic data or statistics. |
| clear ancp neighbor, on page 11 | Clears the adjacency connection with the neighbor. |

# show ancp an-port

Use the **show ancp an-port** command to display data or message statistics referring to individual or multiple Access Node (AN) ports.

**show ancp an-port** [ {**all** | **configured** | **dynamic-only** | **summary**} [**statistics**] | **statistics**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays data for all AN ports. |
| **configured** | (Optional) Displays data for AN ports mapped to local subinterfaces. |
| **dynamic-only** | (Optional) Displays data for AN ports not mapped to any local subinterfaces. |
| **summary** | (Optional) Displays summary data for all active AN ports. |
| **statistics** | (Optional) Displays message statistics for AN ports. |

## Command Default

If no arguments are specified, the **show ancp an-port** command displays all ANCP ports sorted by circuit ID.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |
| Release 4.0.0 | This command was modified to provide information on the ICCP groups of VLAN sub-interfaces. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following example shows how to display the statistics for all AN ports.

```
RP/0/RSP0/CPU0:router# show ancp an-port all statistics

  List of AN port message statistics

  Circuit-id                     Port Up    Port Down  Total
  ------------------------------ ---------- ---------- ----------
  cir100_1                       1          0          1
  cir101_1                       1          0          1
```

```
  cir200_1                        0          0          0
```

The following example shows how to display information and statistics for all AN ports mapped to any local VLAN subinterfaces..

```
RP/0/RSP0/CPU0:router# show ancp an-port configured

  List of AN port data for ports mapped to local sub-interfaces

  ------------------------------ ----- ---------- -------- ---- ------------
                                                   Line     Num  Adjusted DS
  Circuit-id                     State Uptime     State    Intf Rate (kbps)
  ------------------------------ ----- ---------- -------- ---- ------------
  cir100_1                       UP    00:12:04   SHOWTIME 1    10000
  cir101_1                       UP    00:12:04   SHOWTIME 1    10000
  cir200_1                       -     00:00:00   -        1    0

RP/0/RSP0/CPU0:router# show ancp an-port configured statistics

  List of AN port message statistics for ports mapped to local sub-interfaces

  Circuit-id                     Port Up    Port Down  Total
  ------------------------------ ---------- ---------- ----------
  cir100_1                       1          0          1
  cir101_1                       1          0          1
  cir200_1                       0          0          0
```

The following example shows how to display summary data for all AN ports.

```
RP/0/RSP0/CPU0:router# show ancp an-port summary

     AN Port Summary
  --------------------------------
  State Up                  2
  State Down                0
  Config only ports         1
  Total                     3
  # Configured ports        3
  # Mapped sub-interfaces   3
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port circuit-id, on page 16 | Displays data or message statistics for an AN port identified by its circuit-id. |
| show ancp an-port interface, on page 18 | Displays data or message statistics for a sub-interface mapped to an AN port. |
| show ancp an-port neighbor, on page 21 | Displays data or message statistics for AN ports associated with a specific neighbor. |
| show ancp an-port state, on page 23 | Displays data or message statistics for AN ports which are in a specific state. |

# show ancp an-port circuit-id

Use the **show ancp an-port circuit-id** command to display data or message statistics for an AN port identified by its circuit-id.

**show ancp an-port circuit-id** *Access-Loop-Circuit-Id* [**detail** | **statistics** [**detail**]]

## Syntax Description

| | |
|---|---|
| *Access-Loop-Circuit-Id* | Unique access loop circuit ID name identifying the access port. Maximum 63 characters. |
| **detail** | (Optional) Displays additional data on a list of interfaces mapped to the port. |
| **statistics** | (Optional) Displays message statistics for an AN port. |

## Command Default

No default behavior or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |
| Release 4.0.0 | This command was modified to provide information on the ICCP groups of VLAN sub-interfaces. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following example shows how to display information for an AN port identified by its circuit-id.

```
RP/0/RSP0/CPU0:router# show ancp an-port circuit-id cir100_1

  AN port circuit-id cir100_1:
  State                                                 UP
  Uptime                                                00:11:31
  Time Since Last Message                               00:11:31
  Encap Type                                            ETHERNET
  DSL type                                              VDSL2
  DSL Line State                                        SHOWTIME
  Number of Mapped Sub-interfaces                       1
  Neighbor sender-name                                  0000.3200.0102
  Neighbor description                                  -
  Configured Rate Adjustment                            100%
```

```
  Actual Downstream Data Rate (kbps)                    10000
  Effective Downstream Data Rate (kbps)                 10000
```

The following example shows how to display statistics for an AN port identified by its circuit-id.

```
RP/0/RSP0/CPU0:router# show ancp an-port circuit-id cir100_1 statistics

  Port message statistics for circuit-id cir100_1:

    Port Up       1
    Port Down     0
    ------------------------
    Total         1
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp an-port interface, on page 18 | Displays data or message statistics for a sub-interface mapped to an AN port. |
| show ancp an-port neighbor, on page 21 | Displays data or message statistics for AN ports associated with a specific neighbor. |
| show ancp an-port state, on page 23 | Displays data or message statistics for AN ports which are in a specific state. |

# show ancp an-port interface

Use the **show ancp an-port interface** command to display data or message statistics for a sub-interface mapped to an AN port.

**show ancp an-port interface** {*physical interface-id* [**detail** | **statistics** [**detail**]] | **mapping**}

## Syntax Description

| | |
|---|---|
| *physical interface-id* | (Optional) Physical layer identifier as defined in Table 2: Physical Interface-id parameters for the show ancp an-port command, on page 18. |
| **detail** | (Optional) Displays additional data on a list of interfaces mapped to the port. |
| **statistics** | (Optional) Displays message statistics for an AN port. |
| *mapping* | (Optional) Displays a summary of sub-interface mapping to AN ports. |

## Command Default

No default behavior or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |
| Release 4.0.0 | This command was modified to provide information on the ICCP groups of VLAN sub-interfaces. |

## Usage Guidelines

The following table defines physical interface **id** parameters available to refine the output of the **show ancp redundancy iccp group** command. Use any of the physical interface id parameters in place of the physical interface **id** argument.

***Table 2: Physical Interface-id parameters for the show ancp an-port command***

| Syntax | Description |
|---|---|
| **Bundle-Ether** *instance.subinterface* | Specifies an aggregated Ethernet interface.<br>Replace the *instance* argument with an Ethernet bundle instance. Range is 1 to 65535.<br>Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647. |

| Syntax | Description |
|---|---|
| **GigabitEthernet** *instance.subinterface* | Specifies a GigabitEthernet/IEEE 802.3 interface.<br>Replace the *instance* argument with a physical interface instance specified in the *rack/slot/module/port* notation.<br>Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647. |
| **TenGigE** *instance.subinterface* | Specifies a TenGigabitEthernet/IEEE 802.3 interface.<br>Replace the *instance* argument with a physical interface instance specified in the *rack/slot/module/port* notation.<br>Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647. |

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following examples show how to display ANCP information and statistics for the Bundle-Ether interface at location 100.1:

```
RP/0/RSP0/CPU0:router# show ancp an-port interface bundle-Ether 100.1

  AN port circuit-id cir100_1:

  State                                                 UP
  Uptime                                                00:13:26
  Time Since Last Message                               00:13:26
  Encap Type                                            ETHERNET
  DSL type                                              VDSL2
  DSL Line State                                        SHOWTIME
  Number of Mapped Sub-interfaces                       1
  Neighbor sender-name                                  0000.3200.0102
  Neighbor description                                  -
  Configured Rate Adjustment                            100%
  Actual Downstream Data Rate (kbps)                    10000
  Effective Downstream Data Rate (kbps)                 10000


RP/0/RSP0/CPU0:router# show ancp an-port interface bundle-Ether 100.1 statistics

  Port message statistics for circuit-id cir100_1:

    Port Up       1
    Port Down     0
    -------------------------
    Total         1

RP/0/RSP0/CPU0:router# show ancp an-port interface bundle-Ether 1.1 detail
Tue Nov 17 17:28:44.390 EST

  AN port circuit-id ckt1:
```

```
  State                                                 -
  Uptime                                                00:00:00
  Time Since Last Message                               00:00:00
  Encap Type                                            -
  DSL type                                              -
  DSL Line State                                        -
  Number of Mapped Sub-interfaces                       3
  Neighbor sender-name                                  -
  Neighbor description                                  -
  Configured Rate Adjustment                            0%
  Actual Downstream Data Rate (kbps)                    0
  Effective Downstream Data Rate (kbps)                 0
  Actual Data Rate Upstream/Downstream (kbps)           0/0
  Minimum Data Rate Upstream/Downstream (kbps)          0/0
  Attainable Data Rate Upstream/Downstream (kbps)       0/0
  Maximum Data Rate Upstream/Downstream (kbps)          0/0
  Minimum Low Power Data Rate Upstream/Downstream (kbps)  0/0
  Maximum Interleaving Delay Upstream/Downstream (ms)   0/0
  Actual Interleaving Delay Upstream/Downstream (ms)    0/0

  Sub-interface Summary: total 3
  ------------------------------------------------
  Sub-interface name                ifhandle    ICCP Group    Redundancy State
  --------------------------------  ----------  ------------
------------------------
  Bundle-Ether1.1                   0x20000072  1             ACTIVE

  GigabitEthernet0/0/0/0.1          0x20000022  0             DOWN

  GigabitEthernet0/0/0/0.2          0x20000042  0             DOWN
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp an-port circuit-id, on page 16 | Displays data or message statistics for an AN port identified by its circuit-id. |
| show ancp an-port neighbor, on page 21 | Displays data or message statistics for AN ports associated with a specific neighbor. |
| show ancp an-port state, on page 23 | Displays data or message statistics for AN ports which are in a specific state. |

# show ancp an-port neighbor

Use the **show ancp an-port neighbor** command to display data or message statistics for AN ports associated with a specific neighbor.

**show ancp an-port neighbor** {**description** *description* | **none** | **sender-name** {*H.H.HA.B.C.D*}} [**statistics**]

## Syntax Description

| | |
|---|---|
| **description** *description* | (Optional) Identifies the neighbor by description. The argument *description* has a maximum of 63 characters. |
| **none** | (Optional) Displays AN ports not associated with a neighbor. |
| **sender-name** | (Optional) Identifies the neighbor by sender-name. |
| *H.H.H* | (Optional) MAC address of the sending interface. |
| *A.B.C.D* | (Optional) IPv4 address of the sending interface. |
| **statistics** | (Optional) Displays port message statistics for a specific AN port. |

## Command Default

No default behaviour or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |
| Release 4.0.0 | This command was modified to provide information on the ICCP groups of VLAN sub-interfaces. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following example shows how to display information and statistics for AN ports not associated with any neighbor:

```
RP/0/RSP0/CPU0:router# show ancp an-port neighbor none

  List of AN port data for ports associated with no neighbor
```

```
  ------------------------------ ----- ---------- -------- ---- ------------
                                                  Line     Num  Adjusted DS
  Circuit-id                     State Uptime     State    Intf Rate (kbps)
  ------------------------------ ----- ---------- -------- ---- ------------
  cir200_1                       -     00:00:00   -        1    0


RP/0/RSP0/CPU0:router# show ancp an-port neighbor none statistics

  List of AN port message statistics for ports associated with no neighbor

  Circuit-id                     Port Up    Port Down  Total
  ------------------------------ ---------- ---------- ----------
  cir200_1                       0          0          0
```

The following example shows how to display information and statistics on all AN ports associated with a neighbor identified by its sender-name:

```
RP/0/RSP0/CPU0:router# show ancp an-port neighbor sender-name 0000.3200.0102

  List of AN port data for neighbor sender name 0000.3200.0102

  ------------------------------ ----- ---------- -------- ---- ------------
                                                  Line     Num  Adjusted DS
  Circuit-id                     State Uptime     State    Intf Rate (kbps)
  ------------------------------ ----- ---------- -------- ---- ------------
  cir100_1                       UP    00:18:03   SHOWTIME 1    10000

RP/0/RSP0/CPU0:router# show ancp an-port neighbor sender-name 0000.3200.0102 statistics

  List of AN port message statistics for neighbor sender name 0000.3200.0102

  Circuit-id                     Port Up    Port Down  Total
  ------------------------------ ---------- ---------- ----------
  cir100_1                       1          0          1
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp an-port circuit-id, on page 16 | Displays data or message statistics for an AN port identified by its circuit-id. |
| show ancp an-port interface, on page 18 | Displays data or message statistics for a sub-interface mapped to an AN port. |
| show ancp an-port state, on page 23 | Displays data or message statistics for AN ports which are in a specific state. |

# show ancp an-port state

Use the **show ancp an-port state** command to display data or message statistics for AN ports which are in a specific state.

**show ancp an-port state** {**up** | **down** | **none**} [**statistics**]

## Syntax Description

| | |
|---|---|
| **up** | (Optional) Displays information about AN ports in an up state. |
| **down** | (Optional) Displays information about AN ports in a down state. |
| **none** | (Optional) Displays information about AN ports not reported by any neighbor. |
| **statistics** | (Optional) Displays port message statistics for a specific AN port. |

## Command Default

No default behaviour or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support the mapping of ANCP ports to VLAN interfaces over Ethernet bundles. |
| Release 4.0.0 | This command was modified to provide information on the ICCP groups of VLAN sub-interfaces. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following example shows how to display information for all AN ports in an Up state:

```
RP/0/RSP0/CPU0:router# show ancp an-port state up

  List of AN port data for ports in UP state

  ------------------------------ ----- ---------- -------- ---- ------------
                                                  Line     Num  Adjusted DS
  Circuit-id                     State Uptime     State    Intf Rate (kbps)
  ------------------------------ ----- ---------- -------- ---- ------------
  cir100_1                       UP    00:18:42   SHOWTIME 1    10000
  cir101_1                       UP    00:18:42   SHOWTIME 1    10000
```

The following example shows how to display information for all AN ports not reported by any neighbor:

```
RP/0/RSP0/CPU0:router# show ancp an-port state none

  List of AN port data for ports with NO state

  ------------------------------ ----- ---------- -------- ---- ------------
                                                   Line     Num  Adjusted DS
  Circuit-id                     State Uptime     State    Intf Rate (kbps)
  ------------------------------ ----- ---------- -------- ---- ------------
  cir200_1                       -     00:00:00   -        1    0
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp an-port circuit-id, on page 16 | Displays data or message statistics for an AN port identified by its circuit-id. |
| show ancp an-port interface, on page 18 | Displays data or message statistics for a sub-interface mapped to an AN port. |
| show ancp an-port neighbor, on page 21 | Displays data or message statistics for AN ports associated with a specific neighbor. |

# show ancp neighbor

To display data or message statistics associated with individual ANCP adjacencies or sets of adjacencies, use the **show ancp neighbor** command in EXEC mode.

**show ancp neighbor** {**description** *string* | **sender-name** {*H.H.HA.B.C.D*}} [**all**] **state** {**none** | **synsent** | **synrcvd** | **estab**} [**statistics**] [**summary**]

## Syntax Description

| | |
|---|---|
| **description** *string* | Identifier of ANCP neighbor. General string up to 63 characters. |
| **sender-name** | ANCP neighbor identification. |
| *H.H.H* | MAC address of the sending interface. |
| *A.B.C.D* | IP address of the sending interface. |
| **all** | Displays all ANCP neighbors. |
| **state** | Displays ANCP neighbors in specified state.<br>• none—Displays ANCP neighbors in a down state.<br>• synsent—Displays ANCP neighbors in the SYNSENT state.<br>• synrcvd—Displays ANCP neighbors in the SYNRCVD state.<br>• estab—Displays ANCP neighbors in the ESTAB state. |
| **statistics** | (Optional) Displays packet statistics. |
| **summary** | (Optional) Displays a summary of all active ANCP neighbors. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows the output from a specific neighbor using the **sender-name** MAC address:

```
RP/0/RSP0/CPU0:router# show ancp neighbor sender-name 0006.2aaa.281b

             ANCP Neighbor Data
  ------------------------------------------
  Sender Name               0006.2aaa.281b
  Description               first
  State                     ESTAB
  Capability                Topology Discovery
  Ports:
    State Up                25
    State Down              5
    Total                   30
```

The following example shows the same command with the addition of the **detail** keyword, showing a summary of AN ports that were reported by that neighbor:

```
RP/0/RSP0/CPU0:router# show ancp neighbor sender-name 0006.2aaa.281b detail

              ANCP Neighbor Data
  ------------------------------------------
  Sender Name                0006.2aaa.281b
  Description                first
  State                      ESTAB
  Capability                 Topology Discovery
  Ports:
    State Up                 4
    State Down               0
    Total                    4
Remote IP Addr/TCP Port   4.11.0.1/11126
Local  IP Addr/TCP Port   4.11.0.100/6068
Server Sender Name        0013.1aff.c2bd
Remote Timeout            25500 msec
Local  Timeout            10000 msec
Adjacency Uptime          01:25:20
Time Since Last Port Msg  00:00:04
Remote Port               0
Remote Instance           1
Local Instance            1
Remote Partition ID       0

List of AN port data for neighbor sender name 0006.2aaa.281b
------------------------------ ----- ---------- -------- ----  ------------
                                                 Line     Num   Adjusted DS
Circuit-id                     State Uptime     State    Intf  Rate (kbps)
------------------------------ ----- ---------- -------- ----  ------------
circuit1                       UP    00:27:49   SHOWTIME   3    2250
circuti2                       UP    00:00:49   SHOWTIME   2    2250
circuit3                       UP    00:00:49   SHOWTIME   2    2250
circuti4                       UP    00:00:49   SHOWTIME   0    2250
```

The following example shows the same command, this time with the addition of the **statistics** keyword, showing a summary of message statistics for the selected neighbor:

```
RP/0/RSP0/CPU0:router# show ancp neighbor sender-name 0006.2aaa.281b statistics

ANCP Neighbor Message Statistics
for Sender-name -, Description 0006.2aaa.281b
-----------------------------------------------
               Sent         Received
SYN            1            2
SNYACK         1            0
ACK            589          238
```

```
RSTACK          0             0
Port Up         -             10
Port Down       -             0
Drops           0             0
Total           600           250
```

## Related Commands

| Command | Description |
|---|---|
| clear ancp neighbor, on page 11 | Clears the adjacency connection with the neighbor. |
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp neighbor summary, on page 28 | Displays adjacency counts by state. |
| show qos summary, on page 237 | Lists the interfaces at a specific location. |

# show ancp neighbor summary

To display adjacency counts by state, use the **show ancp neighbor summary** command in EXEC mode.

**show ancp neighbor summary** [**statistics**] [**detail**]

## Syntax Description

| | |
|---|---|
| **statistics** | (Optional) Provides summary message statistics. |
| **detail** | (Optional) Displays the current rate adjustment table. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read, write |

## Examples

The following example shows the output from the **show ancp neighbor summary** command:

```
RP/0/RSP0/CPU0:router# show ancp neighbor summary

    ANCP Neighbor Summary Information
    ---------------------------------
    Neighbor count by state:
     -                0
     SYNSENT          0
     SYNRCVD          0
     ESTAB            1
```

The following example shows the same command with the addition of the **detail** keyword, showing a summary of individual neighbor data:

```
RP/0/RSP0/CPU0:router# show ancp neighbor summary detail

    ANCP Neighbor Summary Information
    ---------------------------------
    Neighbor count by state:
     -                0
     SYNSENT          0
     SYNRCVD          0
     ESTAB            1
```

```
  Summary Data By Neighbor
-----------------------------------------------------------
Neighbor          Neighbor                 Port Cnt by State
Description       Sender-Name     State    Up       Down
----------------- --------------  -------- -------  -------
first             0006.2aaa.281b  ESTAB    5        2
-                 0101.0101.0000  -        0        0
```

This example shows how to display summary message statistics by adding the **statistics** keyword to the **show ancp neighbor summary** command:

```
RP/0/RSP0/CPU0:router# show ancp neighbor summary statistics

    ANCP summary Neighbor Statistics
  -----------------------------------
                Sent          Received
   SYN          4             8
   SYNACK       5             0
   ACK          8886          3525
   RSTACK       2             0
   Port Up      -             16
   Port Down    -             0
   Drops        0             0
Total           8897          3549
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp neighbor, on page 25 | Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies. |
| show ancp summary, on page 39 | Displays information about ANCP configuration, including server sender name and neighbor and port counts by state. |

# show ancp redundancy iccp

To display the state or statistics of ICCP in the ANCP application, use the **show ancp redundancy iccp** command in EXEC mode.

**show ancp redundancy iccp** [**statistics**]

## Syntax Description

| | |
|---|---|
| **statistics** | (Optional) Displays the ANCP ICCP statistics. |

## Command Default

No default behaviour or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

The following example shows how to display the state of ICCP in the ANCP application:

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp
Tue Nov 17 17:17:04.043 EST

ANCP ICCP Information
------------------------------------------------------------------
ICCP State                  UP
ICCP Congestion             Cleared
ICCP Group Count            1
ICCP Group Interface Count  1
Creation Timestamp          Tue Nov 17 14:20:15 2009
```

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

***Table 3: show ancp redundancy iccp Field Descriptions***

| Field | Description |
|---|---|
| ICCP State | ANCP ICCP State. |
| ICCP Congestion | State of ICCP congestion. |
| ICCP Group Count | Number of ICCP Groups that ANCP VLAN sub-interfaces are members of. |

| Field | Description |
|---|---|
| ICCP Group Interface Count | Number of MC-LAG VLAN sub-interfaces to which ANCP circuits are mapped. |
| Creation Timestamp | Timestamp of ANCP registration with the ICCP server. |

The following example shows how to display the ANCP ICCP statistics:

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp statistics
Tue Nov 17 17:17:08.150 EST

ANCP ICCP Statistics
------------------------------------------------------------------

ICCP Statistics
------------------------------------------------------------------
Up Rx                          1
Down Rx                        0
Congestion Clear Rx            0
Congestion Clear Rx Drop       0
Congestion Detecetd Rx         0
Congestion Detecetd Rx Drop    0
Tx Failure                     0

ICCP Group Statistics
------------------------------------------------------------------
Peer Up Rx                     0
Peer Down Rx                   0
Sync Request Rx                0
Connect Tx                     1
Connect Tx Failure             0
Disconnect Tx                  0
Disconnect Tx Failure          0
Start Retry Timer              0

ICCP Interface Statistics
------------------------------------------------------------------
Active Rx                      0
Standby Rx                     0
Down Rx                        0
Sync Request Rx                0
Sync Request Rx Drop           0
Sync Request Tx                0
Sync Request Tx Drop           0
Sync Rx                        0
Sync Rx Drop                   0
Sync Start Rx                  0
Sync Start Rx Drop             0
Sync End Rx                    0
Sync End Rx Drop               0
Sync Unsolicited Rx            0
Sync Unsolicited Rx Drop       0
Sync Invalid Rx                0
Sync Tx                        0
Sync Tx Drop                   0
App State Rx                   0
App_State_Rx Drop              0
App State Tx                   0
App_State_Tx Drop              0
Start Retry Timer              0
```

The output indicates the number and type of messages (for example, Up Rx) received (denoted by Rx) and transmitted (denoted by Tx) by the ANCP application. Failure denotes a failed message. Drop indicates a dropped message. Start Retry Timer indicates the number of times the Retry Timer has been initiated as a result of a message transmission failure.

## Related Commands

| Command | Description |
|---|---|
| show ancp redundancy iccp group, on page 33 | Displays the state and statistics of an ICCP Group in the ANCP application. |
| show iccp group | Displays summary of the configured ICCP Groups and their states. |

# show ancp redundancy iccp group

To display the state and/or statistics of an ICCP Group that an ANCP VLAN sub-interface is a member of, use the **show ancp redundancy iccp group** command in EXEC mode.

**show ancp redundancy iccp group** [*ICCP group id* [**interface Bundle-Ether** *instance*.*subinterface* [**statistics**] | **statistics**] | **detail** | **interface** [**Bundle-Ether** *instance*.*subinterface* [**statistics**] | **detail** | **statistics**] | **statistics**]

## Syntax Description

| | |
|---|---|
| *ICCP group id* | (Optional) Number identifying the ICCP Group. Range is 1 to 24. |
| **interface** | (Optional) Displays information for a particular physical layer interface. |
| **Bundle-Ether** *instance.subinterface* | (Optional) Specifies an aggregated Ethernet interface.<br>Replace the *instance* argument with an Ethernet bundle instance. Range is 1 to 65535.<br>Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647. |
| **statistics** | (Optional) Displays message statistics. |
| **detail** | (Optional) Displays detailed information. |

## Command Default

No default behavior or values.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| ancp | read |

## Examples

```
The following example shows how to display the state of ICCP groups configured on the ANCP
 application:

RP/0/RSP0/CPU0:router# show ancp redundancy iccp group
Tue Nov 17 17:19:30.484 EST

ICCP                                Active      Standby

Group Id                Peers       Interfaces  Interfaces  ICCP Group State
-------------------------------------------------------------------------------------------
```

```
1                       1          1           0           Connected Peer Present
```

The output indicates the Group IDs, their states, and the number of peers. It also indicates the number of interfaces within each group for which the ANCP is the active or standby PoA.

The following example shows how to display details of ICCP Group 1:

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group 1
Tue Nov 17 17:19:33.470 EST

ICCP Group 1 Information
----------------------------------------------------------------
State                          Connected Peer Present
Previous State                 Connected No Peers
Number of Active Interfaces    1
Number of Standby Interfaces   0
Number of Peers                1
Creation Timestamp             Tue Nov 17 17:16:57 2009


ICCP Group 1 Peers

Ip Address       Timestamp
------------------------------
10.10.10.1       Tue Nov 17 17:18:49 2009
```

The output indicates the current and previous states of ICCP Group 1, its creation timestamp, and the number of peers and their IP addresses. It also indicates the number of interfaces within each group for which the ANCP is the active or standby PoA.

The following example shows how to display the statistics of ICCP Group 1:

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group 1 statistics
Tue Nov 17 17:19:38.262 EST

ICCP Group 1 Statistics
----------------------------------------------------------------
Peer Up Rx                     1
Peer Down Rx                   0
Sync Request Rx                0
Connect Tx                     1
Connect Tx Failure             0
Disconnect Tx                  0
Disconnect Tx Failure          0
Start Retry Timer              0

ICCP Group 1 Interface Statistics
----------------------------------------------------------------
Active Rx                      1
Standby Rx                     0
Down Rx                        0
Sync Request Rx                0
Sync Request Rx Drop           0
Sync Request Tx                4
Sync Request Tx Drop           0
Sync Rx                        0
Sync Rx Drop                   0
Sync Start Rx                  0
Sync Start Rx Drop             0
Sync End Rx                    0
Sync End Rx Drop               0
Sync Unsolicited Rx            0
Sync Unsolicited Rx Drop       0
```

```
Sync Invalid Rx                0
Sync Tx                        0
Sync Tx Drop                   0
App State Rx                   0
App_State_Rx Drop              0
App State Tx                   0
App_State_Tx Drop              0
Start Retry Timer              4
```

The output indicates the number and type of messages (for example, Up Rx) received (denoted by Rx) and transmitted (denoted by Tx) in ICCP Group 1. Failure denotes a failed message. Drop indicates a dropped message. Start Retry Timer indicates the number of times the Retry Timer has been initiated as a result of a message transmission failure.

The following example shows how to display information on the ICCP interfaces.

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group interface
Tue Nov 17 17:24:31.356 EST

ICCP Interfaces

Interface                          ICCP Group Id  Redundancy State    ICCP Group Port State
-------------------------------------------------------------------------------------------
Bundle-Ether1.1                    1              ACTIVE              Active Peers
```

The output indicates the MC-LAG Bundle-Ether sub-interfaces that are mapped to ANCP circuits, their ICCP Group ID's, redundancy states and ICCP Group Port States.

The following example shows how to display information on the Bundle-Ether interface at location 1.1.

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group interface bundle-Ether 1.1
Tue Nov 17 17:24:37.111 EST

ICCP Group Interface Bundle-Ether1.1
------------------------------------------------------------
ICCP Group Id                          1
Redundancy State                       ACTIVE
ICCP Group Port                        Active ICCP Down
Previous State                         Active No Peers
Last Redundancy State Change Timestamp  Thu Aug  5 12:20:40 2010
Last Sync Timestamp                    None
Creation Timestamp                     Thu Aug  5 12:20:40 2010
Request Id                             0
Retry Timer                            Not Running
Retry Timer Period                     0
```

The output displays information about the MC-LAG Bundle-Ether 1.1 interface, which is mapped to an ANCP circuit. ICCP Group Port indicates the current state of the ICCP Group Port. Previous State indicates the previous state of the ICCP Group Port. The Request ID is the tag attached to the last request message sent to the active PoA, for this interface. It is used to correlate PoA requests and responses. When a response to a request is not received, the request message is resent after the Retry Timer Period has elapsed. The Retry Timer field indicates the current state of the retry timer.

The following example shows how to display statistics for the Bundle_Ether interface at location 1.1.

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group interface bundle-Ether 1.1 statistics
Tue Nov 17 17:24:42.662 EST

ICCP Group Interface Bundle-Ether1.1 Statistics
----------------------------------------------------------------
Active Rx                     1
Standby Rx                    0
Down Rx                       0
Sync Request Rx               0
Sync Request Rx Drop          0
Sync Request Tx               4
Sync Request Tx Drop          0
Sync Rx                       0
Sync Rx Drop                  0
Sync Start Rx                 0
Sync Start Rx Drop            0
Sync End Rx                   0
Sync End Rx Drop              0
Sync Unsolicited Rx           0
Sync Unsolicited Rx Drop      0
Sync Invalid Rx               0
Sync Tx                       0
Sync Tx Drop                  0
App State Rx                  0
App_State_Rx Drop             0
App State Tx                  0
App_State_Tx Drop             0
Start Retry Timer             4
```

The output indicates the number and type of messages (for example, Up Rx) received (denoted by Rx) and transmitted (denoted by Tx), which relate to the MC-LAG Bundle Ether 1.1. interface. Failure denotes a failed message. Drop indicates a dropped message. Start Retry Timer indicates the number of times the Retry Timer has been initiated as a result of a message transmission failure.

The following example shows how to display information on the ICCP Group 1 interfaces

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group 1 interface
Tue Nov 17 17:25:18.302 EST

ICCP Interfaces

Interface                          ICCP Group Id  Redundancy State    ICCP Group Port State
-------------------------------------------------------------------------------------------
Bundle-Ether1.1                    1              ACTIVE              Active Peers
```

The output indicates the redundancy states and ICCP Group Port States of the MC-LAG Bundle-Ether sub-interfaces that are mapped to ANCP circuits in ICCP Group 1.

The following example shows how to display information on the Bundle_Ether interface, in ICCP Group 1, at location 1.1.

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group 1 interface bundle-Ether 1.1
Tue Nov 17 17:25:24.389 EST

ICCP Group Interface Bundle-Ether1.1
----------------------------------------------------------------
ICCP Group Id                      1
Redundancy State                   ACTIVE
```

```
ICCP Group Port                          Active ICCP Down
Previous State                           Active No Peers
Last Redundancy State Change Timestamp   Thu Aug  5 12:20:40 2010
Last Sync Timestamp                      None
Creation Timestamp                       Thu Aug  5 12:20:40 2010
Request Id                               0
Retry Timer                              Not Running
Retry Timer Period                       0
```

The output displays information about the MC-LAG Bundle-Ether 1.1 interface, in ICCP Group 1, which is mapped to an ANCP circuit. ICCP Group Port indicates the current state of the ICCP Group Port. Previous State indicates the previous state of the ICCP Group Port. The Request ID is the tag attached to the last request message sent to the active PoA, for this interface. It is used to correlate PoA requests and responses. When a response to a request is not received, the request message is resent after the Retry Timer Period has elapsed. The Retry Timer field indicates the current state of the retry timer.

The following example shows how to display statistics for the Bundle_Ether interface, in ICCP Group 1, at location 1.1.

```
RP/0/RSP0/CPU0:router# show ancp redundancy iccp group 1 interface bundle-Ether 1.1 statistics
Tue Nov 17 17:25:27.719 EST

ICCP Group Interface Bundle-Ether1.1 Statistics
----------------------------------------------------------------
Active Rx                     1
Standby Rx                    0
Down Rx                       0
Sync Request Rx               0
Sync Request Rx Drop          0
Sync Request Tx               4
Sync Request Tx Drop          0
Sync Rx                       0
Sync Rx Drop                  0
Sync Start Rx                 0
Sync Start Rx Drop            0
Sync End Rx                   0
Sync End Rx Drop              0
Sync Unsolicited Rx           0
Sync Unsolicited Rx Drop      0
Sync Invalid Rx               0
Sync Tx                       0
Sync Tx Drop                  0
App State Rx                  0
App_State_Rx Drop             0
App State Tx                  0
App_State_Tx Drop             0
Start Retry Timer             4
```

The output indicates the number and type of messages (for example, Up Rx) received (denoted by Rx) and transmitted (denoted by Tx) which relate to the MC-LAG Bundle Ether 1.1. interface, in ICCP Group 1. Failure denotes a failed message. Drop indicates a dropped message. Start Retry

Timer indicates the number of times the Retry Timer has been initiated as a result of a message transmission failure.

**Related Commands**

| Command | Description |
|---|---|
| show ancp redundancy iccp, on page 30 | Displays the state or statistics of ICCP in the ANCP application. |

# show ancp summary

To display information about ANCP configuration, including server sender name and neighbor and port counts by state, use the **show ancp summary** command in EXEC mode.

**show ancp summary** [**statistics**] [**detail**]

## Syntax Description

| | |
|---|---|
| **statistics** | (Optional) Provides a summary of ANCP message statistics. |
| **detail** | (Optional) Provides rate adjustment configuration information in addition to the **show ancp summary** output. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| ancp | read |

## Examples

The following example shows how to display generic information about ANCP configuration, along with neighbor and port counts by state:

```
RP/0/RSP0/CPU0:router# show ancp summary
    ANCP Summary Information
   ---------------------------------------------
   Capability:                Topology Discovery
   Server sender-name:        0013:1aff.c2bd

Neighbor count by state:
  -                           0
  SYNSENT                     0
  SUNRCVD                     0
  ESTAB                       1
  ----------------------------------
  Total                       1

Port count by state:
  State Up                    1
  State Down                  0
  State Unknown               0
  ----------------------------------
  Total                       1
```

```
  No. configured ports         1
  No. mapped sub-interfaces    4
```

The following example shows how to display rate adjustment configuration information in addition to the generic information shown in the previous example:

```
RP/0/RSP0/CPU0:router# show ancp summary detail
    ANCP Summary Information
   ------------------------------------------
   Capability:                Topology Discovery
   Server sender-name:        0013:1aff.c2bd

Neighbor count by state:
  -                           0
  SYNSENT                     0
  SUNRCVD                     0
  ESTAB                       1
  ---------------------------------
  Total                       1
Port count by state:
  State Up                    1
  State Down                  0
  State Unknown               0
  ---------------------------------
  Total                       1

  No. configured ports        1
  No. mapped sub-interfaces   4

Rate adjustment configuration:
-----------------------------------------
DSL Type   Loop Type        Percent-Factor
-----------------------------------------
ADSL1      ETHERNET               90
ADSL2      ETHERNET               100
ADSL2PLUS  ETHERNET               100
VDSL1      ETHERNET               100
VDSL2      ETHERNET               100
SDSL       ETHERNET               100
ADSL1      ATM                    100
ADSL2      ATM                    100
ADSL2PLUS  ATM                    100
VDSL1      ATM                    100
VDSL2      ATM                    100
SDSL       ATM                    100
```

The following example shows how to display a summary of ANCP message statistics:

```
RP/0/RSP0/CPU0:router# show ancp summary statistics

    ANCP Summary Message Statistics
   ---------------------------------------
                Sent          Received
   SYN          3             6
   SYNACK       4             0
   ACK          7105          2819
   RSTACK       2             0
   Port Up      -             6
   Port Down    -             0
```

```
Drops           0               0
Total           7114            2831
```

## Related Commands

| Command | Description |
|---|---|
| show ancp an-port, on page 14 | Displays data or message statistics referring to individual or multiple Access Node (AN) ports. |
| show ancp neighbor, on page 25 | Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies. |
| show ancp neighbor summary, on page 28 | Displays adjacency counts by state. |



# Packet Classification Commands

This chapter describes the commands used for QoS packet classification.

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 Packet Classification concepts, configuration tasks and examples, see the Configuring Modular QoS Service Packet Classification and Marking chapter in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*.


- class (policy-map), on page 45
- class-map, on page 47
- end-class-map, on page 49
- end-policy-map, on page 50
- exceed-action, on page 51
- hw-module qos-mode pwhe-aggregate-shaper , on page 54
- match cac, on page 56
- match cos, on page 57
- match vlan, on page 59
- match ethertype, on page 61
- match flow-key, on page 63
- match fr-de, on page 65
- match frame-relay dlci, on page 66
- match access-group, on page 68
- match destination-address, on page 70
- match discard-class, on page 72
- match dscp, on page 74
- match mpls experimental topmost, on page 77
- match precedence, on page 79
- match protocol, on page 82
- match qos-group, on page 84
- set fr-de, on page 86
- set discard-class, on page 88
- set dscp, on page 90
- set ip encapsulation, on page 92
- set mpls experimental, on page 94

- set precedence, on page 96
- ntp(ipv4/ipv6), on page 98
- dscp(ntp), on page 99
- dscp precedence(ntp), on page 102
- shape average, on page 104
- show qos pwhe-aggregrate-shaper, on page 106
- show qos-ea interface, on page 108
- show qos status interface, on page 115

# 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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# policy-map pm1
RP/0/RSP0/CPU0:router(config-pmap)# end-policy-map
RP/0/RSP0/CPU0:router(config)# end
!
RP/0/RSP0/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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match precedence 3
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:routerconfig-pmap-c)# shape average 100 mbps
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)# shape average 50 mbps
```

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 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | 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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# class-map class101
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 101
```

# 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 3.7.2 | 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/RSP0/CPU0:router(config)# class-map class101
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 101
RP/0/RSP0/CPU0:router(config-cmap)# end-class-map
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | 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 3.7.2 | 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 250
RP/0/RSP0/CPU0:router(config-pmap-c)# set precedence 3
RP/0/RSP0/CPU0:router(config-pmap)# end-policy-map
```

## Related Commands

| Command | Description |
|---|---|
| policy-map, on page 141 | 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:<br>• **atm-clp value** —Sets the cell loss priority (CLP) bit.<br>• **cos [inner]** *value* —Sets the class of service value. Range is 0 to 7.<br>• **cos** *value* —Sets the class of service value. Range is 0 to 7.<br>• **dei** —Sets the drop eligible indicator (DEI). Can be 0 or 1.<br>• **discard-class** *value* —Sets the discard class value. Range is 0 to 7.<br>• **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values.<br>• **dscp** [**tunnel**] *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values. With the **tunnel** keyword, the DSCP is set in the outer header.<br>• **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.<br>• **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.<br>• **precedence** *precedence* —Sets the IP precedence and sends the packet. See Table 5: IP Precedence Values and Names, on page 80 for a list of valid values.<br>• **precedence** [**tunnel**] *precedence* —Sets the IP precedence and sends the packet. See Table 5: IP Precedence Values and Names, on page 80 for a list of valid values. With the **tunnel** keyword, the precedence is set in the outer header.<br>• **qos-group** *value* —Sets the QoS group value.<br>• **qos-group** *value* —Sets the QoS group value. Range is 0 to 63.<br>• **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 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **set dei** keyword was added. |

## Usage Guidelines

For more information regarding the traffic policing feature, see the police rate, on page 132 command.

The **set dei** action in policy maps is supported on 802.1ad packets for:

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

**Note** The set DEI action is ignored for traffic on interfaces that are not configured for 802.1ad encapsulation.

## 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action drop
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface pos 0/5/0/0
RP/0/RSP0/CPU0:router(config-if) service-policy input policy1
```

In this example, the police rate is set to 5 Mbps. Conforming traffic is marked with a DEI value of 0; traffic that exceeds the police rate is marked with a DEI value of 1.

```
RP/0/RSP0/CPU0:router(config)# policy-map 1ad-mark-dei
RP/0/RSP0/CPU0:router(config-pmap)# class c1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 5 mbps
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set dei 0
```

```
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action set dei 1
RP/0/RSP0/CPU0:router(config-pmap-c-police)# end-policy-map
```

## Related Commands

| Command | Description |
|---|---|
| conform-action, on page 203 | Configures the action to take on packets that conform to the rate limit. |
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |
| violate-action, on page 190 | Configures the action to take on packets that violate the rate limit. |

# hw-module qos-mode pwhe-aggregate-shaper

To enable co-existence mode, use the **hw-module qos-mode pwhe-aggregate-shaper** command in Global Configuration mode. To disable co-existence mode, use the **no** form of this command.

**Note** If you are running either on Cisco IOS XR or Cisco IOS XR 64 bit, use the **hw-module qos-mode pwhe-aggregate-shaper** command in Global configuration mode.

**hw-module** {**all** | **location** *node-id*} **qos-mode pwhe-aggregate-shaper sub-interface** {**egress** | **ingress**} {**non-queuing** | **queuing**}
**no hw-module** {**all** | **location** *node-id*} **qos-mode pwhe-aggregate-shaper sub-interface** {**egress** | **ingress**}

## Syntax Description

| | |
|---|---|
| **all** | Specifies all location. |
| **location** *node-id* | Specifies location of a particular node. The *node-id* argument is entered in the rack/slot/module notation. |
| **qos-mode** | Configures QoS mode in hardware module ports. For more information on various QoS modes, use the question mark (?) online help function. |
| **pwhe-aggregate-shaper** | Configures PWHE aggregate shaper parameters. |
| **sub-interface** | Configures PWHE subinterface QoS policy co-existence mode. |
| **egress** | Configures PWHE co-existence mode in egress direction. |
| **ingress** | Configures PWHE co-existence mode in ingress direction. |
| **non-queuing** | Configures co-existence non-queuing mode. |
| **queuing** | Configures co-existence queuing mode. |

## Command Default

None.

## Command Modes

Global Configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command indicates that the PWHE main interface policies can co-exist with subinterface policies.

The mode change takes effect immediately on a line card (LC) if there is no PWHE main or subinterface policy on the LC, otherwise LC reload is required.

**Note** To avoid LC reload we recommend that the mode change is performed when there is no policy applied on any PWHE main or subinterfaces.

The co-existence mode with subinterface queuing policies is known as co-existence queuing mode.

The co-existence mode with subinterface non-queuing policies is known as co-existence non-queuing mode.

Adding, deleting and in-place modification of the PWHE aggregate shaper are allowed regardless of presence of subinterface policies.

**hw-module { all | location** *node-id* } **qos-mode pwhe-aggregate-shaper sub-interface ingress queuing** will not be rejected if there are LCs in the chassis which do not support ingress queuing.

Use the **show qos pwhe-aggregate-shaper** command to view current configured mode and operating mode.

**Task ID**

| Task ID | Operation |
|---|---|
| root-lr | read, write |

### Example

This example shows how to configure co-existence queuing mode in egress direction for all the line cards.

```
RP/0/RSP0/CPU0:router(config)# hw-module all qos-mode pwhe-aggregate-shaper sub-interface
egress queuing
```

# match cac

To identify specified call admission control (CAC) fields as a match criteria in a class map, use the **match cac** command in class map configuration mode. To remove a specified CAC field from the matching criteria for a class map, use the **no** form of this command.

**match cac** {**admitted** | **unadmitted**}**[ local ]**
**no match cac** {**admitted** | **unadmitted**}

## Syntax Description

| | |
|---|---|
| **admitted** | Specifies the packets admitted by CAC action as the match criteria in a class map. |
| **unadmitted** | Specifies the packets unadmitted by CAC action as the match criteria in a class map. |
| **local** | Specified the CAC local. |

## Command Default

No match criteria are specified.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

The **match cac** command specifies a call admission control field or action 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 cac** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure admit class for CAC.

```
RP/0/RSP0/CPU0:router(config)# class-map match-all video
RP/0/RSP0/CPU0:router(config-cmap)# match cac admitted local
RP/0/RSP0/CPU0:router(config-cmap)# exit
```

# 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 3.7.2 | This command was introduced. |

## 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 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.

## 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/RSP0/CPU0:router(config)# class-map cos146
RP/0/RSP0/CPU0:router(config-cmap)# match cos 1 4 6
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class cos146
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface HundredGigE 0/7/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| set cos, on page 266 | Sets the Layer 2 class of service (CoS) value of an outgoing packet. |

# 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. |
| *vlanid* | VLAN identifier that specifies the exact value from 1 to 4094 or a range of values from 1 to 4094. Up to eight values can be specified in a match statement. |

## Command Default

No match criteria are specified.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## 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.

## 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/RSP0/CPU0:router(config)# class-map vlan1
RP/0/RSP0/CPU0:router(config-cmap)# match vlan 1234 1698 3000-4000
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class vlan1
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
```

```
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |

# match ethertype

To identify selected Ethernet type fields as the match criteria for a class map, use the **match ethertype** command in class map configuration mode. To remove the Ethernet type fields match criteria from a class map, use the **no** form of this command.

**match ethertype** *ethertype_field*
**no match ethertype** *ethertype_field*

## Syntax Description

*ethertype_field* Ethernet type field that specifies the Ethernet service. Values can be:

- <1536-65535>—Ethertype value; only 2054 (the value representing ARP) is supported.
- **arp** —Match on address resolution protocol.
- ipv4 (not supported).
- ipv6 (not supported).

**Caution**
If you specify any value other than the supported values, the system allows you to commit the configuration. However, if you try to commit a configuration that applies the policy-map (containing the invalid ethertype match) to an interface, the system rejects the commit action.

## Command Default

No match criteria are specified.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.1.0 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

### Example

This example shows how to configure Ethernet type:

```
RP/0/RSP0/CPU0:router(config)# class-map match-any arp_1
RP/0/RSP0/CPU0:router(config-cmap)# match ethertype arp
RP/0/RSP0/CPU0:router(config-cmap)# exit
```

**Related Commands**

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |

# match flow-key

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

**match flow-key** [**5-tuple** | **dst-ip** | **src-ip** ] [**flow-cache** {**idle-timeout***period* | **none**}]
**no match flow-key**

## Syntax Description

| | |
|---|---|
| **5-tuple** | Specifies the 5 tuples to identify a flow. The 5 tuples required to define a flow are: source IP address, destination IP address, source port number, destination port number, and protocol. |
| **dst-ip** | Specifies the destination IP address of the flow mask. |
| **src-ip** | Specifies the source IP address of the flow mask. |
| **flow-cache** | Configures the flow-cache parameters. |
| **idle-timeout** | Specifies the maximum time of inactivity for a flow. |
| *period* | Specifies the idle timeout period in seconds. |
| **none** | Specifies that the flow does not expire. |

## Command Default

- Default flow mask is 5-tuple.
- Default idle timeout is 30s.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

The **match flow-key** command specifies a flow mask 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.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure the source IP address of the flow mask as the only flow tuple and a flow idle timeout of 200 seconds.

```
RP/0/RSP0/CPU0:router(config)# class-map match-all video1
RP/0/RSP0/CPU0:router(config-cmap)# match precedence 5
```

```
RP/0/RSP0/CPU0:router(config-cmap)# match flow-key src-ip flow-cache idle-timeout 200
RP/0/RSP0/CPU0:router(config-cmap)# exit
```

# match fr-de

To match packets on the basis of the Frame Relay discard eligibility (DE) bit setting, use the **match fr-de** command in class-map configuration mode. To remove the match criterion, use the **no** form of this command.

**match fr-de** *fr-de-bit-value*
**no match fr-de** *fr-de-bit-value*

## Syntax Description

| | |
|---|---|
| **not** | (Optional) Negates the specified match result. |
| *fr-de-bit-value* | Specifies the Frame Relay DE bit. Value can be 1. |

## Command Default

Packets are not matched on the basis of the Frame Relay DE bit setting.

## Command Modes

Class map configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

This match criterion can be used under a subinterface (L2 PVC) using the **service-policy** command, and it is supported in the ingress direction only. This match criterion can also be used in hierarchical policy maps.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to create a class called match-fr-de and match packets on the basis of the Frame Relay DE bit setting. Packets match Frame Relay DE bit 1.

```
RP/0/RSP0/CPU0:router(config)# class-map match-fr-de
RP/0/RSP0/CPU0:router(config-cmap)# match fr-de 1
RP/0/RSP0/CPU0:routerrouter(config-cmap)# end
```

To match Frame Relay DE bit 0, use this configuration:

```
RP/0/RSP0/CPU0:router(config)# class-map match-not-fr-de
RP/0/RSP0/CPU0:router(config-cmap)# match not fr-de 1
RP/0/RSP0/CPU0:router(config-cmap)# end
```

## Related Commands

| Command | Description |
|---|---|
| set fr-de, on page 86 | Changes the discard eligible (DE) bit setting in the address field of a Frame Relay frame to 1 for all traffic leaving an interface. |

# match frame-relay dlci

To specify a Frame Relay packet data-link connection identifier (DLCI) number or number range as a match criterion in a class map, use the **match frame-relay dlci** command in class map configuration mode. To remove a previously specified DLCI number as a match criterion, use the **no** form of this command.

**match frame-relay dlci** [*DlciStartDlci-EndDlci*]
**no match frame-relay dlci** [*DlciStartDlci-EndDlci*]

## Syntax Description

| | |
|---|---|
| *Dlci* | A DLCI number associated with the packet. Range is from 16 to 1007. |
| *StartDlci-EndDlci* | A DLCI number range from 16 to 1007. Numbers are separated by a hyphen. |

## Command Default

No DLCI number is specified.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

The match criterion for the **match frame-relay dlci** command can be used only on hierarchical policy maps.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to create the fr-dlci class map, and specify the Frame Relay DLCI number range 100-200 as a match criterion. Packets with DLCIs matching this criterion are placed in fr-dlci. In this example, class map fr-dlci evaluates all packets entering Packet-over-SONET/SDH (POS) interface 0/1/0/0.1 for DLCIs in the range from 100 through 200. If the incoming packet has been marked with the DLCI in the range from 100 through 200, the packet is queued to the class queue with the bandwidth setting of 300 kbps.

```
RP/0/RSP0/CPU0:router(config)# class-map fr-dlci
RP/0/RSP0/CPU0:router(config-cmap)# match frame-relay dlci 100-200
RP/0/RSP0/CPU0:router(config-cmap)# end
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class fr-dlci
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface pos 0/1/0/0.1
RP/0/RSP0/CPU0:router(config)# service-policy output policy1

RP/0/RSP0/CPU0:router(config)# interface pos 0/1/0/0.1 point-to-point pvc 16
```

```
RP/0/RSP0/CPU0:router(config-subif)# pvc 16
RP/0/RSP0/CPU0:router(config-fr-vc)# service-policy output policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| match dscp, on page 74 | Configures a DSCP value as a match criterion. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| show frame-relay pvc | Displays statistics about Frame Relay permanent virtual circuits (PVCs). |

# 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** | **ethernet-service**} *access-group-name*
**no match** [**not**] **access-group** {**ipv4** | **ipv6** | **ethernet-service**} *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. |
| **ethernet-service** | Specifies the name of the ethernet-service 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 3.7.2 | This command was introduced. |
| Release 4.2.1 | Support for IPv6 ACLs with source port matching was added in MQC policy maps. |
| Release 6.0.1 | The **ethernet-service** keyword was introduced. |

## 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.

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.



**Note**

- You can provide multiple values in a configuration; only the first value is considered for the match criteria. Subsequent values indicated in the match statement are ignored for classification.
- The capture statements in an ethernet-service ACL are ignored.
- An ethernet-service ACL should have only permit statements. If there are any deny statements, the policy is rejected.
- If you specify a value for the **Ether-Type** keyword using the **match access-group ethernet-service** command, the value is ignored.

## 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/RSP0/CPU0:router(config)# class-map map1
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 map1

RP/0/RSP0/CPU0:router(config-cmap)# match access-group ethernet-service map1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |

# 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 3.7.2 | 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/RSP0/CPU0:router(config)#class-map match-any A
RP/0/RSP0/CPU0:router(config-cmap)# match destination-address mac 000.f0d0.2356
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |

# 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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# class-map discard-class5
RP/0/RSP0/CPU0:router(config-cmap)# match discard-class 5
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class discard-class5
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/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 4: IP DSCP Reserved Keywords, on page 75 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 3.7.2 | This command was introduced. |
| 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 4: 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 |
| 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/RSP0/CPU0:router(config)# class-map dscp14
RP/0/RSP0/CPU0:router(config-cmap)# match dscp ipv4 14
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class dscp14
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface pos 0/1/0/0
RP/0/RSP0/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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# class-map mplsmap1
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 1
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class mplsmap1
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| match dscp, on page 74 | Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map. |
| policy-map, on page 141 | 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 94 | Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost or imposition labels. |
| show policy-map interface, on page 169 | 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 5: IP Precedence Values and Names, on page 80 describes the reserved keywords.<br><br>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 3.7.2 | This command was introduced. |

## 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 5: 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/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# class-map ipprec5
RP/0/RSP0/CPU0:router(config-cmap)# match precedence ipv4 5
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class ipprec5
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if)# service-policy  input policy1
```

**Related Commands**

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| set precedence, on page 96 | Sets the precedence value in the IP header. |
| show policy-map interface, on page 169 | 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 3.7.2 | This command was introduced. |
| 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 6: Protocol Names and Descriptions***

| Name | Description |
|---|---|
| ahp | Authentication Header Protocol |
| eigrp | Cisco Enhanced Interior Gateway Routing Protocol |
| esp | Encapsulation Security Payload |

| Name | Description |
|---|---|
| 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/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-value8*]
**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 63 or a range of values from 0 to 63. 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 3.7.2 | This command was introduced. |

## 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 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.

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.

The **match qos-group** command is supported only on 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 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/RSP0/CPU0:router(config)# class-map qosgroup5
RP/0/RSP0/CPU0:router(config-cmap)# match qos-group 5
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class qosgroup5
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 300
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | 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 88 | Sets the discard class and Quality of Service (QoS) group identifiers on IP Version 4 (IPv4) or Multiprotocol Label Switching (MPLS) packets. |

# set fr-de

To change the discard eligible (DE) bit setting in the address field of a Frame Relay frame to 1 for all traffic leaving an interface, use the **set fr-de** command in policy map configuration mode. To remove the DE bit setting, use the **no** form of this command.

**set fr-de** [*fr-de-bit-value*]
**no set fr-de** [*fr-de-bit-value*]

## Syntax Description

| | |
|---|---|
| **not** | (Optional) Negates the specified match result. |
| *fr-de-bit-value* | (Optional) Specifies the Frame Relay DE bit. Value can be 0 or 1. Value can be 1. |

## Command Default

The default value is 0.

## Command Modes

Policy map configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

To disable this command in a traffic policy, use the **no set fr-de** command in policy map configuration mode of the traffic policy.

If the DE bit is already set to 1, no changes are made to the frame.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to set the DE bit using the **set fr-de** command in the traffic policy. The router sets the DE bit of outbound packets belonging to the ip-precedence class.

```
RP/0/RSP0/CPU0:router(config)# class-map ip-precedence
RP/0/RSP0/CPU0:router(config-cmap)# match precedence 0 1
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map set-de
RP/0/RSP0/CPU0:router(config-pmap)# class ip-precedence
RP/0/RSP0/CPU0:router(config-pmap-c)# set fr-de 1
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface serial 0/1/0/0/1
RP/0/RSP0/CPU0:router(config-if)# no ip address
RP/0/RSP0/CPU0:router(config-if)# encapsulation frame-relay
RP/0/RSP0/CPU0:router(config-if)# interface serial 0/1/0/0.1 point-to-point
RP/0/RSP0/CPU0:router(config-subif)# ip address 10.1.1.1 255.255.255.252
```

```
RP/0/RSP0/CPU0:router(config-subif)# pvc 16
RP/0/RSP0/CPU0:router(config-fr-vc)# service-policy output set-de
```

## Related Commands

| Command | Description |
|---|---|
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |

# 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 default behavior or values

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

The **set discard-class** command associates a discard class ID with a packet. After the discard class is 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 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/RSP0/CPU0:router(config)# class-map cust1
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 1
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy2
RP/0/RSP0/CPU0:router(config-pmap)# class cust1
RP/0/RSP0/CPU0:router(config-pmap-c)# set discard-class 5
```

```
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy2
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | 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 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 4: IP DSCP Reserved Keywords, on page 75 describes the reserved keywords. |

## Command Default

No default behavior or values

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.1 | The **tunnel** keyword on Layer 3 interfaces in the ingress direction was added. |

## Usage Guidelines

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

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 4: IP DSCP Reserved Keywords, on page 75 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/RSP0/CPU0:router (config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set dscp 8
```

## Related Commands

| Command | Description |
|---|---|
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | 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 96 | Sets the precedence value in the IP header. |
| show policy-map interface, on page 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# set ip encapsulation

To set traffic class imposition for SRv6 encapsulation, use the **set ip encapsulation** command in policy map class configuration mode.

**set ip encapsulation class-of-service** *cos-value*

## Syntax Description

| | |
|---|---|
| **class-of-service** | Specifies the class of service. |
| *cos-value* | Specifies the number that sets the SRv6 encapsulation in the IP header. The value ranges from 0 to 63. |

## Command Default

None

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 24.2.1 | This command was introduced. |

## Usage Guidelines

- The **set ip encapsulation class-of-service** command is not allowed in egress QoS policies.
- The **set qos-group** action cannot be used in conjunction with the **set ip encapsulation class-of-service** command.
- The IP encapsulation marking (**set ip encapsulation class-of-service**) and the MPLS experimental imposition marking ( **set mpls experimental**) features are mutually exclusive. Both the configurations are not allowed at the same time.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

This example shows how to set the traffic class imposition for SRv6 encapsulations.

```
RP/0/RSP0/CPU0:router(config)# class-map match-any class1
RP/0/RSP0/CPU0:router(config-pmap)# match protocol ipv4
RP/0/RSP0/CPU0:router(config-pmap-c)# match access-group ipv4 10
RP/0/RSP0/CPU0:router(config-cmap-c)# class class-default
RP/0/RSP0/CPU0:router(config-cmap-c)# end-class-map

RP/0/RSP0/CPU0:router(config)# policy-map SRv6
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set ip encapsulation class-of-service 55
RP/0/RSP0/CPU0:router(config-cmap-c)# class class-default
RP/0/RSP0/CPU0:router(config-cmap-c)# end-policy-map
```

```
RP/0/RSP0/CPU0:router(config)# interface HundredGigE 0/0/0/24
RP/0/RSP0/CPU0:router(config-if)# service-policy input SRv6
```

# 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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 acl101
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set mpls experimental topmost 5
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
```

```
RP/0/RSP0/CPU0:router(config)# interface HundredGigE 0/1/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy output policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | 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 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 5: IP Precedence Values and Names, on page 80 describes the reserved keywords. |

## Command Default

No default behavior or values

## Command Modes

Policy map class configuration

## Command History

| | |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.1 | The **tunnel** keyword on Layer 3 interfaces in the ingress direction 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.

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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 customer1
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set precedence 5
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if)# service-policy output policy1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | 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/RSP0/CPU0:router(config)#ntp ipv4 ?
  dscp        Set IP DSCP (DiffServ CodePoint)
  precedence  Set precedence

RP/0/RSP0/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/RSP0/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/RSP0/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/RSP0/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/RSP0/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)
```

# shape average

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* | **$***shape-rate* = *percentage*} | *rate* [*units*] | **per-thousand** *value* | **per-million** *value* | **$***shape-rate* = *rate* [*units*]}

## 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:<br>• **Excess burst size**—values can be from 1 to 4294967295<br>• **bps**—bits per second (default)<br>• **gbps**—gigabits per second<br>• **kbps**—kilobits per second<br>• **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. |
| **$** | Specifies that a QoS shaper variable is configured. |
| *shape-rate* | QoS shaper variable name that can be parameterized. |

## Command Default

*units*: **bps**

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 5.2.0 | $*shape-rate* =*rate* option was added to support QoS shaper parameterization in BNG. |

## Usage Guidelines

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.

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.

The shaper parameters, used to override the locally-configured values in BNG, can either be sent to BNG by the RADIUS server during connection establishment, as CISCO VSAs in an Access Accept message, or can be sent to BNG as part of the CoA messages.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

This example sets traffic shaping to 50 percent of the parent shaper rate:

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# shape average percent 50
```

This example shows how to set traffic shaping to 100000 kbps:

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# shape average 100000 kbps
```

This example shows how to set the default value of QoS shape-rate variable (shaper4) as 100000 kbps, in BNG:

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# shape average $shaper4 = 100000 kbps
```

# show qos pwhe-aggregate-shaper

To display current configured coexistence mode and coexistence operating modes, use the **show qos pwhe-aggregate-shaper** command in EXEC mode.

**show qos pwhe-aggregate-shaper** {**all** | **location** *node-id*}

## Syntax Description

| | |
|---|---|
| **all** | Specifies all locations. |
| **location** *node-id* | Specifies location of a particular node. The *node-id* argument is entered in the rack/slot/module notation. |

## Command Default

None.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read |

### Example

This example shows PW-HE coexistence mode and coexistence operating modes for location 0/1/CPU0.

```
RP/0/RSP0/CPU0:router# show qos  pwhe-aggregate-shaper location 0/1/CPU0

                     Configured                    Operational
Node           ingress          egress           ingress          egress
------------------------------------------------------------------------------
0/1/CPU0       disabled         disabled         disabled         disabled
```

This example shows PW-HE coexistence mode and coexistence operating modes for all locations.

```
RP/0/RSP0/CPU0:router# show qos pwhe-aggregate-shaper all

                     Configured                    Operational
Node           ingress          egress           ingress          egress
------------------------------------------------------------------------------
0/1/CPU0       non-queuing      queuing          non-queuing      queuing

 'all' line cards configured for ingress coexistence non-queuing
```

This example shows PW-HE coexistence mode and coexistence operating modes for all locations. In this example, line card (LC) at location 0/2/CPU0 is not in the chassis.

```
RP/0/RSP0/CPU0:router# show qos pwhe-aggregate-shaper all

                     Configured                          Operational
Node             ingress        egress               ingress          egress
-------------------------------------------------------------------------------
0/2/CPU0         queuing        non-queuing             ?               ?
0/1/CPU0         non-queuing    queuing               non-queuing      queuing

'?' means line card is offline - has not booted up or not inserted into the chassis
```

This example shows PW-HE coexistence mode and coexistence operating modes for all locations. In this example, LC at location 0/2/CPU0 does not support PW-HE QoS and LC at location 0/1/CPU0 supports PW-HE QoS, and both the LCs are active.

```
RP/0/RSP0/CPU0:router# show qos pwhe-aggregate-shaper all

                     Configured                      Operational
Node           ingress          egress           ingress          egress
-------------------------------------------------------------------------------
0/2/CPU0       queuing          non-queuing      N/A              N/A
0/1/CPU0       non-queuing      queuing          non-queuing      queuing

'N/A' means line card does not support PWHE QoS "
```

# show qos-ea interface

To display internal programming information for an interface, use the **show qos-ea interface** command in EXEC mode.

**show qos-ea interface** *type interface-path-id* { **input** | **output** } {**detail** | **member**} *interface-type interface-path-id* [**location***interface-path-id* ]

## Syntax Description

| | |
|---|---|
| *type* | Interface type.<br>For interface type **PW-Ether** or **PW-IW** provide interface handle number. The range is from 1 to 32768. |
| *interface-path-id* | Physical interface or virtual interface. Use the **show interfaces** command to see a list of configured interfaces. |
| **input** | Refers to policy applied in ingress direction. |
| **output** | Refers to policy applied egress direction. |
| **detail** | Displays detailed output. |
| **member** | Specifies member of bundle interface or pin-down (generic list) interface of PWHE interface. |
| **location** | (Optional) Specifies the location of the node. |

## Command Default

None.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1 | This command was introduced. |
| Release 5.1.1 | The show outputs were updated for CAC and UBRL details.<br>PWHE Ethernet interface type **PW-Ether** and **PW-IW** were added. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read |

## Examples

This is the sample output which shows the QoS information on a Ten Gigabit Ethernet interface, applicable for the releases 5.3.2 onwards:

```
RP/0/RSP0/CPU0:tardis1-pwhe-spe#show qos-ea interface tenGigE 0/0/0/0/0 output
Interface: TenGigE0_0_0_0_0 output policy: EGRESS_CHILD_POLICY
```

```
Total number of classes: 8
Total number of UBRL classes: 0
Total number of CAC classes: 0
----------------------------------------------------
Policy name: EGRESS_CHILD_POLICY
Hierarchical depth 1
Interface type TenGigE
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x00000100
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8108020800002
Local port 0, NP 0
Policy map id 0x1420, format 17, uidb index 0x0002
----------------------------------------------------
Index 0 Level 0 Class name cp1 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 1
Queue limit 125000000 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0B
Queue: Q-ID 0x000803c0 Stat ID(Commit/Excess/Drop): 0x000813C0/0x00000000/0x00A69700
----------------------------------------------------
Index 1 Level 0 Class name cp2 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 2
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0C
Queue: Q-ID 0x000803c1 Stat ID(Commit/Excess/Drop): 0x000813C1/0x00000000/0x00A69704
----------------------------------------------------
Index 2 Level 0 Class name cp3 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 3
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0D
Queue: Q-ID 0x000803c3 Stat ID(Commit/Excess/Drop): 0x000813C3/0x00000000/0x00A6970C
----------------------------------------------------
Index 3 Level 0 Class name cp4 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 4
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0E
Queue: Q-ID 0x000803c4 Stat ID(Commit/Excess/Drop): 0x000813C4/0x00000000/0x00A69710
----------------------------------------------------
Index 4 Level 0 Class name cp5 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 5
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0F
Queue: Q-ID 0x000803c5 Stat ID(Commit/Excess/Drop): 0x000813C5/0x00000000/0x00A69714
----------------------------------------------------
Index 5 Level 0 Class name cp6 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 6
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E10
Queue: Q-ID 0x000803c6 Stat ID(Commit/Excess/Drop): 0x000813C6/0x00000000/0x00A69718
----------------------------------------------------
```

```
Index 6 Level 0 Class name cp7 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 7
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E11
Queue: Q-ID 0x000803c7 Stat ID(Commit/Excess/Drop): 0x000813C7/0x00000000/0x00A6971C
------------------------------------------------------
Index 7 Level 0 Class name class-default service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/900
Queue limit 13937408 Guarantee 0
Node Result: Class-based stats:Stat ID 0x00C68E12
Queue: Q-ID 0x000803c2 Stat ID(Commit/Excess/Drop): 0x000813C2/0x00000000/0x00A69708
```

This is the sample output of the show qos-ea interface command (Applicable until Release 5.1.1):

```
RP/0/RSP0/CPU0:router# show qos-ea interface gigabitEthernet 0/0/0/30 output
Interface: TenGigE0_3_0_34.3 output policy: two
Total number of classes: 18
------------------------------------------------------
Policy name: two
Hierarchical depth 2
Interface type VLAN Subif
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x0A001DC0
ul_ifh 0x00000000, ul_id 0x00000040
uidb index 0x002D
qos_ifh 0x15800040002d
Local port 34, NP 5
Policy map id 0x2008, format 15, uidb index 0x002D
------------------------------------------------------
Index 0 Level 0 Class name p1 service_id 0x0 Policy name two
Node flags: None
Stats flags: Queuing enabled
Node Config:
Shape: CIR/CBS/PIR/PBS: 0kbps/62500000B/5000000kbps/62500000B
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/1
Node Result: Class-based stats:Stat ID 0x005102DD mode: 16Q
Queue: N/A Stat ID(Commit/Excess/Drop): 0x006E01E0/0x00000000/0x006E01E1
Index 1 Level 1 Class name c1 service_id 0x0 Policy name p16
------------------------------------------------------
Index 17 Level 0 Class name class-default service_id 0x0 Policy name two
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/1
Queue limit 62500000 Guarantee 0
Node Result: Class-based stats:Stat ID 0x005102F4
Queue: Q-ID 0x00030082 Stat ID(Commit/Excess/Drop): 0x006E028A/0x00000000/0x006E028B
```

This is the sample output of the show qos-ea interface command (Applicable from Release 5.1.1):

```
RP/0/# show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: premium_services (Flow Aware Policy)
Total number of classes: 5
Total number of UBRL classes: 0
Total number of CAC classes: 1
------------------------------------------------------
Policy name: premium_services
Hierarchical depth 2
```

```
Interface type GigE
Interface rate 1000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2018, format 16, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name dscp_cs5 service_id 0x0 Policy name premium_services
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 100000kbps/1250000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
------------------------------------------------------
Index 1 Level 0 Class name dscp_cs6 service_id 0x0 Policy name premium_services
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
Node flags: None
Stats flags:
Node Config: None
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 2 Level 1 Class name video_admitted service_id 0x0 Policy name video_flows
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
CAC Flow Counter ID: 0xf41e61
CAC Flow Counter Value: 0
Number of CAC flows admitted: 0
Parent policy premium_services Class dscp_cs6
Node flags: LEAF
Stats flags:
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E1
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 3 Level 1 Class name class-default service_id 0x0 Policy name video_flows
Flow QoS Info: CAC Redirect Class
Parent policy premium_services Class dscp_cs6
Node flags: LEAF DEFAULT
Stats flags:
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E2
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 4 Level 0 Class name class-default service_id 0x0 Policy name premium_services
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E3
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
```

```
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E3/0x005102E4/0x005102E5
------------------------------------------------------
```

This is the sample output of the show qos-ea interface command with the flow related information for CAC:

```
RP/0/# show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: premium-services (Flow Aware Policy)
Total number of classes: 3
Total number of UBRL classes: 0
Total number of CAC classes: 1
Interface rate 1000000 kbps
------------------------------------------------------
Policy name: premium-services
Hierarchical depth 1
Interface type GigE
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2014, format 18, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name prec5 service_id 0x0 Policy name premium-services
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 100000kbps/1250000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
------------------------------------------------------
Index 1 Level 0 Class name video service_id 0x0 Policy name premium-services
Flow QoS Info: CAC Admit Class
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
CAC Reject Action: DROP
CAC Flow Counter ID: 0xf41e61
CAC Flow Counter Value: 0
Number of CAC flows admitted: 0
Node flags: LEAF
Stats flags: CAC Reject Drop enabled
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 2 Level 0 Class name class-default service_id 0x0 Policy name premium-services
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E2
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E2/0x005102E3/0x005102E4
------------------------------------------------------
```

This is the sample output of the show qos-ea interface command with the flow related information for UBRL:

```
RP/0/ # show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: voice_flow (Flow Aware Policy)
```

```
Total number of classes: 3
Total number of UBRL classes: 1
Total number of CAC classes: 0
------------------------------------------------------
Policy name: voice_flow
Hierarchical depth 1
Interface type GigE
Interface rate 1000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2008, format 16, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name voice_prec6 service_id 0x0 Policy name voice_flow
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 5000kbps/62500B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
------------------------------------------------------
Index 1 Level 0 Class name ubrl1 service_id 0x0 Policy name voice_flow
Flow QoS Info: UBRL
UBRL Flow Mask Mode: src-ip (0x80)
UBRL Flow Age: 200 Seconds
Number of UBRL flows learnt: 0
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Flow Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 10000kbps/125000B/0kbps/0B
Catch-all Police Color aware 0 Type 1 CIR/CBS/PIR/PBS:
100000000kbps/12500000B/100000000kbps/12500000B
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E0/0x005102E1/0x005102E2
------------------------------------------------------
Index 2 Level 0 Class name class-default service_id 0x0 Policy name voice_flow
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E3
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001805/0x005102E3/0x005102E4/0x005102E5
------------------------------------------------------
```

This is the sample output of the show qos-ea interface command for PWHE interface:

```
RP/0/# show qos-ea interface pw-ether 1 output member tenGigE 0/2/0/3
Thu Mar 20 01:46:39.070 UTC
Interface: TenGigE0_2_0_3 output policy: pwhe-egress
Total number of classes: 1
------------------------------------------------------
Policy name: pwhe-egress
Hierarchical depth 1
Interface type unknown
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x000000E0
ul_ifh 0x08000680, ul_id 0x00000040
uidb index 0x0019
```

```
qos_ifh 0x811a00019001e
Local port 3, NP 1
Policy map id 0x2000, format 15, uidb index 0x0019
------------------------------------------------------
Index 0 Level 0 Class name class-default service_id 0x0 Policy name pwhe-egress
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
Shape: CIR/CBS/PIR/PBS: 0kbps/12500000B/1000000kbps/12500000B
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/20
Queue limit 12500000 Guarantee 0
Node Result: Class-based stats:Stat ID 0x005102C1
Queue: Q-ID 0x0001000a Stat ID(Commit/Excess/Drop): 0x00640032/0x00000000/0x00640033
------------------------------------------------------
```

# show qos status interface

To display the status of the service-policy applied on the interface, use the **show qos status interface** command in EXEC mode.

**show qos status interface** [**interface** {*typeall*} *interface-path-id*] [**input** | **output**]**nv** [**satellite** *satellite-id*]

## Syntax Description

| | |
|---|---|
| *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.<br>• *rack*—Chassis number of the rack.<br>• *slot*—Physical slot number of the line card.<br>• *module*—Module number. A physical layer interface module (PLIM) is always 0.<br>• *port*—Physical port number of the interface.<br>**Note** In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RSP0 or RSP1) and the module is CPU0.<br>Example: interface MgmtEth0/RSP0/CPU0/0.<br>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. |
| **nv** | (Optional) Displays the statistics of the satellite access or fabric interfaces. |
| **satellite** | (Optional) Displays the per class statistics on the inbound or outbound traffic for the specified satellite. |
| *satellite-id* | (Optional) Displays the satellite statistics based on the specified satellite ID. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

This sample output shows how to the status of the service-policy applied on the TenGigE interface 0/6/1/0 that are in the output and input direction:

```
RP/0/RSP0/CPU0:router#  show qos status interface gigabitEthernet 200/0/0/0 nv

GigabitEthernet200/0/0/0  Satellite: 200 input: marking

     Last Operation Attempted :  ADD
     Status                   :  ACTIVE

GigabitEthernet200/0/0/0 direction output: Service Policy not installed

RP/0/RSP0/CPU0:router#show qos status interface gigabitEthernet 200/0/0/0 input nv

GigabitEthernet200/0/0/0  Satellite: 200 input: marking

     Last Operation Attempted :  ADD
     Status                   :  ACTIVE
```



# Congestion Management Commands

This chapter describes the commands used to manage congestion.

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 congestion management concepts, configuration tasks and examples, see the Configuring Congestion Management chapter in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*.


- admit cac local, on page 119
- flow idle-timeout, on page 120
- flow rate, on page 121
- rate, on page 122
- hw-module buffer-carve-mode, on page 123
- hw-module fia-buffer-profile, on page 124
- hw-module fia-intf-policer disable, on page 125
- hw-module fia-vqi-shaper location, on page 126
- hw-module flow-qos location max-flow-count, on page 127
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- interface-taps, on page 131
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- qos account, on page 188
- violate-action, on page 190

# admit cac local

To configure the call admission control (CAC) local flow type and to enter the policy map class cac configuration sub-mode, use the **admit cac local** command in policy map class configuration mode. To delete CAC configuration, use the **no** form of this command.

**admit cac local**
**no admit cac local**

## Syntax Description

This command has no keywords or arguments.

## Command Default

None.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure the call admission control (CAC) local flow type and to enter the policy map class cac configuration mode.

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-cmap)# class class1
RP/0/RSP0/CPU0:router(config-cmap-c)# admit cac local
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# exit
```

# flow idle-timeout

To configure the maximum time of inactivity for a flow, use the **flow idle-timeout** command in policy map class cac configuration mode. To remove the configured idle timeout for a flow, use the **no** form of this command.

**flow idle-timeout** *period*
**no flow idle-timeout**

## Syntax Description

| | |
|---|---|
| *period* | Specifies the maximum time the flow can be inactive. The value is in seconds.<br>The valid *period* range is between 10s to 2560 seconds. The timeout has a granularity of 10s. |

## Command Default

Default period of 30s

## Command Modes

Policy map class cac configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure the maximum time of inactivity for the flow as 34 seconds.

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-cmap)# class class1
RP/0/RSP0/CPU0:router(config-cmap-c)# admit cac local
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# flow idle-timeout 34
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# exit
```

# flow rate

To configure the per flow rate for a flow, use the **flow rate** command in policy map class cac configuration mode. To remove the configured flow rate, use the **no** form of this command.

**flow rate** *rate*
**no flow rate**

## Syntax Description

*rate* Specifies the committed per flow rate. The value ranges from 1-4294967294.

The committed per flow rate allows these options:

- bps: Bits per second
- cellsps: Cells per second
- gbps: Gigabits per second
- kbps: Kilobits per second
- mbps: Megabits per second

## Command Default

The default unit is Kbps.

## Command Modes

Policy map class cac configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure flow rate of 100 Kbps.

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-cmap)# class class1
RP/0/RSP0/CPU0:router(config-cmap-c)# admit cac local
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# flow rate 100
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# exit
```

# rate

To configure the combined rate of all flows, use the **rate** command in policy map class cac configuration mode. To remove the configured rate, use the **no** form of this command.

**rate** *rate*
**no rate**

## Syntax Description

*rate* Specifies the committed aggregate rate for all flows. The value ranges from 1-4294967294.

The committed aggregate rate for all flows allows these options:

- bps: Bits per second
- cellsps: Cells per second
- gbps: Gigabits per second
- kbps: Kilobits per second
- mbps: Megabits per second

## Command Default

The default unit is Kbps.

## Command Modes

Policy map class cac configuration

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure the per flow rate 896 kbps.

```
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-cmap)# class class1
RP/0/RSP0/CPU0:router(config-cmap-c)# admit cac local
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# rate 896
RP/0/RSP0/CPU0:router(config-cmap-c-cac)# exit
```

# hw-module buffer-carve-mode

To enable the static buffer allocation mode, use the **hw-module buffer-carve-mode** command in the XR config mode.

To return to the default buffer value (dynamic), use the **no** form of this command.

**hw-module buffer-carve mode location 0/0/CPU0** *mode*

## Syntax Description

| | |
|---|---|
| *mode* | Specifies the buffer mode option.<br>• *dynamic*—Sets buffer management to dynamic allocation (default).<br>• *static*—Sets buffer management to static allocation. |

## Command Default

Dynamic mode is enabled by default.

## Command Modes

XR config mode

## Command History

| Release | Modification |
|---|---|
| Release 7.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

## Examples

```
RP/0/RSP0/CPU0:router(admin-config)# R2#conf

RP/0/RSP0/CPU0:router(admin-config)# R2(config)#hw-module buffer-carve-mode location 0/0/CPU0
 static

RP/0/RSP0/CPU0:router(admin-config)# R2(config)#commit

RP/0/RSP0/CPU0:router(admin-config)# R2(config)#end
```

# hw-module fia-buffer-profile

To increase the virtual output queue (VoQ) buffering capacity on the ingress line card in the event of congestion or traffic bursts towards a small number of ports on the egress line card, use the **hw-module fia-buffer-profile** command in Global Configuration mode.

**hw-module fia-buffer-profile location** *<lc-location>* **extra-large**

## Syntax Description

| | |
|---|---|
| **location** | Specifies the location of a specific ingress line card. |
| *<lc-location>* | Location of an ingress line card entered in the *rack/slot/module*. |
| **extra-large** | Enables to use extra large profile to increase the VoQ buffering capacity on the ingress line card. |

## Command Default

None

## Command Modes

Global Configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 6.2.2 | This command was introduced. |

## Usage Guidelines

The FIA buffer profile value can only be implemented on the ingress line card.

## Task ID

| Task ID | Operation |
|---|---|
| root-lr | read, write |

This example shows how to use the **hw-module fia-buffer-profile** to increase the VoQ buffering capacity on the ingress line card.

```
RP/0/RSP0/CPU0:router(config)# hw-module fia-buffer-profile location 0/1/CPU0 extra-large
```

# hw-module fia-intf-policer disable

To disable the FIA interface policing mechanism on the line cards, which helps prevent the dropping of control packets under high bandwidth conditions without losing any fabric packets, use the **hw-module fia-intf-policer disable** command in Global Configuration mode.

**hw-module fia-intf-policer disable**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or value.

## Command Modes

Global Configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | This command was introduced. |

## Usage Guidelines

The Cisco ASR 9900 series chassis supports the **hw-module fia-intf-policer disable** command.

Configuring the **hw-module fia-intf-policer disable** command on the Cisco ASR 9900 series chassis with both Cisco ASR 9000 series line cards and Cisco ASR 9900 series line cards disables the FIA interface policer only on the Cisco ASR 9900 series line cards.

Before disabling the FIA interface policer, implement a QoS policy to mark and protect priority traffic, as disabling the FIA interface policer can pose risks to critical packets, such as packet drops, if traffic to the LC exceeds fabric switching capacity.

## Task ID

| Task ID | Operation |
|---|---|
| root-lr | read, write |

## Examples

This example illustrates how to use the **hw-module fia-intf-policer disable** command to disable the FIA interface policing mechanism on line cards, preventing the dropping of control packets under high bandwidth conditions without losing any fabric packets.

```
Router# configure
Router(config)# hw-module fia-intf-policer disable
Router(config)# commit
```

# hw-module fia-vqi-shaper location

To configure the Virtual Queuing Index (VQI) shaper value and enhance the shaper value, use the **hw-module fia-vqi-shaper location** command in Global Configuration mode. To return to the default shaper value, use the **no** form of this command.

**hw-module fia-vqi-shaper location** *<lc-location>* **enhance**

## Syntax Description

| | |
|---|---|
| *<lc-location>* | Specifies the location of a particular egress line card. |
| **enhance** | Provides the option to enhance the fabric shaper limit to 18 Gigabit Ethernet from the earlier 13 Gigabit Ethernet mode. |

## Command Default

The default VQI shape value is 13 Gigabit Ethernet.

## Command Modes

Global Configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1.0 | This command was introduced. |

## Usage Guidelines

The VQI shaper value can only be implemented on the egress card.

If the shape granularity is not enhanced, a default value of 13 Gigabit Ethernet is applied to all output interfaces belonging to a particular line card.

Using this command does not affect the ingress shaper value of the line card.

## Task ID

| Task ID | Operation |
|---|---|
| root-lr | read, write |

```
RP/0/RSP0/CPU0:router(config)# hw-module fia-vqi-shaper location enhance
```

# hw-module flow-qos location max-flow-count

To configure the required number of policers for the flow-aware QoS feature, use the **hw-module flow-qos location max-flow-count** command in admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode. To remove the configured policers, use the **no** form of this command.

**hw-module flow-qos location***node-id* **max-flow-count** *value*
**no hw-module flow-qos location***node-id* **max-flow-count** *value*

## Syntax Description

| | |
|---|---|
| *node-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.<br>• *rack* —Chassis number of the rack.<br>• *slot* —Physical slot number of the modular services card or line card.<br>• *module* —Module number. A physical layer interface module (PLIM) is always 0. |
| *value* | Specify the value in multiples of 1K (1024).<br>• For Cisco IOS XR from 1 to 256<br>• For Cisco IOS XR 64 bit from 1 to 368 |

## Command Default

None

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| root-lr | read, write |

This example shows how to set the required number of policers for the flow-aware qos feature to 128 at location 0/1/CPU0:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module flow-qos location 0/1/CPU0 max-flow-count
128
```

This example shows how to set the required number of policers for the flow-aware qos feature to 125 on a line card running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module flow-qos location 0/0/0 max-flow-count 125
```

# hw-module location qos-mode port-limit-oversubscribe

To enable the port limit oversubscribe mode on a specific line card, use the **hw-module location qos-mode port-limit-oversubscribe** command in the admin configuration mode. If you are running Cisco IOS XR 64 bit, then use the same command in XR config mode. To disable the port limit mode on a specific line card, use the **no** form of this command.

**hw-module location** *node-id* **qos-mode port-limit-oversubscribe**
**no hw-module location** *node-id* **qos-mode port-limit-oversubscribe**

## Syntax Description

| | | |
|---|---|---|
| **location** | *node-id* | Specifies location of a particular node. The *node-id* argument is entered in the rack/slot/module notation. |

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.2.2 | Support for Cisco IOS XR 64 bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

**Note** Due to hardware limitations and different port buffer sizes, the traffic is processed differently on the following LCs:

- Cisco ASR 9000 Enhanced Ethernet Line Card - The command is ignored and has no effect.
- Cisco ASR 9000 High Density 100GE Ethernet line cards - The command doubles the per port buffer limit on SE linecards and is ignored on TR linecards.
- Cisco ASR 9000 Series 24-port and 48-port dual-rate 10GE/1GE line cards - The command doubles the per port buffer limit on SE linecards and is ignored on TR linecards.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |
| root-lr | read, write |

### Example

This example shows how to enable port limit on a line card:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module location 0/1/CPU0 qos-mode
port-limit-oversubscribe
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to enable port limit on a line card running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module location 0/0/0 qos-mode port-limit-oversubscribe

RP/0/RSP0/CPU0:router(config)# commit
```

# interface-taps

Configures the policer rate on the interface.

**interface-taps 2gig**
**no interface-taps 2gig**

This command has no arguments.

## Command Default

None.

## Command Modes

Global configuration mode.

## Command History

| Release | Modification |
|---|---|
| Release 6.0.1 | This command was introduced. |

## Usage Guidelines

Configuring the interface-taps 2gig command changes the default policer rate on the interface to 2Gbps (bidirectional 1Gbps).

**Note** The default policer rate is 512 Mbps on Typhoon line cards and 1Gbps on Tomahawk line cards.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

The following example shows how you can configure the policer rate to 2Gbps (bidirectional 1Gbps).

```
RP/0/RSP0/CPU0:router(config)# interface-taps 2gig
RP/0/RSP0/CPU0:router(config)# commit
```

# 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:<br>• **bps** —bits per second (default)<br>• **gbps** —gigabits per second<br>• **kbps** —kilobits per second<br>• **mbps** —megabits per second<br>• **pps** —packets per second<br>**Note** QOS offload on satellite feature does not support **pps** unit. |
| **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:<br>• **bytes** —bytes (default)<br>• **gbytes** —gigabytes<br>• **kbytes** —kilobytes<br>• **mbytes** —megabytes<br>• **ms** —milliseconds<br>• **us** —microseconds<br>• **packets** —packets |
| **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 3.7.2 | This command was introduced. |
| Release 4.0.1 | The **pps** and **packets** keywords were added. |

**Usage Guidelines** 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.

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.

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
 !
```

The router supports hierarchical ingress policing, which consists of a two-level hierarchical policy-map. The two levels are:

- Parent level: Consists of a class-default or match-vlan class (in nCmD model) only and has policing with only transmit/drop actions.
- Child level: Consists of a flat policy that can be configured with any action other than the queuing action. This level does not contain configurations that require a continuous bit support.

You can police the ingress interface while applying different classification submodels on the ingress interfaces. The order of the actions within the hierarchical policy-map is from child to parent as specified by the Modular Quality of Service command-line interface (MQC). This is with the exception of the queuing action (shape),

which is executed after any police/set actions. If a police action is configured in a child policy, the child police action is executed before the parent police action.

The police action is invoked with only transmit/drop actions under the conform-action and exceed-action options specified for class-default traffic.

This example explains a hierarchical policer configuration:

```
!
policy-map parent
 class class-default

service-policy child
  police rate percent 50
  conform-action transmit
  exceed-action drop
 !
```



**Note** If you use conform-action drop in the class default of the input qos policy, then it can lead to dropping of DHCP packets. Therefore, there should be a separate class for DHCP packets. You can use the following ACL configuration in the class-map:

```
ipv4 access-list test-ipv4
10 permit udp any host 255.255.255.255 eq bootps
!
```



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

The policer uses an incremental step size of 64 kbps. The configured value is rounded down to the nearest 64 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 configured, it is automatically set to 100 msec-worth of the CIR value. For example, if a CIR value of 1,000,000 kbps is entered, the burst value is calculated to be 12,500,000 bytes. The maximum burst value supported depends on the line card (LC) on which the QoS policy is applied:

- For ASR 9000 Enhanced Ethernet Line Card, the maximum allowed burst value is 4294967295.
- For A9K-SIP-700 Line Card, the maximum allowed burst value is 4294967295.
- For ASR 9000 Ethernet Line Card, the maximum supported burst value is dependent on the Policer rate and is calculated by the formula:

  Maximum supported burst value = ((16 * Policer rate in Bytes Per Second) * 67108864 ) / (250 * 1000000))

  However, if no Policer rate is specified, the maximum supported burst value is taken as 2147483647.

When you define policers, for optimum performance use these formulas to calculate the burst values:

Committed Burst (Bc) = CIR bps * (1 byte / 8 bits) * 1.5 seconds

Excess Burst (Be) =2 * Bc

For example, if CIR = 2,000,000 bps, the calculated burst value is 2,000,000 * (1/8) * 1.5 = 375,000 bytes.

For more information, see the "Committed Bursts and Excess Bursts" section in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*.



**Note**

- Set the peak-burst value according to the formula peak-burst = 2 * burst.
- A police rate minimum of 8 pps and a granularity of 8 pps is supported.

## 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RSP0/CPU0:router(config-pmap-c-police)#conform-action set mpls experimental topmost 4
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if) service-policy input policy1
```

In this example, traffic policing is configured with an average rate of 200 pps, and a normal burst size of 50 packets, for all packets in class-map class1, leaving GigabitEthernet interface 0/1/0/9:

```
RP/0/RSP0/CPU0:router(config)# policy-map pps-1r2c
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 200 pps burst 50 packets
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if) service-policy output policy1
```

## Related Commands

| Command | Description |
|---|---|
| child-conform-aware, on page 200 | Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# police bucket

To configure traffic policing and share policer bucket, use the **police bucket shared** command in policy map class configuration mode. To refer policer bucket, use the **police bucket referred** command in policy map class configuration mode.

**police bucket** {**referred** *policer-instance-name* | **shared** *policer-instance-name* **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

| | |
|---|---|
| **referred** | Specifies referred policer bucket. |
| **shared** | Defines and shares policer bucket. |
| *policer instance name* | Specifies shared or referred policer bucket instance name. The maximum length for *policer instance name* is 64 characters. |
| **rate** | Specifies police rate. |
| *value* | Committed information rate (CIR). Range is from 1 to 4294967295. |
| *units* | (Optional) Unit of measurement for the CIR. Values can be:<br>• **bps** —bits per second (default)<br>• **gbps** —gigabits per second<br>• **kbps** —kilobits per second<br>• **mbps** —megabits per second<br>• **pps** —packets 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 for every thousand of the link bandwidth. |
| **per-million** *value* | Specifies the committed information rate in for every 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:<br>• **bytes** —bytes (default)<br>• **gbytes** —gigabytes<br>• **kbytes** —kilobytes<br>• **mbytes** —megabytes<br>• **ms** —milliseconds<br>• **us** —microseconds<br>• **packets** —packets |
| **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**

None.

**Command Modes**

Policy map configuration.

**Command History**

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

**Usage Guidelines**

**Note** The policer actions (conform, exceed and violet) under shared and referred policers may be different for different classes that share and refer a policer.

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 bucket** 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 Ethernet transmission, the encapsulation is considered to be 14 bytes, whereas for IEEE 802.1Q, the encapsulation is 18 bytes.

The policer uses an incremental step size of 64 kbps. The configured value is rounded down to the nearest 64 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 configured, it is automatically set to 100 msec-worth of the CIR value. For example, if a CIR value of 1,000,000 kbps is entered, the burst value is calculated to be 12,500,000 bytes. The maximum burst value supported depends on the line card (LC) on which the QoS policy is applied:

- For ASR 9000 Enhanced Ethernet Line Card, the maximum allowed burst value is 4294967295.
- For A9K-SIP-700 Line Card, the maximum allowed burst value is 4294967295.
- For ASR 9000 Ethernet Line Card, the maximum supported burst value is dependent on the Policer rate and is calculated by the formula:

  Maximum supported burst value = ((16 * Policer rate in Bytes Per Second) * 67108864 ) / (250 * 1000000))

  However, if no Policer rate is specified, the maximum supported burst value is taken as 2147483647.

When you define policers, for optimum performance use these formulas to calculate the burst values:

Committed Burst (Bc) = CIR bps * (1 byte / 8 bits) * 1.5 seconds

Excess Burst (Be) =2 * Bc

For example, if CIR = 2,000,000 bps, the calculated burst value is 2,000,000 * (1/8) * 1.5 = 375,000 bytes.

**Note**
- Set the peak-burst value according to the formula peak-burst = 2 * burst.
- A police rate minimum of 8 pps and a granularity of 8 pps is supported.

**Task ID**

| Task ID | Operation |
|---|---|
| qos | read, write |

In this example for dual ingress traffic, traffic policing is configured with the average rate at 2 Mbps, and the policer bucket to police traffic at rate 1Mbps is shared:

```
RP/0/RSP0/CPU0:router#(config-pmap-c) policy-map parent
  RP/0/RSP0/CPU0:router#(config-pmap-c) class voip
    RP/0/RSP0/CPU0:router#(config-pmap-c) police rate 2 mbps
    RP/0/RSP0/CPU0:router#(config-pmap-c) priority level 1
    RP/0/RSP0/CPU0:router#(config-pmap-c) service-policy voip-child
 RP/0/RSP0/CPU0:router#(config-pmap-c) class long-distance
    RP/0/RSP0/CPU0:router#(config-pmap-c) police bucket shared sp1 rate 1 mbps
RP/0/RSP0/CPU0:router#(config-pmap-c) end policy-map
```

In this example for dual ingress traffic, policer bucket is referred to police traffic at rate 1Mbps:

```
RP/0/RSP0/CPU0:router#(config-pmap-c) policy-map voip-child
  RP/0/RSP0/CPU0:router#(config-pmap-c) class long-distance-voip
    RP/0/RSP0/CPU0:router#(config-pmap-c) police bucket referred sp1
    RP/0/RSP0/CPU0:router#(config-pmap-c) class class-default
    RP/0/RSP0/CPU0:router#(config-pmap-c) end policy-map
```

# 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*
**policy-map** [ **type pbr** ] *policy-name*
**no policy-map** [ **type pbr** ] *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 3.7.2 | This command was introduced. |
| 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. 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.

When using Policy-Based Routing (PBR) in a policy map, you can easily guide certain traffic to different paths instead of its usual route.

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

The maximum number of policy maps supported is 2000.



**Note** When a policy map is applied on a physical port, all subinterfaces under the same physical port inherit the same policy.

## 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 136

RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1

RP/0/RSP0/CPU0:router(config-pmap-c)# police cir 250
RP/0/RSP0/CPU0:router(config-pmap-c)# set precedence 3
RP/0/RSP0/CPU0:router(config-pmap-c)# exit

RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/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, 3, 4, 5, 6 and 7. Default level is 1. Level 1 traffic has higher priority. |

## Command Default

No default action.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| 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 is queued to the same, single, priority queue.

Fabric QoS is configured using the **priority** command in the ingress service policy.

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# priority level 2
```

## Related Commands

| Command | Description |
|---|---|
| bandwidth (QoS), on page 195 | Specifies the minimum bandwidth allocated to a class belonging to a policy map. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# random-detect ecn

To enable ECN-based (Explicit Congestion Notification) WRED, use the **random-detect ecn** command in policy-map configuration mode. To remove WRED, use the **no** form of the command.

**random-detect ecn**
**norandom-detect ecn**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or value.

## Command Modes

Policy-map configuration mode.

## Command History

| Release | Modification |
|---|---|
| Release 4.3.0 | This command was introduced. |

## Usage Guidelines

ECN-based WRED can be enabled only on ASR9000 SIP-700 linecards.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

### Example

This example shows how to use the **random-detect ecn**command:

```
RP/0/RSP0/CPU0:router(config-pmap-c)#random-detect ecn
```

# show qos interface

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:<br>• Physical interface instance. Naming notation is *rack/slot/module/port* and a slash between values is required as part of the notation.<br>  • *rack* : Chassis number of the rack.<br>  • *slot* : Physical slot number of the modular services card or line card.<br>  • *module* : Module number. A physical layer interface module (PLIM) is always 0.<br>  • *port* : Physical port number of the interface.<br>**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.<br>• Virtual interface instance. Number range varies depending on interface type.<br>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.<br>**Note** This keyword is applicable only for bundle and PWHE interface. |

| | |
|---|---|
| **host-link** | (Optional) Specifies the host-link.<br>**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 3.7.2 | This command was introduced. |
| Release 4.3.0 | The command was supported in dynamic template configuration mode in BNG. |
| 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.<br>The **show qos interface** command output was updated to display QoS Offload on satellite information.<br>PWHE interface type **PW-Ether** and **PW-IW** were added.<br>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 which shows the QoS information on a Ten Gigabit Ethernet interface, applicable for the releases 5.3.2 onwards:

```
RP/0/RSP0/CPU0:tardis1-pwhe-spe#show qos interface tenGigE 0/0/0/0/0 output
Interface: TenGigE0_0_0_0_0 output
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: EGRESS_CHILD_POLICY Total number of classes: 8
------------------------------------------------------------------------
```

```
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp1
QueueID: 525248 (Priority 1)
Queue Limit: 126976 kbytes Abs-Index: 179 Template: 0 Curve: 7
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp2
QueueID: 525249 (Priority 2)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 6
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp3
QueueID: 525251 (Priority 3)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 5
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp4
QueueID: 525252 (Priority 4)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 0
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp5
QueueID: 525253 (Priority 5)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 0
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp6
QueueID: 525254 (Priority 6)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 0
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: cp7
QueueID: 525255 (Priority 7)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 0
Shape CIR Profile: INVALID
------------------------------------------------------------------------
Level: 0 Policy: EGRESS_CHILD_POLICY Class: class-default
QueueID: 525250 (Priority Normal)
Queue Limit: 13824 kbytes (54443 packets) Abs-Index: 129 Template: 0 Curve: 0
Shape CIR Profile: INVALID
WFQ Profile: 0/206 Committed Weight: 906 Excess Weight: 906
Bandwidth: 0 kbps, BW sum for Level 0: 0 kbps, Excess Ratio: 900
```

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

```
RP/0/RSP0/CPU0:router# show qos interface gig0/0/0/11.1 output

Wed Mar 18 18:25:20.140 UTC
Interface: GigabitEthernet0_0_0_11.1 output Bandwidth: 1000000 kbps ANCP: 999936 kbps
Policy: parent-3play-subscriber-line Total number of classes: 5
------------------------------------------------------------------------
Level: 0 Policy: parent-3play-subscriber-line Class: class-default
QueueID: N/A
Shape Profile: 1 CIR: 200000 kbps (200 mbps)
CBS: 100352 bytes PIR: 999936 kbps PBS: 12517376 bytes
WFQ Profile: 1 Committed Weight: 51 Excess Weight: 100
Bandwidth: 200000 kbps, BW sum for Level 0: 1000000 kbps, Excess Ratio: 100
------------------------------------------------------------------------
Level: 1 Policy: child-3play Class: 3play-voip
Parent Policy: parent-3play-subscriber-line Class: class-default
QueueID: 136 (Priority 1)
Queue Limit: 16 kbytes Profile: 3 Scale Profile: 0
Policer Profile: 0 (Single)
Conform: 65 kbps (65 kbps) Burst: 1598 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
```

```
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: child-3play Class: 3play-video
Parent Policy: parent-3play-subscriber-line Class: class-default
QueueID: 137 (Priority 2)
Queue Limit: 8 kbytes (11 Unknown) Profile: 4 Scale Profile: 0
Policer Profile: 24 (Single)
Conform: 128 kbps (128 kbps) Burst: 1598 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
WRED Type: COS based Table: 0 Profile: 4 Scale Profile: 0 Curves: 3
Default RED Curve Thresholds Min : 8 kbytes Max: 8 kbytes
WRED Curve: 1 Thresholds Min : 8 kbytes Max: 8 kbytes
 Match: 3
WRED Curve: 2 Thresholds Min : 8 kbytes Max: 8 kbytes
 Match: 4
------------------------------------------------------------------------
Level: 1 Policy: child-3play Class: 3play-premium
Parent Policy: parent-3play-subscriber-line Class: class-default
QueueID: 138 (Priority Normal)
Queue Limit: 2097 kbytes Profile: 2 Scale Profile: 0
WFQ Profile: 6 Committed Weight: 1020 Excess Weight: 1020
Bandwidth: 200000 kbps, BW sum for Level 1: 200000 kbps, Excess Ratio: 1
------------------------------------------------------------------------
Level: 1 Policy: child-3play Class: class-default
Parent Policy: parent-3play-subscriber-line Class: class-default
QueueID: 139 (Priority Normal)
Queue Limit: 65 kbytes Profile: 1 Scale Profile: 3
WFQ Profile: 0 Committed Weight: 1 Excess Weight: 1020
Bandwidth: 0 kbps, BW sum for Level 1: 200000 kbps, Excess Ratio: 1
------------------------------------------------------------------------
```

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

```
RP/0/RSP0/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
```

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/RSP0/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/RSP0/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/RSP0/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/RSP0/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
```

This table describes the significant fields shown in the display.

***Table 7: show QoS interface Field Descriptions***

| Field | Description |
|---|---|
| Level 0 class | Level 0 class identifier in hexadecimal format. |
| Level 1 class | Level 1 class identifier in hexadecimal format. |
| class name | Name that was assigned to this class with the **class** command. |
| Conform | Number of conform packets transmitted. |
| Burst | Configured burst size, expressed in bytes, gigabytes (GB), kilobytes (KB), megabytes (MB), milliseconds (ms), or microseconds (us). |

| Field | Description |
|---|---|
| Queue ID | Queue identifier. |
| Child Policer Conform | Child Policer conform action (transmitted or dropped). |
| Child Policer Exceed | Child Policer exceed action (transmitted or dropped). |
| Child Policer Violate | Child Policer violate action (transmitted or dropped). |
| Flow QoS Info | Information pertaining to CAC actions, and UBRL. |
| CAC Flow Mask Mode | Configured flow mask for CAC actions. |
| CAC Flow Rate | Configured rate for CAC actions. |
| CAC Rate | Configured total bandwidth for CAC admitted flows. |
| UBRL Flow Mask Mode | Configured flow mask for UBRL. |
| Flow Age | Configured expiry time to purge out stale flow records set in the flow cache. |

# show qos-ea interface

To display internal programming information for an interface, use the **show qos-ea interface** command in EXEC mode.

**show qos-ea interface** *type interface-path-id* { **input** | **output** } {**detail** | **member**} *interface-type interface-path-id* [**location***interface-path-id* ]

## Syntax Description

| | |
|---|---|
| *type* | Interface type.<br>For interface type **PW-Ether** or **PW-IW** provide interface handle number. The range is from 1 to 32768. |
| *interface-path-id* | Physical interface or virtual interface. Use the **show interfaces** command to see a list of configured interfaces. |
| **input** | Refers to policy applied in ingress direction. |
| **output** | Refers to policy applied egress direction. |
| **detail** | Displays detailed output. |
| **member** | Specifies member of bundle interface or pin-down (generic list) interface of PWHE interface. |
| **location** | (Optional) Specifies the location of the node. |

## Command Default

None.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1 | This command was introduced. |
| Release 5.1.1 | The show outputs were updated for CAC and UBRL details.<br>PWHE Ethernet interface type **PW-Ether** and **PW-IW** were added. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read |

## Examples

This is the sample output which shows the QoS information on a Ten Gigabit Ethernet interface, applicable for the releases 5.3.2 onwards:

```
RP/0/RSP0/CPU0:tardis1-pwhe-spe#show qos-ea interface tenGigE 0/0/0/0/0 output
Interface: TenGigE0_0_0_0_0 output policy: EGRESS_CHILD_POLICY
```

```
Total number of classes: 8
Total number of UBRL classes: 0
Total number of CAC classes: 0
------------------------------------------------------
Policy name: EGRESS_CHILD_POLICY
Hierarchical depth 1
Interface type TenGigE
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x00000100
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8108020800002
Local port 0, NP 0
Policy map id 0x1420, format 17, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name cp1 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 1
Queue limit 125000000 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0B
Queue: Q-ID 0x000803c0 Stat ID(Commit/Excess/Drop): 0x000813C0/0x00000000/0x00A69700
------------------------------------------------------
Index 1 Level 0 Class name cp2 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 2
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0C
Queue: Q-ID 0x000803c1 Stat ID(Commit/Excess/Drop): 0x000813C1/0x00000000/0x00A69704
------------------------------------------------------
Index 2 Level 0 Class name cp3 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 3
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0D
Queue: Q-ID 0x000803c3 Stat ID(Commit/Excess/Drop): 0x000813C3/0x00000000/0x00A6970C
------------------------------------------------------
Index 3 Level 0 Class name cp4 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 4
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0E
Queue: Q-ID 0x000803c4 Stat ID(Commit/Excess/Drop): 0x000813C4/0x00000000/0x00A69710
------------------------------------------------------
Index 4 Level 0 Class name cp5 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 5
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E0F
Queue: Q-ID 0x000803c5 Stat ID(Commit/Excess/Drop): 0x000813C5/0x00000000/0x00A69714
------------------------------------------------------
Index 5 Level 0 Class name cp6 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 6
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E10
Queue: Q-ID 0x000803c6 Stat ID(Commit/Excess/Drop): 0x000813C6/0x00000000/0x00A69718
------------------------------------------------------
```

```
Index 6 Level 0 Class name cp7 service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF
Stats flags: Queuing enabled
Node Config: Priority: 7
Queue limit 13937408 Guarantee 1
Node Result: Class-based stats:Stat ID 0x00C68E11
Queue: Q-ID 0x000803c7 Stat ID(Commit/Excess/Drop): 0x000813C7/0x00000000/0x00A6971C
------------------------------------------------------
Index 7 Level 0 Class name class-default service_id 0x0 Policy name EGRESS_CHILD_POLICY
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/900
Queue limit 13937408 Guarantee 0
Node Result: Class-based stats:Stat ID 0x00C68E12
Queue: Q-ID 0x000803c2 Stat ID(Commit/Excess/Drop): 0x000813C2/0x00000000/0x00A69708
```

This is the sample output of the show qos-ea interface command (Applicable until Release 5.1.1):

```
RP/0/RSP0/CPU0:router# show qos-ea interface gigabitEthernet 0/0/0/30 output
Interface: TenGigE0_3_0_34.3 output policy: two
Total number of classes: 18
------------------------------------------------------
Policy name: two
Hierarchical depth 2
Interface type VLAN Subif
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x0A001DC0
ul_ifh 0x00000000, ul_id 0x00000040
uidb index 0x002D
qos_ifh 0x15800040002d
Local port 34, NP 5
Policy map id 0x2008, format 15, uidb index 0x002D
------------------------------------------------------
Index 0 Level 0 Class name p1 service_id 0x0 Policy name two
Node flags: None
Stats flags: Queuing enabled
Node Config:
Shape: CIR/CBS/PIR/PBS: 0kbps/62500000B/5000000kbps/62500000B
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/1
Node Result: Class-based stats:Stat ID 0x005102DD mode: 16Q
Queue: N/A Stat ID(Commit/Excess/Drop): 0x006E01E0/0x00000000/0x006E01E1
Index 1 Level 1 Class name c1 service_id 0x0 Policy name p16
------------------------------------------------------
Index 17 Level 0 Class name class-default service_id 0x0 Policy name two
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/1
Queue limit 62500000 Guarantee 0
Node Result: Class-based stats:Stat ID 0x005102F4
Queue: Q-ID 0x00030082 Stat ID(Commit/Excess/Drop): 0x006E028A/0x00000000/0x006E028B
```

This is the sample output of the show qos-ea interface command (Applicable from Release 5.1.1):

```
RP/0/# show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: premium_services (Flow Aware Policy)
Total number of classes: 5
Total number of UBRL classes: 0
Total number of CAC classes: 1
------------------------------------------------------
Policy name: premium_services
Hierarchical depth 2
```

```
Interface type GigE
Interface rate 1000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2018, format 16, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name dscp_cs5 service_id 0x0 Policy name premium_services
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 100000kbps/1250000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
------------------------------------------------------
Index 1 Level 0 Class name dscp_cs6 service_id 0x0 Policy name premium_services
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
Node flags: None
Stats flags:
Node Config: None
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 2 Level 1 Class name video_admitted service_id 0x0 Policy name video_flows
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
CAC Flow Counter ID: 0xf41e61
CAC Flow Counter Value: 0
Number of CAC flows admitted: 0
Parent policy premium_services Class dscp_cs6
Node flags: LEAF
Stats flags:
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E1
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 3 Level 1 Class name class-default service_id 0x0 Policy name video_flows
Flow QoS Info: CAC Redirect Class
Parent policy premium_services Class dscp_cs6
Node flags: LEAF DEFAULT
Stats flags:
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E2
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 4 Level 0 Class name class-default service_id 0x0 Policy name premium_services
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E3
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
```

```
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E3/0x005102E4/0x005102E5
------------------------------------------------------
```

This is the sample output of the show qos-ea interface command with the flow related information for CAC:

```
RP/0/# show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: premium-services (Flow Aware Policy)
Total number of classes: 3
Total number of UBRL classes: 0
Total number of CAC classes: 1
Interface rate 1000000 kbps
------------------------------------------------------
Policy name: premium-services
Hierarchical depth 1
Interface type GigE
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2014, format 18, uidb index 0x0002
------------------------------------------------------
Index 0 Level 0 Class name prec5 service_id 0x0 Policy name premium-services
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 100000kbps/1250000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
------------------------------------------------------
Index 1 Level 0 Class name video service_id 0x0 Policy name premium-services
Flow QoS Info: CAC Admit Class
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
CAC Reject Action: DROP
CAC Flow Counter ID: 0xf41e61
CAC Flow Counter Value: 0
Number of CAC flows admitted: 0
Node flags: LEAF
Stats flags: CAC Reject Drop enabled
Node Config: Mark
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
------------------------------------------------------
Index 2 Level 0 Class name class-default service_id 0x0 Policy name premium-services
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E2
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E2/0x005102E3/0x005102E4
------------------------------------------------------
```

This is the sample output of the show qos-ea interface command with the flow related information for UBRL:

```
RP/0/ # show qos-ea interface gigabitEthernet 0/1/0/0 input
Interface: GigabitEthernet0_1_0_0 input policy: voice_flow (Flow Aware Policy)
```

```
Total number of classes: 3
Total number of UBRL classes: 1
Total number of CAC classes: 0
----------------------------------------------------
Policy name: voice_flow
Hierarchical depth 1
Interface type GigE
Interface rate 1000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x060000C0
ul_ifh 0x00000000, ul_id 0x00000080
uidb index 0x0002
qos_ifh 0x8100000800002
Local port 0, NP 0
Policy map id 0x2008, format 16, uidb index 0x0002
----------------------------------------------------
Index 0 Level 0 Class name voice_prec6 service_id 0x0 Policy name voice_flow
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 5000kbps/62500B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102DD
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001803/0x005102DD/0x005102DE/0x005102DF
----------------------------------------------------
Index 1 Level 0 Class name ubrl1 service_id 0x0 Policy name voice_flow
Flow QoS Info: UBRL
UBRL Flow Mask Mode: src-ip (0x80)
UBRL Flow Age: 200 Seconds
Number of UBRL flows learnt: 0
Node flags: LEAF
Stats flags: Policer type 1 Max category 0
Node Config:
Flow Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 10000kbps/125000B/0kbps/0B
Catch-all Police Color aware 0 Type 1 CIR/CBS/PIR/PBS:
100000000kbps/12500000B/100000000kbps/12500000B
Node Result: Class-based stats:Stat ID 0x005102E0
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001804/0x005102E0/0x005102E1/0x005102E2
----------------------------------------------------
Index 2 Level 0 Class name class-default service_id 0x0 Policy name voice_flow
Node flags: LEAF DEFAULT DEFAULT-ALL
Stats flags: Policer type 1 Max category 0
Node Config:
Police Color aware 0 Type 1 CIR/CBS/PIR/PBS: 30000kbps/375000B/0kbps/0B
Node Result: Class-based stats:Stat ID 0x005102E3
Queue: N/A Stat ID(Commit/Excess/Drop): 0x00000000/0x00000000/0x00000000
Police ID (Token/Conform/Exceed/Violate): 0x00001805/0x005102E3/0x005102E4/0x005102E5
----------------------------------------------------
```

This is the sample output of the show qos-ea interface command for PWHE interface:

```
RP/0/# show qos-ea interface pw-ether 1 output member tenGigE 0/2/0/3
Thu Mar 20 01:46:39.070 UTC
Interface: TenGigE0_2_0_3 output policy: pwhe-egress
Total number of classes: 1
----------------------------------------------------
Policy name: pwhe-egress
Hierarchical depth 1
Interface type unknown
Interface rate 10000000 kbps
Port Shaper rate 0 kbps
Interface handle 0x000000E0
ul_ifh 0x08000680, ul_id 0x00000040
uidb index 0x0019
```

```
qos_ifh 0x811a00019001e
Local port 3, NP 1
Policy map id 0x2000, format 15, uidb index 0x0019
------------------------------------------------------
Index 0 Level 0 Class name class-default service_id 0x0 Policy name pwhe-egress
Node flags: LEAF Q_LEAF DEFAULT DEFAULT-ALL
Stats flags: Queuing enabled
Node Config:
Shape: CIR/CBS/PIR/PBS: 0kbps/12500000B/1000000kbps/12500000B
WFQ: BW/Sum of BW/Excess ratio: 0kbps/0kbps/20
Queue limit 12500000 Guarantee 0
Node Result: Class-based stats:Stat ID 0x005102C1
Queue: Q-ID 0x0001000a Stat ID(Commit/Excess/Drop): 0x00640032/0x00000000/0x00640033
------------------------------------------------------
```

# 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.<br>**Note** Use the **show interfaces** command to see a list of all interfaces currently configured on the router.<br>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.<br>**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.<br>The **out** keyword was replaced with the **output** keyword.<br>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/RSP0/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 8: show fmgr interface Field Descriptions***

| Field | Description |
|---|---|
| QOS ENTRIES | Displays the following QoS information:<br>• Interface—Interface type and identifier.<br>• Feature—Feature currently running on the specified interface.<br>• 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 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*}

## Syntax Description

| | |
|---|---|
| **all** | Displays shape granularity information for all 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.<br>• *rack* —Chassis number of the rack.<br>• *slot* —Physical slot number of the modular services card or line card.<br>• *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 shape granularity for the output interface at location 0/1/CPU0:

```
RP/0/RSP0/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 9: show hw-module qos output shape granularity location Field Descriptions, on page 167
describes the significant fields shown in the display.

***Table 9: 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[ accounting** | **control** | **pbr** | **performance-traffic** | **qos ]** [**interface** {*interface type* | **all**} *interface-path-id*] [**input** | **output** [**member** *interface type interface-path-id*]]**nv** [**satellite** *satellite-id*]

## Syntax Description

| | |
|---|---|
| **type accounting** | Displays accounting details for a policy-map. |
| **type control** | Displays control details for a policy-map. |
| **type pbr** | Displays Policy-based routing (PBR) details for a policy-map. |
| **type performance-traffic** | Displays real time application flow monitoring details for a policy-map. |
| **type qos** | Displays qos statistics for qos policies. |
| *interface type* | Interface type. For more information, use the question mark (?) online help function. |
| **all** | Specifies all interfaces. |
| *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.<br>• *rack*—Chassis number of the rack.<br>• *slot*—Physical slot number of the line card.<br>• *module*—Module number. A physical layer interface module (PLIM) is always 0.<br>• *port*—Physical port number of the interface.<br>**Note** In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RSP0 or RSP1) and the module is CPU0.<br>Example: interface MgmtEth0/RSP0/CPU0/0.<br>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. |
| **nv** | Displays the statistics of the satellite access or fabric interfaces. |
| **satellite** | Displays the per class statistics on the inbound or outbound traffic for the specified satellite. |
| *satellite-id* | Displays the satellite statistics based on the specified satellite ID. |

**Command Default**

None

**Command Modes**

EXEC mode

**Command History**

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **show policy-map interface** command output was updated to show IPHC statistics. |
| Release 4.3.1 | The **pbr** keyword was added. |
| Release 5.1.1 | The **nv satellite** keywords and the *satellite-id* variable were added. The show outputs were updated for nv satellite details.<br>The show outputs were updated for CAC and UBRL details.<br>PWHE interface type **PW-Ether** and **PW-IW** were added. |

**Usage Guidelines**

The **show policy-map interface** command displays the statistics for classes in the service policy attached to an interface.

The **show policy-map interface** command displays the statistics for shared and referred classes separately. To determine the policer action, an aggregate of the shared policer statistics should be collected.

For PWHE aggregate shaper the **show policy-map interface** command displays aggregate of all the queuing stats for subinterface policies if they co-exist.

The output of the **show policy-map interface** command is inconsistent for priority level 1, priority level 2, priority level 3 that is configured on the bundle interface, when the interface has either of these combinations:

- 3rd generation of ASR 9000 LC with SE and TR versions
- 4th generation of ASR 9000 LC with SE and 3rd generation of ASR 9000 LC with TR versions

Additionally, for priority level 3 configuration the show policy-map interface command output is inconsistent when the bundle interface has a combination of 3rd generation ASR 9000 LC with TR and 4th generation of ASR 9000 LC with TR versions.

In order to display consistent show policy-map interface, use **show policy-map interface bundle-eth** <*number*> **[input | output] member** {*interface type interface-path-id*} command.

## 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 direction:

```
RP/0/RSP0/CPU0:router# show policy-map interface TenGigE0/1/0/0 nv

TenGigE0/1/0/0 direction input: Service Policy not installed

TenGigE0/1/0/0 Satellite: 0 output: policy_queue

Class class7
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                130/133640               35
    Transmitted         :                130/133640               35
    Total Dropped       :                  0/0                    0
  Queueing statistics
    Queue ID                            : 1
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)          : 0/0
    Queue(conform)      :                130/133640               35
    Queue(exceed)       :                  0/0                    0
    CLP0 Taildropped(packets/bytes)     : 0/0
    CLP1 Taildropped(packets/bytes)     : 0/0
```

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

```
RP/0/RSP0/CPU0:router # show policy-map interface gigabitEthernet1000/0/0/0 nv

GigabitEthernet1000/0/0/0 Satellite: 0 input: policy

Class class0
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :         11511218114/11787487348736       363762
    Transmitted         :         11511218114/11787487348736       363762
    Total Dropped       :                  0/0                    0
Class class1
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :          3251595388/3329633677312        98038
    Transmitted         :          3251595388/3329633677312        98038
    Total Dropped       :                  0/0                    0
Class class2
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :          3003931166/3076025511936        123068
    Transmitted         :          3003931166/3076025511936        123068
    Total Dropped       :                  0/0                    0


RP/0/RSP0/CPU0:router # show policy-map interface TenGigE0/1/1/2 nv satellite 1000

TenGigE0/1/1/2 direction input: Service Policy not installed

TenGigE0/1/1/2 Satellite: 0 output: icl
```

```
Class icl1
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                   0
    Transmitted         :                  0/0                   0
    Total Dropped       :                  0/0                   0
  Queueing statistics
    Queue ID                              : 1
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)            : 0/0
    Queue(conform)      :                    0/0                   0
    Queue(exceed)       :                    0/0                   0
    CLP0 Taildropped(packets/bytes)       : 0/0
    CLP1 Taildropped(packets/bytes)       : 0/0
Class icl2
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                   0
    Transmitted         :                  0/0                   0
    Total Dropped       :                  0/0                   0
  Queueing statistics
    Queue ID                              : 2
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)            : 0/0
    Queue(conform)      :                    0/0                   0
    Queue(exceed)       :                    0/0                   0
    CLP0 Taildropped(packets/bytes)       : 0/0
    CLP1 Taildropped(packets/bytes)       : 0/0
Class icl4
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                   0
    Transmitted         :                  0/0                   0
    Total Dropped       :                  0/0                   0
  Queueing statistics
    Queue ID                              : 4
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)            : 0/0
    Queue(conform)      :                    0/0                   0
    Queue(exceed)       :                    0/0                   0
    CLP0 Taildropped(packets/bytes)       : 0/0
    CLP1 Taildropped(packets/bytes)       : 0/0
Class icl5
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                   0
    Transmitted         :                  0/0                   0
    Total Dropped       :                  0/0                   0
  Queueing statistics
    Queue ID                              : 5
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)            : 0/0
    Queue(conform)      :                    0/0                   0
    Queue(exceed)       :                    0/0                   0
    CLP0 Taildropped(packets/bytes)       : 0/0
    CLP1 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                              : 0
    High watermark  (Unknown)
    Inst-queue-len  (Unknown)
    Avg-queue-len   (Unknown)
    Taildropped(packets/bytes)            : 0/0
    Queue(conform)      :                    0/0                    0
    Queue(exceed)       :                    0/0                    0
    CLP0 Taildropped(packets/bytes)       : 0/0
    CLP1 Taildropped(packets/bytes)       : 0/0
```

This example shows how to display the policy statistics information for ring topology on satellite 100.

```
RP/0/RSP0/CPU0:router# show policy-map interface GigabitEthernet 100/0/0/40 nv satellite
100

GigabitEthernet100/0/0/40 Satellite: 0 input: NV9kV

Class 9kv-dscp
  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
Class class-default
  Classification statistics          (packets/bytes)     (rate - kbps)
Matched : 1737069/111172288 29645
    Transmitted         :             1737069/111172288            29645
    Total Dropped       :                  0/0                    0
```

This example shows how to display the flow related information for CAC:

```
RP/0/RSP0/CPU0:router#show policy-map interface gigabitEthernet 0/1/0/0

GigabitEthernet0/1/0/0 input: premium-services

Class prec5
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         : N/A
    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
Class video   (CAC_ADMIT)
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         : N/A
    Total Dropped       : N/A
  CAC Statistics                     (packets/bytes)      (rate-kbps)
    CAC Admitted        :                  0/0                    0
    CAC Drop            :                  0/0                    0
Class class-default
  Classification statistics          (packets/bytes)     (rate - kbps)
```

```
    Matched             :                  0/0                    0
    Transmitted         : N/A
    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
```

This example shows how to display the flow related information for UBRL:

```
RP/0/RSP0/CPU0:router#show policy-map interface gigabitEthernet 0/1/0/0

GigabitEthernet0/1/0/0 input: voice_flow

Class voice_prec6
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         : N/A
    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
Class ubrl1            (UBRL_CLASS)
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         : N/A
    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
Class class-default
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         : N/A
    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
GigabitEthernet0/1/0/0 direction output: Service Policy not installed
```

**Note**

- The **show policy-map interface** command displays matched rate that is more than the line rate, when a:
  - kernel crash is executed on an active route switch processor (RSP) of host.
  - state of policy-map changes from standby to new active.
  - state of new active offloaded policy-map changes to an active state for ICL interface.
- The **show policy-map interface** command does not show updated conform stats for 2R3C configuration when policy rate is changed.
- In the **show policy-map interface** command output, displayed police rate and actual police rate for an interface varies.

This table describes the significant fields shown in the display.

***Table 10: 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. |
| 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. |
| Compression Statistics | |
| Sent Total | Total number of packets sent. |

| Field | Description |
|---|---|
| Sent Compressed | Number of compressed packets sent. |
| Sent full header | Number of packets sent with a full header. |
| Saved | Number of bytes saved. |
| Sent | Number of bytes sent. |
| Efficiency improvement factor | Ratio of the packet's original full size to the packet's compressed size. |
| Queue (conform) | Number of packets or bytes that conformed to the queue rate for this class. |
| Queue (exceed) | Number of packets or bytes that exceeded the queue rate for this class. |
| NV9kV | NV SAT Simple ring. |
| CAC Statistics | |
| CAC Admitted | Number of packets admitted. |
| CAC Drop | Number of packets dropped. |

# show policy-map shared-policy-instance

To display the statistics for all details of the shared policy instance, use the **show policy-map shared-policy-instance** command in EXEC mode.

**show policy-map shared-policy-instance** *instance-name* **member** *member-interface* [**input** | **output**] **location** *node-id*

## Syntax Description

| | |
|---|---|
| *instance-name* | String of up to 32 characters to identify the shared policy instance. |
| **member** | Identifies a specific bundle member link or PWHE member. |
| *member-interface* | Identifies interface type and interface-path-id. |
| **input** | (Optional) Display the policy map attached to the input interface. |
| **output** | (Optional) Display the policy map attached to the output interface. |
| **location** *node-id* | Location of node. The node-id argument is entered in the *rack/slot/module* notation. |

## Command Default

If neither **input** nor **output** is selected, statistics for both are displayed.

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support shared policy instance over bundle interfaces. |
| Release 5.1.1 | This command was updated to support SPI over PW-Ether subinterface. |

## Usage Guidelines

QoS statistics are only available for the shared policy instance. There are no per-member interface QoS statistics.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to display statistics for all details of the shared policy instance named inst-shape:

```
RP/0/RSP0/CPU0:router# show policy-map shared-policy-instance inst-shape input location
0/RSP0/CPU0

 input: shape
Class class-default
```

```
  Classification statistics          (packets/bytes)      (rate - kbps)
    Matched          :                     0/0                   0
    Transmitted      :                     0/0                   0
    Total Dropped    :                     0/0                   0
    Policy child 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                            : 268435466
        High watermark  (Unknown
        Inst-queue-len  (packets)           : 0
        Avg-queue-len   (Unknown)
        Taildropped(packets/bytes)          : 0/0
        Queue(conform)      :                  0/0                   0
        Queue(exceed)       :                  0/0                   0
        RED random drops(packets/bytes      : 0/0

RP/0/RSP0/CPU0:router:router#show policy-map shared-policy-instance spi1 location 0/1/cPU0


Shared Policy Instance spi1 input: hier_l2_ingress

Class class-default
  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
    Policy child_hier_l2_ingress Class cos3
      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
Policed and dropped(parent policer)  : 0/0
    Policy child_hier_l2_ingress Class cos4
      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
        Policed and dropped(parent policer)  : 0/0
    Policy child_hier_l2_ingress Class cos5
      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
        Policed and dropped(parent policer)  : 0/0
    Policy child_hier_l2_ingress Class class-default
      Classification statistics          (packets/bytes)      (rate - kbps)
        Matched             :                  0/0                    0
        Transmitted         :                  0/0                    0
        Total Dropped       :                  0/0                    0

Shared Policy Instance spi1 output: l2_egress

Class qos_grp1
  Classification statistics          (packets/bytes)      (rate - kbps)
    Matched             :                  0/0                    0
    Transmitted         :                  0/0                    0
    Total Dropped       :                  0/0                    0
  Queueing statistics
    Queue ID                           : 18
    High watermark                     : N/A
    Inst-queue-len   (packets)         : 0
    Avg-queue-len    (packets)         : 0
    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                           : 19
    High watermark                     : N/A
    Inst-queue-len   (packets)         : 0
    Avg-queue-len    (packets)         : 0
    Taildropped(packets/bytes)         : 0/0
```

## Related Commands

| Command | Description |
|---|---|
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | Attaches a policy map to an input interface or output interface to be used as the service policy for that interface. |
| show policy-map interface, on page 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# 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 3.9.0 | This command was introduced. |
| Release 4.3.1 | The **pbr** keyword was added. |
| Release 5.1.1 | The show outputs were updated for nv satellite details. |

## Usage Guidelines

For a short period of time while a QoS policy is being modified, there might not be any policy in effect on the interfaces in which the modified policy is used. For this reason, 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.

When an unsupported policy-map is offloaded, a warning message stating 'policy is not offloaded' is shown. But the **show policy-map targets** command shows the unsupported policy-map entry for an interface.

## 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/RSP0/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
```

This example shows target of the offloaded policies that are applied for ingress and egress traffic to the LC at location 0/1/cpu0:

```
RP/0/RSP0/CPU0:router# show policy-map targets location 0/1/cpU0

1) Policymap: policy    Type: qos
     Targets (applied as main policy):
       GigabitEthernet1000/0/0/0 input
       GigabitEthernet1000/0/0/1 input
     Total targets: 2

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


2) Policymap: policy_queue    Type: qos
     Targets (applied as main policy):
       TenGigE0/1/0/0 output
     Total targets: 1

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

## Related Commands

| Command | Description |
|---|---|
| show policy-map interface, on page 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# show qos flow-aware summary location

To display the flow aware qos summary information on the specified interface, use the **show qos flow-aware summary location** command in the EXEC mode.

**show qos flow-aware summary location** {*interface-path-id* | **all**}

## Syntax Description

| | |
|---|---|
| *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.<br>• *rack* —Chassis number of the rack.<br>• *slot* —Physical slot number of the modular services card or line card.<br>• *module* —Module number. A physical layer interface module (PLIM) is always 0. |
| **all** | Specifies all location. |

## Command Default

No default behavior or values

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read |

This sample output shows how to display the flow aware qos summary information at location 0/1/CPU0:

```
RP/0/RSP0/CPU0:router# show qos flow-aware summary location 0/1/CPU0

Flow QoS Summary Information:
=====================

Number of interfaces with Flow Aware QoS Policies: 1
Number of interfaces with ingress Flow Aware QoS Policies: 1
Number of interfaces with egress Flow Aware QoS Policies: 0
Number of UBRL Classes: 1
Number of CAC Classes: 0
NP id: 0
  Max number of Flow Table Entries: 51200
  Used Flow Table Entries: 0
  Number of CAC Flow Counters In Use: 1
NP id: 1
  Max number of Flow Table Entries: 51200
  Used Flow Table Entries: 0
```

```
Number of CAC Flow Counters In Use: 1
```

# show qos inconsistency

To display inconsistency information for the QoS policy on an interface, use the **show qos inconsistency** command in EXEC mode.

**show qos inconsistency** {**detail** *warning-type* {**file** *filename* | **location** *node-id*} | **summary** {**file** *filename* | **location** *node-id*}}

## Syntax Description

| | |
|---|---|
| **detail** | Displays interface and policy name details of the inconsistency. |
| *warning-type* | Selects the warning types to display:<br>• 0—All warning types<br>• 1—ANCP - No shaper at top policy map<br>• 2—ANCP - Multiple classes at top policy map<br>• 3—ANCP - Downstream rate less than shaper rate<br>• 4—ANCP - Downstream rate more than port speed<br>• 5—ANCP - Policy resolution failure<br>• 6—ANCP - Traffic manager program failure<br>• 7—Port speed - Policy resolution failure<br>• 8—Port speed - Traffic manager program failure<br>• 9—Bundle member addition failure<br>• 10—Interface state not matching system configuration |
| **file** *filename* | Specify a file name, such as disk0:tmp.log or bootflash:. |
| **location** *node-id* | Displays detailed QoS information for the designated node. The *node-id* argument is entered in the rack/slot/module notation. |
| **summary** | Displays summary counts of QoS inconsistency warnings. |

## Command Default

None

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.3.0 | The command was supported in dynamic template configuration mode in BNG. |

## Usage Guidelines

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 example provides detail about QoS policy inconsistency, for all warning types:

```
RP/0/RSP0/CPU0:router# show qos inconsistency detail 0 location 0/7/CPU0

Interface Lists with QoS Inconsistency Warning:
========================================================

                     Node 0/7/CPU0
--------------------------------------------------------

Interfaces with QoS Inconsistency:  ANCP - No Shaper at top policymap
=========================================================================
Interface                   Direction  Policy Name             SPI Name
-------------------------------------------------------------------------
GigabitEthernet0/7/0/1.5     output    parent-none

Interfaces with QoS Inconsistency:  ANCP - Downstream Rate less than Shaper Rate
=========================================================================
Interface                   Direction  Policy Name             SPI Name
-------------------------------------------------------------------------
GigabitEthernet0/7/0/1       output    parent                   SPI1
GigabitEthernet0/7/0/1.2     output    parent
GigabitEthernet0/7/0/1       output    normal-policy-name      normal-spi-name
```

This example displays summary counts of inconsistency warnings:

```
RP/0/RSP0/CPU0:router#
RP/0/RSP0/CPU0:router# show qos inconsistency summary location 0/7/CPU0

Summary Counts of QoS Inconsistency Warnings:
========================================================


                     Node 0/7/CPU0

   Inconsistency Warning Type                Count
--------------------------------------------------------
ANCP - No Shaper at top policymap:              1
ANCP - Downstream Rate less than Shaper Rate:    4
```

## Related Commands

| Command | Description |
|---|---|
| show qos interface, on page 146 | Displays QoS information for a specific interface. |

# show qos shared-policy-instance

To list interface details for a specific location of a specific shared policy instance, attached to either an input or output interface, use the **show qos shared-policy-instance** command in EXEC mode.

**show qos shared-policy-instance** *instance-name* {**input** | **output**} **location** *node-id*

## Syntax Description

| | |
|---|---|
| *instance-name* | String of up to 32 characters to identify the shared policy instance. |
| **input** | Displays details for the shared policy instance attached to the input interface. |
| **output** | Displays details for the shared policy instance attached to the output interface |
| **location** *node-id* | Location of node. The node-id argument is entered in *rack/slot/module* notation. |

## Command Default

None

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support shared policy instance over bundle interfaces. |
| Release 4.3.0 | The command was supported in BNG. |
| Release 5.1.1 | This command was updated to support SPI over PW-Ether subinterface. |

## Usage Guidelines

To enter the dynamic template configuration mode, run **dynamic-template** command in the Global Configuration mode

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

This example shows the results of the command to show details of the shared policy instance attached to the input interface at location 0/RSP0/CPU0:

```
RP/0/RSP0/CPU0:router# show qos shared-policy-instance instancetwo input location 0/RSP0/CPU0

shared-policy-instance: instancetwo input Bandwidth: 10000000 kbps
Policy: shape Total number of classes: 2
------------------------------------------------------------------------
Level: 0 Policy: shape Class: class-default
QueueID: N/A
Shape Profile: 1 CIR: 16 kbps CBS: 1024 bytes PIR: 128000 kbps PBS:1605632
bytes WFQ Profile: 1 Committed Weight: 1 Excess Weight: 1
```

```
Bandwidth: 0 kbps, Parent Bandwidth: 10000000 kbps, Excess Ratio: 1
------------------------------------------------------------------------
Level: 1 Policy: child Class: class-default Parent Policy: shape Class: class-default
QueueID: 268435466 (Priority Normal)
Queue Limit: 1572 kbytes Profile: 1 Scale Profile: 14 WFQ Profile: 2
Committed Weight: 10 Excess Weight: 1020
Bandwidth: 0 kbps, Parent Bandwidth: 0kbps, Excess Ratio: 1
------------------------------------------------------------------------


RP/0/RSP0/CPU0:router# show qos shared-policy-instance spi5 output location 0/1/cPU0
Interface: GigabitEthernet0_1_1_5
------------------------------------------------------
shared-policy-instance: spi5 output
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: parent Total number of classes: 3
------------------------------------------------------------------------
Level: 0 Policy: parent Class: class-default
QueueID: N/A
Shape CIR : NONE
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: child Class: prec1
Parent Policy: parent Class: class-default
QueueID: 131112 (Priority 1)
Queue Limit: 318 kbytes Abs-Index: 46 Template: 0 Curve: 6
Shape CIR Profile: INVALID
Policer Profile: 56 (Single)
Conform: 25000 kbps (5 percent) Burst: 312500 bytes (0 Default)
Child Policer Conform: TX
Child Policer Exceed: DROP
Child Policer Violate: DROP
------------------------------------------------------------------------
Level: 1 Policy: child Class: class-default
Parent Policy: parent Class: class-default
QueueID: 131114 (Priority Normal)
Queue Limit: 5888 kbytes Abs-Index: 109 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 1: 0 kbps, Excess Ratio: 1
------------------------------------------------------------------------
```

# qos account

To enable QoS Layer 2 overhead accounting, use the **qos account** command in dynamic template configuration mode. To disable this qos account, use the **no** form of this command.

**qos account** [ **AAL5** | **user-defined** *offset* **atm** ] [ **mux-1483 routed** | **mux-dot1q-rbe** | **mux-pppoa** | **mux-rbe** | **snap-1483routed** | **snap-dot1q-rbe** | **snap-pppoa** | **snap-rbe** ]

## Syntax Description

| | |
|---|---|
| **AAL5** | Specifies AAL5 for qos. |
| **user-defined** | Specifies the user-defined keyword. |
| *offset* | Specifies the user-defined offset size. |
| **atm** | Adds ATM cell tax to the L2 overhead. |
| **mux-1483 routed** | Specifies the mux-1483 routed. |
| **mux-dot1q-rbe** | Specifies the mux-dot1q-rbe. |
| **mux-pppoa** | Specifies the mux-pppoa. |
| **mux-rbe** | Specifies the mux-rbe. |
| **snap-1483routed** | Specifies the snap-1483routed. |
| **snap-dot1q-rbe** | Specifies the snap-dot1q-rbe. |
| **snap-pppoa** | Specifies the snap-pppoa |
| **snap-rbe** | Specifies the snap-rbe. |

## Command Default

None

## Command Modes

Dynamic template configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

## Usage Guidelines

This command is available only in the dynamic template type ppp submode.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This is an example of configuring the **qos account** command in dynamic template configuration mode:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# dynamic-template type ppp p1
RP/0/RSP0/CPU0:router(config-dynamic-template-type)# qos account AAL5 snap-rbe
```

## Related Commands

| Command | Description |
|---|---|
| #unique_93 | Sets the minimum guaranteed output bandwidth for a subscriber. |

# 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. |
| | • **qos-group***value*—Sets QoS group value. Range is 0 to 63. |
| **transmit** | Transmits the packets. |

## Command Default

No default behavior or values

## Command Modes

Policy map police configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |

## Usage Guidelines

For more information regarding the traffic policing feature refer to the police rate, on page 132 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/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 250 kbps burst 50
RP/0/RSP0/CPU0:router(config-pmap-c-police)# violate-action drop
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if) service-policy input policy1
```

**Related Commands**

| Command | Description |
|---|---|
| conform-action, on page 203 | Configures the action to take on packets that conform to the rate limit. |
| exceed-action, on page 51 | Configures the action to take on packets that exceed the rate limit. |
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |



# Congestion Avoidance Commands

This chapter describes commands used to avoid congestion.

Congestion avoidance is achieved through packet dropping. Cisco IOS XR software supports the following quality of service (QoS) congestion avoidance techniques that drop packets:

- Random early detection (RED
- Weighted random early detection (WRED)
- Tail drop

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 congestion avoidance concepts, configuration tasks and examples, see the Configuring Congestion Avoidance module in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*


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- bandwidth remaining, on page 198
- child-conform-aware, on page 200
- compress header ip, on page 202
- conform-action, on page 203
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- hw-module all qos-mode ingress-queue-enable, on page 208
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# 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:<br>• **bps**—bits per second<br>• **gbps**—gigabits per second<br>• **kbps**—kilobits per second (default)<br>• **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 3.7.2 | This command was introduced. |

## 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.

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



**Note** The bandwidth value takes into account the Layer 2 encapsulation that is applied to traffic leaving the interface. For Ethernet , the encapsulation is considered to be 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.

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.

- 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.

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 class-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.

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth percent 50
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# class class2
RP/0/RSP0/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* | **ratio** *ratio-value*]
**no bandwidth remaining** [**percent** *percentage-value* | **ratio** *ratio-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. |
| **ratio** *ratio-value* | Specifies the amount of guaranteed bandwidth, based on a bandwidth ratio value. Range is 1 to 1020. |

## Command Default

No bandwidth is specified.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | 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 is typically used in conjunction with the bandwidth configuration at the parent level in hierarchical policy maps. 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 CRC. 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.

The **bandwidth remaining** command is used to proportionally allocate bandwidth to the particular classes, but there is no reserved bandwidth capacity.

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.

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth remaining percent 20
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# class class2
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth remaining percent 80
```

# child-conform-aware

To prevent the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer, use the **child-conform-aware** command in policy map police configuration mode. To remove this action from the policy map, use the **no** form of this command.

**child-conform-aware**
**no child-conform-aware**

## Syntax Description

This command has no keywords or arguments.

## Command Default

The **child-conform-aware** command is not configured.

## Command Modes

Policy map police configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

In hierarchical policing, traffic is policed first at the child policer level and then at the parent policer level. It is possible for traffic that conforms to the maximum rate specified by the child policer to be dropped by the parent policer.

In enhanced hierarchical ingress policing, the **child-conform-aware** command prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

This example shows parent and child policy maps in which two classes are defined in the child policy. In class AF1, the exceed action is set to an action other than to drop traffic.

If the **child-conform-aware** command were not configured in the parent policy, the parent policer would drop traffic that matches the conform rate of the child policer but exceeds the conform rate of the parent policer.

The **child-conform-aware** command prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.

This example shows parent and child policies in which two classes are defined in the child policy. In class AF1, the exceed action is set to an action other than to drop traffic.

If the **child-conform-aware** command were not configured in the parent policy, the parent policer would drop traffic that matches the conform rate of the child policer but exceeds the conform rate of the parent policer.

When used in the parent policer, the **child-conform-aware** command prevents the parent policer from dropping any ingress traffic that conforms to the committed rate specified in the child policer.

In this example, class EF in the child policy is configured with a committed rate of 1 Mbps, a conform action and an exceed action. The traffic that is below 1 Mbps is presented to the parent policer with the MPLS EXP bit set to 4, and traffic that exceeds 1 Mbps is dropped.

Class AF1 in the child policy is configured with a committed rate of 1 Mbps, a conform action and an exceed action. The traffic that is below 1 Mbps is presented to the parent policer with the MPLS EXP bit set to 3, and traffic that exceeds 1 Mbps is presented to the parent policer with the MPLS EXP bit set to 2.

With this child policy configuration, the parent policer sees traffic from the child classes as exceeding its committed rate of 2 Mbps. Without the **child-conform-aware** command in the parent policer, the parent polices to 2 Mbps, which can result into dropping some conformed traffic from class EF in the child policy. When the **child-conform-aware** command is configured in the parent policer, the parent policer does not drop any traffic that conforms under the child policy.

```
RP/0/RSP0/CPU0:router(config)# policy-map parent
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)# service-policy child
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 2 mbps
RP/0/RSP0/CPU0:router(config-pmap-c-police)# child-conform-aware
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action transmit
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action drop

RP/0/RSP0/CPU0:router(config)# policy-map child
RP/0/RSP0/CPU0:router(config-pmap)# class EF
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 1 mbps
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set mpls experimental imposition
 4
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action drop
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# class AF1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 1 mbps
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set mpls experimental imposition
 3
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set mpls experimental imposition
 2
```

## Related Commands

| Command | Description |
|---|---|
| exceed-action, on page 51 | Configures the action to take on packets that exceed the rate limit. |
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# compress header ip

To enable IP header compression for a policy map class, use the **compress header ip** command in policy map class configuration mode. To disable header compression, use the **no** form of this command.

**compress header ip**
**no compress header ip**

## Syntax Description

This command has no keywords or arguments.

## Command Default

By default, IP header compression is disabled.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.0.0 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to enable IP header compression for a policy map class:

```
RP/0/RSP0/CPU0:router(config)#class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match access-group ipv4 customer1
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# compress header ip
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | Attaches a policy map to an input interface or output interface to be used as the service policy for that interface. |

# 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**]

## Syntax Description

| | |
|---|---|
| **drop** | (Optional) Drops the packet. |
| **set** *options* | (Optional) Configures the specified packet properties. Replace *options* with one of the following keywords or keyword arguments:<br>• **atm-clp value** —Sets the cell loss priority (CLP) bit.<br>• **cos value** —Sets the class of service value. Range is 0 to7.<br>• **cos** [**inner**]*value* —Sets the class of service value. Range is 0 to 7.<br>• **dei**—Sets the drop eligible indicator (DEI). Can be 0 or 1.<br>• **discard-class** *value* —Sets the discard class value. Range is 0 to 7.<br>• **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values.<br>• **dscp** [**tunnel**] *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values. With the **tunnel** keyword, the DSCP is set in the outer header.<br>• **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.<br>• **precedence** *precedence* —Sets the IP precedence and sends the packet See Table 2 for a list of valid values.<br>• **precedence** [**tunnel**] *precedence* —Sets the IP precedence and sends the packet. See Table 5: IP Precedence Values and Names, on page 80 for a list of valid values. With the **tunnel** keyword, the precedence is set in the outer header.<br>• **qos-group** *value* —Sets the QoS group value.<br>• **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 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **set dei** keyword was added. |

## Usage Guidelines

For more information regarding the traffic policing feature, see the police rate, on page 132 command.

The **set dei** action in policy maps is supported on 802.1ad packets for:

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



**Note** The set DEI action is ignored for traffic on interfaces that are not configured for 802.1ad encapsulation.

## 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/RSP0/CPU0:router(config)# class-map class
RP/0/RSP0/CPU0:router(config-cmap)# match mpls experimental topmost 0
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map child
RP/0/RSP0/CPU0:router(config-pmap)# class prec1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 100000000 peak-rate 3125000 peak-burst
3125000
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set mpls experimental imp 1
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set qos-group 1
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9
RP/0/RSP0/CPU0:router(config-if) service-policy input policy1
```

In this example, the police rate is set to 5 Mbps. Conforming traffic is marked with a DEI value of 0; traffic that exceeds the police rate is marked with a DEI value of 1.

```
RP/0/RSP0/CPU0:router(config)# policy-map 1ad-mark-dei
RP/0/RSP0/CPU0:router(config-pmap)# class c1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 5 mbps
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set dei 0
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action set dei 1
RP/0/RSP0/CPU0:router(config-pmap-c-police)# end-policy-map
```

## Related Commands

| Command | Description |
|---|---|
| child-conform-aware, on page 200 | Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer. |
| exceed-action, on page 51 | Configures the action to take on packets that exceed the rate limit. |

| Command | Description |
|---|---|
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |
| violate-action, on page 190 | Configures the action to take on packets that violate the rate limit. |

# conform-color

To configure preclassification of Frame Relay packets that are not discard-eligible, use the **conform-color** command in policy map police configuration mode. To remove a conform color from the policy-map, use the **no** form of this command.

**conform-color** *class-map-name*
**no conform-color** *class-map-name*

## Syntax Description

| | |
|---|---|
| *class-map-name* | Specifies the class-map to associate with the conform-color. |

## Command Default

By default, if no preclassification is configured for a packet, the packet is not analyzed by the color-aware policer on the ingress interface, and the packet is given regular policing treatment.

## Command Modes

Policy map police configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.1.0 | This command was introduced. |

## Usage Guidelines

Typically, frame relay packets from a previous node are marked by default as fr-de = 0 (meaning *not* discard eligible) or fr-de = 1 (meaning discard eligible). For *non*-discard-eligible treatment, you must create a class map for the fr-de=0 case and assign the conform-color to that class-map.

For more information regarding the traffic policing feature, see the police rate, on page 132 command.

**Note** The multi-action policer sets cannot be used for IP packets.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

In this example, conform-color is configured for preclassification of packets that are *not* discard-eligible.

```
RP/0/RSP0/CPU0:routerconfigure
RP/0/RSP0/CPU0:router(config)# class-map match-all match_not_frde
RP/0/RSP0/CPU0:router(config-cmap)# match not fr-de 1
RP/0/RSP0/CPU0:router(config-cmap)# policy-map 2R3C_conform_example
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)#  police rate 768000 burst 288000 peak-rate 1536000
peak-burst 576000
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-color match_not_frde
RP/0/RSP0/CPU0:router(config-pmap-c-police)# conform-action set qos-group 1
```

```
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface pos 0/2/0/1
RP/0/RSP0/CPU0:router(config-if) service-policy input policy1
```

## Related Commands

| Command | Description |
|---|---|
| child-conform-aware, on page 200 | Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer. |
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| conform-action, on page 203 | Configures the action to take on packets that conform to the rate limit. |
| exceed-action, on page 51 | Configures the action to take on packets that exceed the rate limit. |
| exceed-color, on page 242 | (Used for SIP 700 cards only.) Configures preclassification of ingress Layer 2 Frame Relay packets that have been previously marked as discard eligible on an upstream node. These previously-marked packets are analyzed and preclassified by the color-aware policer on the ingress interface as part of the 2-rate 3-color (2R3C) traffic policing feature. |
| match fr-de, on page 65 | Match packets on the basis of the Frame Relay discard eligibility (DE) bit setting. |
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |
| violate-action, on page 190 | Configures the action to take on packets that violate the rate limit. |

# hw-module all qos-mode ingress-queue-enable

To enable ingress queueing mode on MOD80-SE and MOD80-TR 4X10 MPA line cards (LCs), use the **hw-module all qos-mode ingress-queue-enable** command in the admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode. To disable ingress queueing mode on MOD80-SE and MOD80-TR 4X10 MPA LCs, use the **no** form of this command.

**hw-module all qos-mode ingress-queue-enable**
**no hw-module all qos-mode ingress-queue-enable**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR Config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |
| root-lr | read, write |

This example shows how to enable ingress queueing mode on MOD80-SE and MOD80-TR 4X10 MPA LCs:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module all qos-mode ingress-queue-enable
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to enable ingress queueing mode on all line cards running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module all qos-mode ingress-queue-enable
RP/0/RSP0/CPU0:router(config)# commit
```

# hw-module all qos-mode per-priority-buffer-limit

To enable per priority buffer limit mode on all line cards (LCs), use the **hw-module all qos-mode per-priority-buffer-limit** command in the admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode. . To disable per priority buffer limit mode on all LCs, use the **no** form of this command.

**hw-module all qos-mode per-priority-buffer-limit**
**no hw-module all qos-mode per-priority-buffer-limit**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |
| root-lr | read, write |

This example shows how to enable per priority buffer limit mode on all LCs:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module all qos-mode per-priority-buffer-limit
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to enable per priority buffer limit mode on all line cards running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module all qos-mode per-priority-buffer-limit
RP/0/RSP0/CPU0:router(config)# commit
```

# hw-module all qos-mode wred-buffer-mode

To enable buffer accounting mode on all line cards (LCs), use the **hw-module all qos-mode wred-buffer-mode** command in the admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode. To disable buffer accounting mode on all LCs, use the **no** form of this command.

**hw-module all qos-mode wred-buffer-mode**
**no hw-module all qos-mode wred-buffer-mode**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

## Task ID

| Task ID | Operation |
|---|---|
| root-lr | read, write |

This example shows how to enable buffer accounting mode on all LCs:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module all qos-mode wred-buffer-mode
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to enable buffer accounting mode on all line cards running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module all qos-mode wred-buffer-mode
RP/0/RSP0/CPU0:router(config)# commit
```

# hw-module location qos-mode lowburst-enabled

To enable lowburst mode on specific line card, use the **hw-module location qos-mode lowburst-enabled** command in the admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode. To disable lowburst mode on specific line card, use the **no** form of this command.

**Note** Lowburst mode is not required on Cisco ASR 9000 4th generation QSFP 28-based Dense 100GE line cards.

**hw-module location** *node-id* **qos-mode lowburst-enabled**
**no hw-module location** *node-id* **qos-mode lowburst-enabled**

## Syntax Description

| | | |
|---|---|---|
| **location** | *node-id* | Specifies location of a particular node. The *node-id* argument is entered in the rack/slot/module notation. |

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |
| root-lr | read, write |

### Example

This example shows how to enable lowburst on a line card:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module location 0/1/CPU0 qos-mode lowburst-enabled
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to enable lowburst on a line card running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module location 0/0/0 qos-mode lowburst-enabled
RP/0/RSP0/CPU0:router(config)# commit
```

# hw-module location qos-child-shaping-disabled

To disable QoS mode child level or flat policy shaping on the line card interfaces, use the **hw-module location qos-child-shaping-disabled** command in the admin configuration mode. If you are running on Cisco IOS XR 64 bit, then use the same command in XR config mode.

**hw-module location** *node-id* **qos-child-shaping-disabled**

## Syntax Description

| | | |
|---|---|---|
| **location** | *node-id* | Specifies location of a particular node. The *node-id* argument is entered in the rack/slot/module notation. |

## Command Default

No default behavior or values.

## Command Modes

Admin configuration mode - Cisco IOS XR

XR config mode - Cisco IOS XR 64 bit

## Command History

| Release | Modification |
|---|---|
| Release 6.1.2 | Support for Cisco IOS XR 64 bit bit was added. |
| Release 5.1.1 | This command was introduced. |

## Usage Guidelines

This command is available only on the ASR 9000 Enhanced Ethernet Line Card.

You must reload LCs for configuration changes to take effect.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |
| root-lr | read, write |

### Example

This example shows how to disable qos child shaping on a line card:

```
RP/0/RSP0/CPU0:router(admin-config)# hw-module location 0/1/CPU0 qos-child-shaping-disabled
RP/0/RSP0/CPU0:router(admin-config)# commit
```

This example shows how to disable qos child shaping on a line card running on Cisco IOS XR 64 bit:

```
RP/0/RSP0/CPU0:router(config)# hw-module location 0/0/0 qos-child-shaping-disabled
```

```
RP/0/RSP0/CPU0:router(config)# commit
```

# 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:<br>• **bytes** —bytes<br>• **kbytes** —kilobytes<br>• **mbytes** —megabytes<br>• **ms** —milliseconds<br>• **packets** —packets (default)<br>• **us** —microseconds<br>**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 100 ms of the “service rate” for a given queue class.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 7.11.1 | Changed the minimum value for 1 Gbps and 10 Gbps interfaces to 10 KB and 400 KB for 400 Gbps interfaces. |

## 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.

From Release 7.11.1, you can configure a minimum queue limit value of:

- 10 KB for 1 Gbps and 100 Gbps interfaces
- 400 KB for 400 Gbps interfaces.

See Chapter *Configuring Modular QoS Congestion Avoidance*, Section *Low Queue Limit and WRED Values for Low Access Speeds* in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers* for details.

### 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 100 ms at the interface rate for Level 1 priority classes.
  - Queue limit is 100 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# queue-limit 1000000
```

# 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.

**random-detect** {**cos** *value* | **default** | **dei** *value* | **discard-class** *value* | **dscp** *value* | **exp** *value* | **precedence** *value* | *min-threshold* [*units*] *max-threshold* [*units*]*probability*}
**no random-detect** [**cos** *value* | **default** | **dei** *value* | **discard-class** *value* | **dscp** *value* | **exp** *value* | **precedence** *value* | *min-threshold* [*units*] *max-threshold* [*units*]]

## Syntax Description

| | |
|---|---|
| **cos** *value* | COS-based WRED. |
| **default** | Enables RED with default minimum and maximum thresholds. |
| dei *value* | Discard-eligibility indicator based WRED. Can be 0 or 1. |
| **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:<br>• 0 or routine<br>• 1 or priority<br>• 2 or immediate<br>• 3 or flash<br>• 4 or flash-override<br>• 5 or critical<br>• 6 or internet<br>• 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:<br>• **bytes**—bytes<br>• **gbytes**—gigabytes<br>• **kbytes**—kilobytes<br>• **mbytes** —megabytes<br>• **ms** —milliseconds<br>• **packets** —packets (default)<br>• **us** —microseconds |

| | |
|---|---|
| *probability* | Probability value. |

**Command Default**

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

**Command Modes**

Policy map class configuration

**Command History**

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.0.0 | The **dei** keyword was added. |
| Release 7.11.1 | Changed the minimum value for 1 Gbps and 10 Gbps interfaces to 5 KB and 100 KB for 400 Gbps interfaces. |

**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 value for RED is calculated as follows:

B = 1/2 default max-threshold, based on 100 ms

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—50 ms at the guaranteed service rate.
- Default RED maximum threshold—100 ms as the guaranteed service rate.

From Release 7.11.1, you can configure a minimum WRED value of 5 KB on 1 Gbps and 10 Gbps interfaces, and 100 KB for 400 Gbps interfaces. See Chapter *Configuring Modular QoS Congestion Avoidance*, Section *Low Queue Limit and WRED Values for Low Access Speeds* in the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers* for details.

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.

Random early detection based on the DEI value is supported on 802.1ad packets for:

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

**Note** If there are any marking actions in the policy, the marked values are used for doing WRED.

**Note** The exponential weight factor is set to 0 for Cisco ASR 9000 series routers.

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect 1000000 2000000
```

In this example, congestion is managed by dropping packets with a DEI value of 1 before dropping packets with a DEI value of 0.

```
RP/0/RSP0/CPU0:router(config)# policy-map dei-sample
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect dei 1 1000 6000
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect dei 0 5000 10000
RP/0/RSP0/CPU0:router(config-pmap-c)# end-policy-map
```

## Related Commands

| Command | Description |
|---|---|
| random-detect precedence, on page 227 | Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence. |
| show policy-map interface, on page 169 | 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:<br>• **bytes** —bytes<br>• **gbytes** —gigabytes<br>• **kbytes** —kilobytes<br>• **mbytes** —megabytes<br>• **ms** —milliseconds<br>• **packets** —packets (default)<br>• **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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# policy-map map1
RP/0/RSP0/CPU0:router(config-pmap)# class c
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect cos 3 1000 bytes 2000 bytes
```

# 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:<br>• Number from 0 to 63 that sets the DSCP value.<br>• Range of DSCP values. Range is from 0 to 63.<br>• Reserved keywords can be specified instead of numeric values. Table 4: IP DSCP Reserved Keywords, on page 75 describes the reserved keywords. |
| *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:<br>• **bytes**—bytes<br>• **gbytes**—gigabytes<br>• **kbytes**—kilobytes<br>• **mbytes** —megabytes<br>• **ms**—milliseconds<br>• **packets**—packets (default)<br>• **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 3.7.2 | This command was introduced. |

## 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 4: IP DSCP Reserved Keywords, on page 75 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect dscp AF11 1000000 2000000
```

## Related Commands

| Command | Description |
|---|---|
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| policy-map, on page 141 | 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 227 | Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence. |
| show policy-map interface, on page 169 | 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:<br>• **bytes**—bytes<br>• **gbytes**—gigabytes<br>• **kbytes**—kilobytes<br>• **mbytes** —megabytes<br>• **ms**—milliseconds<br>• **packets**—packets (default)<br>• **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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect exp 4 1000000 20000
```

## Related Commands

| Command | Description |
|---|---|
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| policy-map, on page 141 | 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 223 | Configures the Weighted Random Early Detection (WRED) thresholds for packets with a specific differentiated services code point (DSCP) value. |
| random-detect precedence, on page 227 | Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence. |
| show policy-map interface, on page 169 | 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 5: IP Precedence Values and Names, on page 80 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:<br>• **bytes**—bytes<br>• **gbytes**—gigabytes<br>• **kbytes**—kilobytes<br>• **mbytes** —megabytes<br>• **ms**—milliseconds<br>• **packets**—packets (default)<br>• **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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)#random-detect precedence 3 1000000 2000000
```

## Related Commands

| Command | Description |
|---|---|
| bandwidth (QoS), on page 195 | Specifies the minimum bandwidth allocated to a class belonging to a policy map. |
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| policy-map, on page 141 | 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 223 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |

# 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 3.7.2 | This command was introduced. |

## 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 only in the child policy.
- If the **bandwidth** command is used in the child policy, the **bandwidth** command must also be used in the parent policy. The one exception is for policies using the default class.

## 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/RSP0/CPU0:router(config)# policy-map child
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# priority
```

```
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map parent
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)# shape average 10000000
RP/0/RSP0/CPU0:router(config-pmap-c)# service-policy child
```

## Related Commands

| Command | Description |
|---|---|
| bandwidth (QoS), on page 195 | Specifies the minimum bandwidth allocated to a class belonging to a policy map. |
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| priority (QoS), on page 143 | Assigns a priority to a class of traffic belonging to a policy map. |
| service-policy (interface), on page 231 | Attaches a policy map to an input interface or output interface to be used as the service policy for that interface. |

# service-policy (interface)

To attach a policy map to an input interface or output interface to be used as the service policy for that interface, and optionally multiple subinterfaces, 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* [**shared-policy-instance** *instance-name*]

## 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. |
| **shared-policy-instance** | (Optional) Allows sharing of QoS resources across multiple subinterfaces.<br>**Note**<br>Sharing across multiple physical interfaces is not supported. |
| *instance-name* | (Optional) String of up to 32 characters to identify the shared policy instance. |

## 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.

Subinterface configuration. This does not apply to BNG.

Dynamic template configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support shared policy instance over bundle interfaces. |
| 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.

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

**Task ID**

| Task ID | Operations |
|---|---|
| qos | read, write |

**Examples**

This example shows policy map policy1 applied to Packet-over-SONET/SDH (POS) interface 0/2/0/0:

```
RP/0/RSP0/CPU0:router(config)# class-map class1
RP/0/RSP0/CPU0:router(config-cmap)# match precedence ipv4 1
RP/0/RSP0/CPU0:router(config-cmap)# exit
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set precedence 2
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface POS 0/2/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy output policy1
```

This example shows policy map policy2 applied to GigabitEthernet subinterface 0/1/0/0.1.

```
RP/0/RSP0/CPU0:router(config)# class-map class2
RP/0/RSP0/CPU0:router(config-cmap)# exit

RP/0/RSP0/CPU0:router(config)# policy-map policy2
RP/0/RSP0/CPU0:router(config-pmap)# class-map class2
RP/0/RSP0/CPU0:router(config-pmap-c)# set precedence 3
RP/0/RSP0/CPU0:router(config-pmap)# exit

RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/0.1
RP/0/RSP0/CPU0:router(config-subif)# service-policy input policy2 shared-policy-instance
ethernet101
```

**Note** This example does not apply to BNG.

This example shows policy map policy 1 applied to Bundle-Ether interfaces 100.1 and 100.2

```
RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 100.1
RP/0/RSP0/CPU0:router(config-if)# service-policy policy1 shared-policy-instance subscriber1
RP/0/RSP0/CPU0:router(config-if)# exit

RP/0/RSP0/CPU0:router(config)# interface Bundle-Ether 100.2
RP/0/RSP0/CPU0:router(config-if)# service-policy output policy1 shared-policy-instance
subscriber1
```

.

**Note** This example does not apply to BNG.

This example is specific to BNG. It shows policy map policy 1 applied in the dynamic template configuration mode.

```
RP/0/RSP0/CPU0:router(config)#dynamic-template type ppp p1
RP/0/RSP0/CPU0:router(config-dynamic-template-type)#service-policy policy1
shared-policy-instance subscriber1
RP/0/RSP0/CPU0:router(config-dynamic-template-type)#exit

RP/0/RSP0/CPU0:router(config)# dynamic-template type ipsubscriber ipsub1
RP/0/RSP0/CPU0:router(config-dynamic-template-type)# service-policy output policy1
shared-policy-instance subscriber1
```

# service-policy (VLAN)

To enable the QoS policy on a parent S-VLAN, or to enable ingress and egress VLAN policies on an access-interface, use the **service-policy** command in the interface configuration mode. To disable this feature, use the **no** form of this command.

**Egress S-VLAN Policy:**
**service-policy output** *service_policy_name* **subscriber-parent** [ **subscriber-group** *group-name* ] [ **resource-id** *value* ]

**Ingress and Egress VLAN Policies:**
**service-policy** { **input** | **output** } *service_policy_name*

## Syntax Description

| | |
|---|---|
| **input** | Attaches the specified service-policy to the ingress direction. |
| **output** | Attaches the specified service-policy to the egress direction. |
| *service_policy_name* | Name of the input or output service-policy. |
| **subscriber-parent** | Configures an S-VLAN policy.<br>**Note** This keyword applies only to the egress direction. |
| **subscriber-group** | Groups subscribers and attaches them to an aggregate shaper based on a logical Group-ID. |
| *group-name* | Name of the logical group for the subscribers. |
| **resource-id** | Specifies a resource-ID that allows to map the desired chunk to be used for this particular S-VLAN and all the subscribers under it.<br>**Note** This keyword applies only to an S-VLAN policy and not to VLAN policy.<br>Policies with **subscriber-group** do not support **resource-id**. |
| *value* | The resource-ID value that ranges from 0-3. |

## Command Default

None

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

| Release | Modification |
|---|---|
| Release 4.3.0 | Support for the **resource-id** keyword was added. |
| Release 4.3.1 | Support for the ingress and egress VLAN policies on an access interface was added. |
| Release 6.2.1 | Support was added for **subscriber-group** keyword. |

## Usage Guidelines

If the **resource-id** option is not specified, then the S-VLAN policy and all the subscribers under it are assigned to the default chunk to which its parent interface is associated with.

The VLAN policy needs to be attached to the access-interfaces before bringing up the sessions with the QoS policy. It is recommended that you do not remove VLAN policies when sessions are already active.

You cannot make non-rate modifications when sessions are already active on the access-interface. To make non-rate modifications to the VLAN policy, you must bring down the sessions that are brought up over the access-interface, modify the policy, and then bring up the sessions again over the access-interface.

For restrictions on the usage of group-based grand parent shaping feature (using **subscriber-group** ), see *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to configure an egress S-VLAN policy using the **service-policy** command, with **subscriber-parent** keyword, in the interface configuration mode:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface bundle-ether 18.12
RP/0/RSP0/CPU0:router(config-subif)# service-policy output svlan-policy subscriber-parent
resource-id 1
```

This example shows how to configure an ingress VLAN policy on an access-interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface bundle-ether 18.203
RP/0/RSP0/CPU0:router(config-subif)# service-policy input mark
```

This example shows how to configure an egress VLAN policy on an access-interface:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# interface bundle-ether 18.203
RP/0/RSP0/CPU0:router(config-subif)# service-policy output metering
```

This example shows how to enable group-based grand parent shaping feature by grouping subscribers and attaching them to an aggregate shaper based on a logical Group-ID:

```
RP/0/RSP0/CPU0:router#configure
```

```
RP/0/RSP0/CPU0:router(config)#interface Bundle-Ether1.1234
RP/0/RSP0/CPU0:router(config-if)#encapsulation ambiguous dot1q 1-4
RP/0/RSP0/CPU0:router(config-if)#service-policy output P0 subscriber-parent subscriber-group
 G0
RP/0/RSP0/CPU0:router(config-if)#service-policy output P1 subscriber-parent subscriber-group
 G1
RP/0/RSP0/CPU0:router(config-if)#service-policy output P2 subscriber-parent subscriber-group
 G2
RP/0/RSP0/CPU0:router(config-if)#service-policy output P3 subscriber-parent subscriber-group
 G3
```

# show qos summary

To view the QoS summary, use the **show qos summary** command in EXEC mode.

**show qos summary** {**shared-policy-instance** *instance-name* **location** *node-id* | **police** {**interface** *type instance* | **location** *node-location*} | **policy** *policy-name* {**interface** *type instance* | **location** *node-location*} | **queue** {**interface** *type instance* | **location** *node-location*}} {**input** | **output**} **[ member** *type instance*] [**host-link** *type instance*] **[ location** *node-location* **]**[**np** *np-location*]

## Syntax Description

| | |
|---|---|
| **shared-policy-instance** *instance-name* | String of up to 32 characters to identify the shared policy instance. |
| **police** | Show policer interface statistics. |
| **policy** *policy-name* | String to identify the policy. |
| **queue** | Show queue statistics. |
| **interface** *type instance* | Interface type and instance. For more information, use the question mark (?) online help function . |
| **location** *node-location* | Identifies fully qualified location specification. |
| **input** | Shows the specified policy map to the input interface. |
| **output** | Shows the specified policy map to the output interface. |
| **np** *np-location* | (Optional) Node processor location. The node processor location is np0, np1, np2, or np3.<br>The **np** keyword is available only for **BVI** interface type. |
| **member** | Specifies member's interface name.<br>The **member** keyword is available only for **bundle-ether**, **PW-Ether** and **PW-IW** interface types. |
| **host-link** | (Optional) Specifies the host-link.<br>This keyword is applicable only for satellite interfaces. |

## Command Default

None

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 4.3.0 | The command was supported in dynamic template configuration mode in BNG.<br>The **np** keyword was introduced. |

| Release | Modification |
|---|---|
| Release 5.1.1 | PWHE interface type **PW-Ether** and **PW-IW** were added. |

## Usage Guidelines

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

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

This example shows the results of the command to show interfaces at location 0/1/CPU0 for a shared-policy-instance:

```
RP/0/RSP0/CPU0:router# show qos summary shared-policy-instance bundlespi location 0/1/CPU0
 output

List of interfaces/NPs retrieved
GigabitEthernet0/1/1/1 (member of Bundle-Ether1.1)
GigabitEthernet0/1/1/2 (member of Bundle-Ether1.1)
```

This example shows policer interface statistics of BVI interface at location 0/5/cpu0:

```
RP/0/RSP0/CPU0:router# show qos summary police interface bvi 1 output location 0/5/cpu0 np
 np1

Legend:
=======
1. Policer ID is displayed in HEX.
2. A '*' against the counter means the action is drop.
3. Conform displays match counter for non-policer leaf.

Policy:Class                        PoliceID     Conform      Exceed     Violate
BVI1 NP1
foo
:dscp48                            6145              0           0*          0*
foo
:class-default                     6146              0           0*          0*
```

# show qoshal qos-mode

To display QoS mode information, use the **show qoshal qos-mode** command in EXEC mode.

**show qoshal qos-mode location** *node-id*

## Syntax Description

| | |
|---|---|
| **location** *node-id* | Specifies location of a particular 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 5.1.1 | This command was introduced. |

## Usage Guidelines

No specific guidelines impact the use of this command.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read |

The following example shows how to display QoS mode information at location 0/1/CPU0:

```
RP/0/RSP0/CPU0:router# show qoshal qos-mode location 0/1/CPU0
L4 WRED buffer mode:Disable
Per priority buffer limit:Disable
MOD-80 4*10 Ingress queue:Disable
```



# Hierarchical Modular QoS Commands

This chapter provides details of the Hierarchical QoS commands.

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.

Hierarchical QoS allows you to specify QoS behavior at multiple policy levels, which provides a high degree of granularity in traffic management. For detailed HQoS concepts, configuration tasks and examples, see the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*


- exceed-color, on page 242
- fragment, on page 244
- match dei, on page 245
- qos output minimum-bandwidth, on page 247
- set dei, on page 248
- service-fragment, on page 250
- service-fragment-parent, on page 251

# exceed-color

To configure preclassification of Frame Relay packets that are discard-eligible, use the **exceed-color** command in policy map police configuration mode. To remove an exceed color from the policy-map, use the **no** form of this command.

**exceed-color** *class-map-name*
**no exceed-color** *class-map-name*

## Syntax Description

| | |
|---|---|
| *class-map-name* | Specifies the class-map to associate with the exceed-color. |

## Command Default

By default, if no preclassification is configured for a packet, the packet is not analyzed by the color-aware policer on the ingress interface, and the packet is given regular policing treatment.

## Command Modes

Policy map police configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.1.0 | This command was introduced. |

## Usage Guidelines

Typically, frame relay packets from a previous node are marked by default as fr-de = 0 (meaning *not* discard eligible) or fr-de = 1 (meaning discard eligible). For discard-eligible treatment, you must create a class map for the fr-de=1 case and assign the exceed-color to that class-map.

For more information regarding the traffic policing feature, see the police rate, on page 132 command.

**Note** The multi-action policer sets cannot be used for IP packets.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

In this example, exceed-color is configured for preclassification of packets that are discard-eligible.

```
RP/0/RSP0/CPU0:routerconfigure
RP/0/RSP0/CPU0:router(config)# class-map match-all match_frde
RP/0/RSP0/CPU0:router(config-cmap)# match fr-de 1
RP/0/RSP0/CPU0:router(config-cmap)# policy-map 2R3C_exceed_example
RP/0/RSP0/CPU0:router(config-pmap)# class class-default
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 768000 burst 288000 peak-rate 1536000
peak-burst 576000
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-color match_frde
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exceed-action set qos-group 2
RP/0/RSP0/CPU0:router(config-pmap-c-police)# exit
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
```

```
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface pos 0/2/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy input policy2
```

## Related Commands

| Command | Description |
|---|---|
| child-conform-aware, on page 200 | Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer. |
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| conform-action, on page 203 | Configures the action to take on packets that conform to the rate limit. |
| conform-color, on page 206 | (Used for SIP 700 cards only.) Configures preclassification of ingress Layer 2 Frame Relay packets that have been previously marked as *not* discard eligible on an upstream node. These previously-marked packets are analyzed and preclassified by the color-aware policer on the ingress interface as part of the 2-rate 3-color (2R3C) traffic policing feature. |
| exceed-action, on page 51 | Configures the action to take on packets that exceed the rate limit. |
| match fr-de, on page 65 | Match packets on the basis of the Frame Relay discard eligibility (DE) bit setting. |
| police rate, on page 132 | Configures traffic policing and enters policy map police configuration mode. |
| policy-map, on page 141 | 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 169 | Displays policy configuration information for all classes configured for all service policies on the specified interface. |
| violate-action, on page 190 | Configures the action to take on packets that violate the rate limit. |

# fragment

To refer to a defined service fragment, use the **fragment** command in the policy-map configuration mode. To delete an earlier mention of the service fragment, use the **no** form of the command.

**fragment** *name*
**no fragment** *name*

## Syntax Description

| | |
|---|---|
| *name* | Previously defined service-fragment. |

## Command Default

None

## Command Modes

Policy-map configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 4.3.1 | This command was introduced. |

## Usage Guidelines

The number of defined service fragments on a port policy is the same as the number of classes supported in a policy.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to refer to a previously-defined service fragment:

```
RP/0/RSP0/CPU0:router (config) # policy-map p1
RP/0/RSP0/CPU0:router (config-pmap) # class c1
RP/0/RSP0/CPU0:router (config-pmap-c) # fragment sf1
```

# match dei

To specify a drop eligible indicator (DEI) value as a match criteria in a class map, use the **match dei** command in class map configuration mode. To remove a specified DEI value from the matching criteria for a class map, use the **no** form of this command.

**match dei** *value*
**no match dei**

## Syntax Description

| | |
|---|---|
| *value* | Value of the DEI bit. Can be 0 or 1. |

## Command Default

There is no default DEI value; it must be specified.

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.7.3 | This command was introduced. |

## Usage Guidelines

The **match dei** command specifies a DEI 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.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

## Examples

In this example, 802.1ad DEI is derived from the incoming 802.1q. Packets with a DEI value of 0 are remarked with a DEI value of 1.

```
RP/0/RSP0/CPU0:router(config)# class-map match-any remark-dei
RP/0/RSP0/CPU0:router(config-cmap)# match dei 0
RP/0/RSP0/CPU0:router(config-cmap)# end-class-map
RP/0/RSP0/CPU0:router(config)# policy-map p1
RP/0/RSP0/CPU0:router(config-pmap)# class remark-dei
RP/0/RSP0/CPU0:router(config-pmap-c)# set dei 1
RP/0/RSP0/CPU0:router(config-pmap-c)# end-policy-map

RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/4/0/39.1 l2transport
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 1
RP/0/RSP0/CPU0:router(config-subif)# rewrite ingress tag push dot1ad 5 symmetric
RP/0/RSP0/CPU0:router(config-subif)# service-policy input p1
```

## Related Commands

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |

| Command | Description |
| --- | --- |
| match cos, on page 57 | Identifies specified class of service (CoS) values as a match criteria in a class map. |

# qos output minimum-bandwidth

To set the minimum guaranteed output bandwidth for a subscriber, use the **qos output minimum-bandwidth** command in dynamic template configuration mode.

**qos output minimum-bandwidth** *range*

## Syntax Description

| | |
|---|---|
| *range* | Specifies the minimum bandwidth range (1- 4294967295 kpbs). |

## Command Default

None

## Command Modes

Dynamic template configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.2.0 | This command was introduced. |

## Usage Guidelines

This command is available only in the dynamic template type ppp submode. The value specified in this command is used only if IGMP HQoS correlation is configured. This is to ensure that the resultant bandwidth does not go below the specified value.

## Task ID

| Task ID | Operation |
|---|---|
| vrrp | read, write |

This is an example of configuring the **qos output minimum-bandwidth** command in dynamic template configuration mode:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# dynamic-template type ppp p1
RP/0/RSP0/CPU0:router(config-dynamic-template-type)# qos output minimum-bandwidth 10
```

# set dei

To set the drop eligible indicator (DEI) value in a policy map class, use the **set dei** command in policy map class configuration mode. To remove a specified DEI value from a policy map class, use the **no** form of this command.

**set dei** *value*
**no set dei**

## Syntax Description

| | |
|---|---|
| *value* | Value of the DEI bit. Can be 0 or 1. |

## Command Default

There is no default DEI value; it must be specified.

## Command Modes

Policy map class configuration

## Command History

| Release | Modification |
|---|---|
| Release 6.6.1 | This command was introduced. |

## Usage Guidelines

The **set dei** command specifies a DEI value in a policy map class. For example, traffic can be policed and the excess traffic can be marked with DEI value of 1, so that it can be preferentially dropped in the egress interface or further downstream, when there is congestion.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

## Examples

In this example, 802.1ad CoS plus DEI is derived from the incoming 802.1q CoS. Packets with a CoS value of 0 are remarked with a DEI value of 1.

```
RP/0/RSP0/CPU0:router(config)# class-map match-any remark-cos
RP/0/RSP0/CPU0:router(config-cmap)# match cos 0
RP/0/RSP0/CPU0:router(config-cmap)# end-class-map
RP/0/RSP0/CPU0:router(config)# policy-map p1
RP/0/RSP0/CPU0:router(config-pmap)# class remark-cos
RP/0/RSP0/CPU0:router(config-pmap-c)# set dei 1
RP/0/RSP0/CPU0:router(config-pmap-c)# end-policy-map

RP/0/RSP0/CPU0:router(config)# interface GigabitEthernet0/4/0/39.1 l2transport
RP/0/RSP0/CPU0:router(config-subif)# encapsulation dot1q 1
RP/0/RSP0/CPU0:router(config-subif)# rewrite ingress tag push dot1ad 5 symmetric
RP/0/RSP0/CPU0:router(config-subif)# service-policy input p1
```

**Related Commands**

| Command | Description |
|---|---|
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |

# service-fragment

To define a service fragment in a class, use the **service-fragment** command in the policy-map configuration mode. To delete the service-fragment, use the **no** form of this command.

**service-fragment** *name*
**no service-fragment** *name*

## Syntax Description

| | |
|---|---|
| *name* | Name for the service fragment. |

## Command Default

None

## Command Modes

Policy-map configuration mode

## Command History

| Release | Modification |
|---|---|
| Release 4.3.1 | This command was introduced. |

## Usage Guidelines

Service fragment names must be unique in a port policy. However, same names can be used across policies.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

This example shows how to define a service fragment name:

```
RP/0/RSP0/CPU0:router (config) # policy-map p1
RP/0/RSP0/CPU0:router (config-pmap) # class c1
RP/0/RSP0/CPU0:router (config-pmap-c) # service-fragment sf1
```

# service-fragment-parent

To apply a service fragment policy to an interface, use the **service-fragment-parent** command in the interface configuration mode. To delete the applied service fragment policy, use the **no** form of this command.

**service-fragment-parent**
**no service-fragment-parent**

## Syntax Description

This command has no keywords or arguments.

## Command Default

No default behavior or value

## Command Modes

Interface configuration

## Command History

| Release | Modification |
|---|---|
| Release 4.3.1 | This command was introduced. |

## Usage Guidelines

Do not use this command was non-service fragment policies.

## Task ID

| Task ID | Operation |
|---|---|
| qos | read, write |

### Example

This example shows how to use the **service-fragment-parent** command:

```
RP/0/RSP0/CPU0:router (config-if) # service-policy input s1 service-fragment-parent
```



# Link Bundles Commands

A link bundle is a group of one or more ports that are aggregated together and treated as a single link.

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.

This chapter describes the commands used for QoS on link bundles. For detailed information on Link Bundles, related concepts and configuration tasks, see the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*.


- clear qos counters (shared-policy-instance), on page 254
- clear qos counters interface, on page 256
- encap-sequence, on page 257
- hw-module all qos-mode aggregate-bundle-mode, on page 259
- show qos aggregate-bundle-mode, on page 261
- hw-module all qos-mode bundle-agg policer, on page 262

# clear qos counters (shared-policy-instance)

To clear counters of a specific shared policy instance, use the **clear qos counters (shared-policy-instance)** command in EXEC mode .

**clear qos counters shared-policy-instance** *instance-name* [**input** | **output**] **location** *node-id*

## Syntax Description

| | |
|---|---|
| *instance-name* | String of up to 32 characters to identify the shared policy instance. |
| **input** | (Optional) Clear the QoS counters of the shared policy instance attached to the input interface. |
| **output** | (Optional) Clear the QoS counters of the shared policy instance attached to the output interface. |
| **location** *node-id* | Location of the node. The node-id argument is entered in the *rack/slot/module* format. Specify the active RSP location as the *node-id* for a shared policy instance over bundle interfaces or PWHE subinterfaces. |

## Command Default

None

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | This command was introduced. |
| Release 3.9.0 | This command was updated to support shared policy instance over bundle interfaces. |
| Release 5.1.1 | This command was updated to support shared policy instance over PWHE subinterfaces. |

## Usage Guidelines

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to clear the qos counters for a specific shared policy instance:

```
RP/0/RSP0/CPU0:router# clear qos counters shared-policy-instance ethernet101 input location
 0/1/CPU0
```

## Related Commands

| Command | Description |
|---|---|
| service-policy (interface), on page 231 | Attaches a policy map to an input interface or output interface to be used as the service policy for that interface. |
| show policy-map shared-policy-instance, on page 177 | Displays the statistics for all details of the shared policy instance. |

# 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* [**input** | **output**]

## Syntax Description

| | |
|---|---|
| *type* | Interface type. For more information, use the question mark (?) online help function. |
| **input** | (Optional) Clears input QoS counters that are attached to the specified interface. |
| **output** | (Optional) Clears output QoS counters that are attached to the specified interface. |

## Command Default

No default behavior or values

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 3.7.2 | 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/RSP0/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/RSP0/CPU0:router# clear qos counters interface pos 0/7/0/3 output
```

# encap-sequence

To set the traffic class for traffic on multiclass multilink (MCMP) interfaces in the egress direction, use the **encap-sequence** command in class map configuration mode.

**encap-sequence** [*class-id* | **none**]
**no encap-sequence** *class-id*

## Syntax Description

| | |
|---|---|
| *class-id* | (Optional) Encapsulation sequence number. Range is 1-15. |
| **none** | (Optional) No encapsulation sequence. |

## Command Default

No default behavior or values

## Command Modes

Class map configuration

## Command History

| Release | Modification |
|---|---|
| Release 3.9.0 | 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.

The **encap-sequence** command is not supported on class-default.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read/write |

## Examples

The following example shows an encapsulation sequences set for three classes in one policy map:

```
RP/0/RSP0/CPU0:router# configure
RP/0/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class voice
RP/0/RSP0/CPU0:router(config-pmap-c)# priority level 1
RP/0/RSP0/CPU0:router(config-pmap-c)# police rate 128
RP/0/RSP0/CPU0:router(config-pmap-c)# encap-sequence none
RP/0/RSP0/CPU0:router(config-pmap-c)# class video
RP/0/RSP0/CPU0:router(config-pmap-c)# priority level 2
RP/0/RSP0/CPU0:router(config-pmap-c)# police 1000
RP/0/RSP0/CPU0:router(config-pmap-c)# encap-sequence 2
RP/0/RSP0/CPU0:router(config-pmap-c)# class mission-critical
```

```
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth 1000
RP/0/RSP0/CPU0:router(config-pmap-c)# encap-sequence 1
```

## Related Commands

| Command | Description |
|---|---|
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| priority (QoS), on page 143 | Assigns a priority to a class of traffic belonging to a policy map. |

# hw-module all qos-mode aggregate-bundle-mode

To enable aggregate bundle QoS mode, use the **hw-module all qos-mode aggregate-bundle-mode** command in EXEC mode. This command assigns policed bandwidth to each member interface based on **bundle-policy/number of members**.

To remove the configuration of bundle QoS aggregate mode, use the no form of the command.

**hw-moduleall qos-mode aggregate-bundle-mode**
**nohw-moduleall qos-mode aggregate-bundle-mode**

## Syntax Description

| | |
|---|---|
| **hw-module** | Specifies the location of the hardware module |
| **all** | Indicates all nodes |
| **qos-mode** | Specifies the QoS mode |
| **aggregate-bundle-mode** | Specifies the bundle QoS aggregate mode as the QoS mode. |

## Command Default

None

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 6.0.1 | This command was introduced to enable aggregate bundle QoS. |

## Usage Guidelines

If the bundle has 2 Mbps policer and 4 interfaces, then each interface will have 512 Kbps policed bandwidth assigned. If one of the interfaces goes down, then the hardware policer gets modified to accommodate the remaining active interfaces, that is, it increases the policed rates of the remaining three active interfaces.

A line card reload is not required while configuring the **hw-module all qos-mode aggregate-bundle-mode** command.

The **hw-module all qos-mode aggregate-bundle-mode** and the **hw-module all qos-mode bundle-agg policer** commands cannot be executed at the same time.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to clear the qos counters for a specific shared policy instance:

```
RP/0/RSP0/CPU0:router# hw-module all qos-mode aggregate-bundle-mode
```

## Related Commands

| Command | Description |
|---|---|
| show qos aggregate-bundle-mode, on page 261 | Shows aggregate bundle QoS. |

# show qos aggregate-bundle-mode

To show aggregate bundle QoS mode, use the **show qos aggregate-bundle-mode** command in EXEC mode.

**showqos aggregate-bundle-mode**

## Syntax Description

| | |
|---|---|
| **qos** | Specifies the type of QoS |
| **aggregate-bundle-mode** | Specifies aggregate bundle QoS as the mode |

## Command Default

None

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| Release 6.0.1 | This command was introduced to show aggregate bundle QoS mode. |

## Usage Guidelines

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to clear the qos counters for a specific shared policy instance:

```
RP/0/RSP0/CPU0:router# show qos aggregate-bundle-mode
```

## Related Commands

| Command | Description |
|---|---|
| #unique_126 | |

# hw-module all qos-mode bundle-agg policer

This command enables sharing of the same policer bucket between members of the bundle interface in the same NP. To enable bundle aggregate policer QoS mode, use the **hw-module all qos-mode bundle-agg-policer** command in CONFIG mode. To remove configuration of bundle QoS aggregate policer mode, use the **no** form of the command.

**hw-moduleall qos-mode bundle-agg-policer**

## Syntax Description

This command has no keywords or arguments.

## Command Default

None

## Command Modes

CONFIG

## Command History

| Release | Modification |
|---|---|
| Release 6.4.1 | This command was introduced to enable bundle aggregate policer on QoS. |
| Release 7.5.1 | Enabling this command allocates separate token buckets for classes that have percent policer values configured. |

## Usage Guidelines

A line card reload is required while executing the **hw-module all qos-mode bundle-agg policer** command.

The **hw-module all qos-mode aggregate-bundle-mode** and the **hw-module all qos-mode bundle-agg policer** commands cannot be executed at the same time.

The **hw-module all qos-mode bundle-agg policer** and the Shared Policy Instance feature cannot be configured together.

## Task ID

| Task ID | Operations |
|---|---|
| qos | read, write |

## Examples

The following example shows how to clear the qos counters for a specific shared policy instance:

```
RP/0/RSP0/CPU0:router(config)# hw-module all qos-mode aggregate-bundle-mode
```

## Related Commands

| Command | Description |
|---|---|
| show qos aggregate-bundle-mode, on page 261 | Shows aggregate bundle QoS. |



# Deployment Scenarios Commands

This chapter provides commands used for QoS implementation of features that are described in other technology books, such as MPLS, L2VPN.

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 deployment scenarios, see the *Modular QoS Configuration Guide for Cisco ASR 9000 Series Routers*.


- random-detect discard-class, on page 264
- set cos, on page 266

# 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:<br>• **bytes**—bytes<br>• **gbytes**—gigabytes<br>• **kbytes**—kilobytes<br>• **mbytes** —megabytes<br>• **ms**—milliseconds<br>• **packets**—packets (default)<br>• **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 3.7.2 | This command was introduced. |

## 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/RSP0/CPU0:router(config)# policy-map policy1
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# random-detect discard-class 3 1000000 2000000
```

## Related Commands

| Command | Description |
|---|---|
| class (policy-map), on page 45 | Specifies the name of the class whose policy you want to create or change. |
| policy-map, on page 141 | 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 227 | Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence. |
| show policy-map interface, on page 169 | Displays policy configuration information for all classes configured for all service policies on the specified 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 3.7.2 | This command was introduced. |

## 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.

## 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/RSP0/CPU0:router(config)# policy-map cos-set
RP/0/RSP0/CPU0:router(config-pmap)# class class1
RP/0/RSP0/CPU0:router(config-pmap-c)# set cos 1
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# class class2
RP/0/RSP0/CPU0:router(config-pmap-c)# set cos 2
RP/0/RSP0/CPU0:router(config-pmap-c)# exit
RP/0/RSP0/CPU0:router(config-pmap)# exit
RP/0/RSP0/CPU0:router(config)# interface gigabitethernet 0/1/0/9.100
RP/0/RSP0/CPU0:router(config-subif)# service-policy output cos-set
```

**Related Commands**

| Command | Description |
|---|---|
| class-map, on page 47 | Defines a traffic class and the associated rules that match packets to the class. |
| policy-map, on page 141 | Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| service-policy (interface), on page 231 | Attaches a policy map to an input interface or output interface to be used as the service policy for that interface. |