Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Command Reference, Release 4.2.x

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CONTENTS

Preface

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

Changes To This Document

Table 1 lists the technical changes made to this document since it was first printed.

Table 1: Changes to This Document

Revision	Date	Change Summary
OL-26082-02	June 2012	Republished with documentation updates for Release 4.2.1.
OL-26082-01	December 2011	Initial release of this document.

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ANCP Commands

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

For detailed information regarding ANCP concepts, configuration tasks and examples, see the Configuring ANCP chapter in the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

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

Command History

Release	Modification
Release 3.7.2	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.

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 41	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: • **GigabitEthernet** (GigabitEthernet/IEEE 802.3 interface) • **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

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

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.

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 11	Clears access node (AN) ports of dynamic data or statistics.
show ancp an-port, on page 16	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.H*| *A.B.C.D*} {**description** *string*| **adjacency-timer** *interval*}

no ancp neighbor sender-name {*H.H.H*| *A.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

ANCP configuration

Command History

Release	Modification
Release 3.7.2	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 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 13	Clears the adjacency connection with the neighbor.
clear ancp summary statistics, on page 15	Clears aggregate message statistics only, without modifying individual neighbor or port statistics.
show ancp neighbor, on page 28	Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies.
show ancp neighbor summary, on page 31	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: **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

ANCP configuration

Command History

Release	Modification
Release 3.7.2	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.

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 41	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.H*| *A.B.C.D*}

no ancp server sender-name {*H.H.H*| *A.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

ANCP configuration

Command History

Release	Modification
Release 3.7.2	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.

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 41	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.

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.H*| *A.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: • **statistics GigabitEthernet** (Gigabit Ethernet/IEEE 802.3 interface) • **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

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

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.

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 13	Clears the adjacency connection with the neighbor.
clear ancp summary statistics, on page 15	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.

clear ancp neighbor {**all**| **description** *string*| **sender-name** {*H.H.H*| *A.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

Command History

Release	Modification
Release 3.7.2	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.

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 11	Clears access node (AN) ports of dynamic data or statistics.
clear ancp summary statistics, on page 15	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.

clear ancp summary statistics

Syntax Description

This command has no keywords or arguments.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.7.2	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.

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 11	Clears access node (AN) ports of dynamic data or statistics.
clear ancp neighbor, on page 13	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

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

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.

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 19	Displays data or message statistics for an AN port identified by its circuit-id.
show ancp an-port interface, on page 21	Displays data or message statistics for a sub-interface mapped to an AN port.
show ancp an-port neighbor, on page 24	Displays data or message statistics for AN ports associated with a specific neighbor.

Command	Description
show ancp an-port state, on page 26	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

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

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.

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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp an-port interface, on page 21	Displays data or message statistics for a sub-interface mapped to an AN port.
show ancp an-port neighbor, on page 24	Displays data or message statistics for AN ports associated with a specific neighbor.
show ancp an-port state, on page 26	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 22.
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

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

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 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. Replace the *instance* argument with an Ethernet bundle instance. Range is 1 to 65535. Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647.
GigabitEthernet *instance.subinterface*	Specifies a GigabitEthernet/IEEE 802.3 interface. Replace the *instance* argument with a physical interface instance specified in the *rack/slot/module/port* notation. Replace the *subinterface* argument with a subinterface value. Range is 0 to 21474883647.
TenGigE *instance.subinterface*	Specifies a TenGigabitEthernet/IEEE 802.3 interface. Replace the *instance* argument with a physical interface instance specified in the *rack/slot/module/port* notation. 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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp an-port circuit-id, on page 19	Displays data or message statistics for an AN port identified by its circuit-id.
show ancp an-port neighbor, on page 24	Displays data or message statistics for AN ports associated with a specific neighbor.
show ancp an-port state, on page 26	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.H*| *A.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

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

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.

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 neigbor:

```
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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp an-port circuit-id, on page 19	Displays data or message statistics for an AN port identified by its circuit-id.
show ancp an-port interface, on page 21	Displays data or message statistics for a sub-interface mapped to an AN port.
show ancp an-port state, on page 26	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

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

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.

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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp an-port circuit-id, on page 19	Displays data or message statistics for an AN port identified by its circuit-id.
show ancp an-port interface, on page 21	Displays data or message statistics for a sub-interface mapped to an AN port.
show ancp an-port neighbor, on page 24	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.H*| *A.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. • none—Displays ANCP neighbors in a down state. • synsent—Displays ANCP neighbors in the SYNSENT state. • synrcvd—Displays ANCP neighbors in the SYNRCVD state. • 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

Command History

Release	Modification
Release 3.7.2	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.

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 13	Clears the adjacency connection with the neighbor.
show ancp an-port, on page 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp neighbor summary, on page 31	Displays adjacency counts by state.
show qos summary, on page 172	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

Command History

Release	Modification
Release 3.7.2	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.

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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp neighbor, on page 28	Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies.
show ancp summary, on page 41	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

Command History

Release	Modification
Release 4.0.0	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.

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.
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 36	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. Replace the *instance* argument with an Ethernet bundle instance. Range is 1 to 65535. 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

Command History

Release	Modification
Release 4.0.0	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.

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 33	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

Command History

Release	Modification
Release 3.7.2	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.

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 16	Displays data or message statistics referring to individual or multiple Access Node (AN) ports.
show ancp neighbor, on page 28	Displays data or message statistics associated with individual ANCP adjacencies or sets of adjacencies.
show ancp neighbor summary, on page 31	Displays adjacency counts by state.

Packet Classification Commands

This chapter describes the commands used for QoS packet classification. For detailed information about Packet Classification concepts, configuration tasks and examples, see the Configuring Modular QoS Service Packet Classification and Marking chapter in the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

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

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.

Policy Map Configuration Mode

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

Class Characteristics

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

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

The following 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 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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. To remove an existing class map from the router, use the **no** form of this command.

class-map [**type qos**] **[match-all] [match-any]** *class-map-name*

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

Syntax Description

type qos	(Optional) Specifies a quality-of-service (QoS) 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

Command History

Release	Modification
Release 3.7.2	This command was introduced.

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.

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.

The following 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**
- **match vpls**

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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
```

Related Commands

Command	Description
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
match access-group, on page 68	Identifies a specified access control list (ACL) number as the match criteria for a class map.
match destination-address, on page 70	Identifies a specific destination MAC address explicitly as a match criterion in a class map.
match discard-class, on page 72	Identifies specific discard class values as a match criteria for a class map.
match dscp, on page 74	Identifies specific IP differentiated services code point (DSCP) values as match criteria for a class map.
match mpls experimental topmost, on page 77	Identifies specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map.

Command	Description
match precedence, on page 79	Identifies IP precedence values as match criteria.
match protocol, on page 82	Identifies a specific protocol as the match criterion for a class map.
match qos-group, on page 85	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.
match source-address, on page 87	Identifies a specific source MAC address as match criterion in a class map.
match vlan, on page 60	Identifies selected VLAN IDs as the match criteria for a class map.

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

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.

Task ID

Task ID	Operations
qos	read, write

Examples

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

Related Commands

Command	Description
class-map, on page 49	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

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.

Task ID

Task ID	Operations
qos	read, write

Examples

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

Related Commands

Command	Description
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

exceed-action

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

exceed-action [**drop**| **set** *options*| **transmit**]

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

Syntax Description

drop	(Optional) Drops the packet.
set *options*	Configures the specified packet properties. Replace *options* with one of the following keywords or keyword arguments: • **atm-clp** *value* —Sets the cell loss priority (CLP) bit. • **cos [inner]** *value* —Sets the class of service value. Range is 0 to 7. • **cos** *value* —Sets the class of service value. Range is 0 to 7. • **dei** —Sets the drop eligible indicator (DEI). Can be 0 or 1. • **discard-class** *value* —Sets the discard class value. Range is 0 to 7. • **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values. • **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. • **fr-de** *value* —Sets the Frame Relay discard eligible (DE) bit on the Frame Relay frame then transmits that packet. In congested environments, frames with the DE bit set to 1 are discarded before frames with the DE bit set to 0. The frame relay DE bit has only one bit and has only two settings, 0 or 1. The default DE bit setting is 0. • **mpls experimental** {**topmost** | **imposition**} *value* —Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost label or imposed label. Range is 0 to 7. • **precedence** *precedence* —Sets the IP precedence and sends the packet. See Table 5: IP Precedence Values and Names, on page 80 for a list of valid values. • **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. • **qos-group** *value* —Sets the QoS group value. • **qos-group** *value* —Sets the QoS group value. Range is 0 to 63. • **srp-priority** *value* —Sets the Spatial Reuse Protocol (SRP) priority. Range is 0 to 7

transmit	(Optional) Transmits the packets.

Command Default

By default, if no action is configured on a packet that exceeds the rate limit, the packet is dropped.

Command Modes

Policy map police configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.
Release 4.0.0	The **set dei** 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.

For more information regarding the traffic policing feature, see the police rate, on page 106 command.

- experimental, qos-group, and discard class values, or
- experimental and qos-group values, or
- experimental and discard class values

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 the following 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 147	Configures the action to take on packets that conform to the rate limit.
exceed-color, on page 176	(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.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 133	Configures the action to take on packets that violate the rate limit.

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

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 **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.

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

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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 Packet-over-SONET (POS) interface 0/1/0/0 .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
 pos 0/1/0/0

RP/0/RSP0/CPU0:router(config-if)# service-policy
 input

 policy1
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
match discard-class, on page 72	Identifies specific discard class values as a match criteria for a class map.
match protocol, on page 82	Identifies a specific protocol as the match criterion for a class map.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set cos, on page 194	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

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 **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.

This command is supported only on Layer 3 ingress.

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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 Gigabit Ethernet 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 49	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

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.

Task ID

Task ID	Operation
qos	read, write

Examples

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 49	Defines a traffic class and the associated rules that match packets to the class.

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

Command History

Release	Modification
Release 4.0.0	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.

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-d
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 89	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 [*Dlci*| *StartDlci-EndDlci*]

no match frame-relay dlci [*Dlci*| *StartDlci-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 commandwas 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 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

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 access-group ipv4 *access-group-name*

no match access-group ipv4 *access-group-name*

Syntax Description

ipv4	Specifies the name of the IPv4 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.

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.

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.

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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

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 **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

The following 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 49	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 white spaces. Range is 0 to 7.

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

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 **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.

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

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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 interface 0/1/0/9 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
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 91	Sets the discard class and Quality of Service (QoS) group identifiers on IP Version 4 (IPv4) or Multiprotocol Label Switching (MPLS) packets.
set qos-group	Sets the quality of service (QoS) group identifiers on packets.

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 [not] dscp [**ipv4**| **ipv6**] *dscp-value* [*dscp-value1 ... dscp-value7*]

no match [not] dscp [**ipv4**| **ipv6**] *dscp-value* [*dscp-value1 ... dscp-value7*]

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 to 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.

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

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 **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 QoS 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

DSCP Value	Reserved Keyword
56	CS7
ipv4	ipv4 dscp
ipv6	ipv6 dscp

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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 0/1/0/0 for 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
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set dscp, on page 93	Marks a packet by setting the IP differentiated services code point (DSCP) in the type of service (ToS) byte.
match precedence, on page 79	Identifies IP precedence values as match criteria.

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	(Optional) Negates the specified match result.
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

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 **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

The following 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 output policy1
```

Related Commands

Command	Description
class-map, on page 49	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 110	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 95	
show policy-map interface, on page 119	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. 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

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 **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.

The following 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

The following 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 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
set precedence, on page 97	Sets the precedence value in the IP header.
show policy-map interface, on page 119	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*]

no match [not] protocol *protocol-value* [*protocol-value1 ... protocol-value7*]

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.

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

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.

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

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

Task ID

Task ID	Operations
qos	read, write

Examples

In the following example, all TCP packets belong to class class1:

```
RP/0/RSP0/CPU0:router(config)# class class1
RP/0/RSP0/CPU0:router(config-cmap)# match protocol tcp
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
match access-group, on page 68	Identifies a specified access control list (ACL) number as the match criteria for a class map.
match mpls experimental topmost, on page 77	Identifies specific three-bit experimental (EXP) field values in the topmost Multiprotocol Label Switching (MPLS) label as match criteria for a class map.
match qos-group, on page 85	Identifies specific quality-of-service (QoS) group values as match criteria in a class map.

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

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 **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

The following example shows a service policy called policy1 attached to an interface. In this example, class map qosgroup5 will evaluate all packets leaving GigabitEthernet 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 output policy1
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 91	Sets the discard class and Quality of Service (QoS) group identifiers on IP Version 4 (IPv4) or Multiprotocol Label Switching (MPLS) packets.
set qos-group	Sets the quality of service (QoS) group identifiers on packets.

match source-address

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

match source-address mac *address*

no match source-address mac *address*

Syntax Description

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

Command Default

No default behavior or values

Command Modes

Class map configuration

Command History

Release	Modification
Release 3.7.2	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 **match source-address** command specifies a source address that is used as the match criterion against which packets are checked to determine if they belong to the class specified by the class map.

To use the **match source-address** command, you must first enter the **class-map** command to specify the name of the class whose match criteria you want to establish. If you specify more than one **match source-address** command in a class map, only the last command entered applies.

This command is supported on an input service policy only.

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

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

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

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

Task ID

Task ID	Operations
qos	read, write

Examples

The following example shows how to match a source MAC address:

```
RP/0/RSP0/CPU0:router(config)# class-map match-any A
RP/0/RSP0/CPU0:router(config-cmap)# match source-address mac 0003.f0d0.2356
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.

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

To 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 110	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

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 **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

The following 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 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 169	Attachs 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.
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

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.

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 the following 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 110	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 169	Attachs a policy map to an input interface or output interface to be used as the service policy for that interface.
set precedence, on page 97	Sets the precedence value in the IP header.
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

set mpls experimental

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

set mpls experimental {**imposition**| **topmost**} *exp-value*

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

Syntax Description

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

Command Default

No MPLS experimental value is set

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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 queueing 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

The following 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  pos 0/7/0/0
RP/0/RSP0/CPU0:router(config-if)# service-policy  output policy1
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 169	Attachs 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

Command Modes

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

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.

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

The following 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 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 169	Attachs a policy map to an input interface or output interface to be used as the service policy for that interface.

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*| *rate* [*units*]}

no shape average {**percent** *percentage*| *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: • **bps**—bits per second (default) • **gbps**—gigabits per second • **kbps**—kilobits per second • **mbps**—megabits per second

Command Default

units: **bps**

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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.

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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
```

The following 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
```

show qos interface

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

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

Syntax Description

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

Command History

Release	Modification
Release 3.7.2	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 **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.

Task ID

Task ID	Operations
qos	read

Examples

The following sample output shows the QoS information on a GigabitEthernet interface:

```
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
------------------------------------------------------------------------
```

Related Commands

Command	Description
show qos inconsistency, on page 128	Displays inconsistency information for the QoS policy on an interface.

Congestion Management Commands

This chapter describes the commands used to manage congestion. For detailed information about congestion management concepts, configuration tasks and examples, see the Configuring Congestion Management chapter in the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

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*} [**burst** *burst-size* [*burst-units*]] [**peak-rate** {*value* [*units*]| **percent** *percentage*}] [**peak-burst** *peak-burst* [*burst-units*]]

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

Syntax Description

value	Committed information rate (CIR). Range is from 1 to 4294967295.
units	(Optional) Unit of measurement for the CIR. Values can be: • **bps** —bits per second (default) • **gbps** —gigabits per second • **kbps** —kilobits per second • **mbps** —megabits per second • **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.
burst *burst-size*	(Optional) Specifies the burst size (in the specified *burst-units*). Range is from 1 to 4294967295.
burst-units	(Optional) Unit of measurement for the burst values. Values can be: • **bytes** —bytes (default) • **gbytes** —gigabytes • **kbytes** —kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **us** —microseconds • **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* . 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 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 **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 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 specifically 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. However, the maximum burst value supported is 2,097,120 bytes.

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

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

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. 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

Examples

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 142	Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

policy-map

To create or modify a policy map that can be attached to one or more interfaces to specify a service policy, use the **policy-map** command in global configuration mode. To delete a policy map, use the **no** form of this command.

policy-map [**type qos**] *policy-name*

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

Syntax Description

type qos	(Optional) Specifies a quality-of-service (QoS) 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

Command History

Release	Modification
Release 3.7.2	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.

Use the **policy-map** command to specify the name of the policy map to be created, added to, or modified before you can configure policies for classes whose match criteria are defined in a class map. Entering the **policy-map** command enables policy map configuration mode in which you can configure or modify the class policies for that policy map.

You can configure class policies in a policy map only if the classes have match criteria defined for them. Use the **class-map** and **match** commands to configure the match criteria for a class. Because you can configure a maximum of 1024 classes in one policy map, no policy map can contain more than 1024 class policies. The maximum number of 1024 classes per policy includes the implicit default class and its child policies.

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

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

The following 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
```

Related Commands

Command	Description
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.

priority (QoS)

To assign a priority to a class of traffic belonging to a policy map, use the **priority** command in policy map class configuration mode. To remove a previously specified priority for a class, use the **no** form of this command.

priority [**level** *priority-level*]

no priority

Syntax Description

level *priority-level*	(Optional) Sets the class priority level value. Values are 1 or 2. 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.

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 **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

The following 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 136	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

show fmgr interface

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

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

Syntax Description

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

Command Default No default behavior or values

Command Modes EXEC

Command History

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

Usage Guidelines 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.

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 7: show fmgr interface Field Descriptions

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

show hw-module qos output shape granularity location

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

Command Default

None

Command Modes

EXEC (#)

Command History

Release	Modification
Release 3.9.2	This command was introduced.

Usage Guidelines

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

Examples

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 8: show hw-module qos output shape granularity location Field Descriptions, on page 118 describes the significant fields shown in the display.

Table 8: show hw-module qos output shape granularity location Field Descriptions

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

Related Commands

Command	Description
hw-module qos output shape granularity location	Configures shape granularity.

show policy-map interface

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

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

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. • *rack*—Chassis number of the rack. • *slot*—Physical slot number of the line card. • *module*—Module number. A physical layer interface module (PLIM) is always 0. • *port*—Physical port number of the interface. **Note** In references to a Management Ethernet interface located on a route processor card, the physical slot number is alphanumeric (RSP0 or RSP1) and the module is CPU0. Example: interface MgmtEth0/RSP0/CPU0/0. For more information about the syntax for the router, use the question mark (?) online help function.
input	(Optional) Displays per class statistics on inbound traffic for the specified policy map and interface.
output	(Optional) Displays per class statistics on outbound traffic for the specified policy map and interface.

Command Default

No default behavior or values

Command Modes

EXEC

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.

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

Task ID

Task ID	Operations
qos	read

Examples

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

```
RP/0/RSP0/CPU0:router# show policy-map interface tengige 0/6/1/0

TenGigE0/6/1/0 input: policy1

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

TenGigE0/6/1/0 output: policy4

Class class1
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                  0/0                   0
    Transmitted         :                  0/0                   0
    Total Dropped       :                  0/0                   0
  Policing statistics                (packets/bytes)     (rate - kbps)
    Policed(conform)    :                  0/0                   0
    Policed(exceed)     :                  0/0                   0
    Policed(violate)    :                  0/0                   0
    Policed and dropped :                  0/0
  Queueing statistics
    Queue ID                              : 51
    Taildropped(packets/bytes)            : 0/0
Class class-default
  Classification statistics          (packets/bytes)     (rate - kbps)
```

```
  Classification statistics          (packets/bytes)     (rate - kbps)
    Matched             :                 0/0                   0
    Transmitted         :                 0/0                   0
    Total Dropped       :                 0/0                   0
  Queueing statistics
    Queue ID                              : 51
    High watermark  (bytes)/(ms)          : 0/0
    Inst-queue-len  (bytes)/(ms)          : 0/0
    Avg-queue-len   (bytes)/(ms)          : 0/0
    Taildropped(packets/bytes)            : 0/0
```

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

```
RP/0/RSP0/CPU0:router# show policy-map interface Serial0/0/3/0/3:0 output

show policy-map int  Serial0/0/3/0/3:0  output
Mon May 18 22:06:14.698 UTC
Serial0/0/3/0/3:0 output: p1
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)             : 0
    Inst-queue-len  (packets)             : 0
    Avg-queue-len   (packets)             : 0
    Taildropped(packets/bytes)            : 0/0
  Compression Statistics
    Header ip rtp
    Sent Total       (packets)            : 880
    Sent Compressed  (packets)            : 877
    Sent full header (packets)            : 342
    Saved            (bytes)              : 31570
    Sent             (bytes)              : 24750
    Efficiency improvement factor         : 2.27
```

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

Table 9: 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.

Field	Description
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.
Queueing 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.
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.

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.
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

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.

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.

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 110	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 169	Attachs 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 119	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 performance-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 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

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.

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.

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
```

Related Commands

Command	Description
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

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: • 0—All warning types • 1—ANCP - No shaper at top policy map • 2—ANCP - Multiple classes at top policy map • 3—ANCP - Downstream rate less than shaper rate • 4—ANCP - Downstream rate more than port speed • 5—ANCP - Policy resolution failure • 6—ANCP - Traffic manager program failure • 7—Port speed - Policy resolution failure • 8—Port speed - Traffic manager program failure • 9—Bundle member addition failure • 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

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.7.2	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.

Task ID

Task ID	Operations
qos	read

Examples

The following 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
```

The following 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 101	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

No default behavior or values

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.

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.

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 spi1 input location 0/1/cPU0

Instancespi1  --   Direction: input
Policy                  hier_l2_ingress
Total number of classes:   5
-----------------------------------------------
MPLS vmrid              160
IPV4 vmrid              159
IPV6 vmrid              158
    LEVEL1 class: classid    =  0x1
    class name               =   class-default
    Policer average                 = 600 mbits/sec (600000 kbps)
    Policer conform burst           = dflt (16777215 bytes)
    Policer conform action          = Just TX
    Policer exceed  action          = DROP PKT

      LEVEL2 class: classid    =  0x2
      class name               =   cos3
      Policer average                 = 100 mbits/sec (100032 kbps)
      Policer conform burst           = dflt (3126000 bytes)
      Policer conform action          = SET EXP AND TX
      Policer conform action value    = 1
      Policer exceed  action          = SET EXP AND TX
      Policer exceed  action value    = 2

      LEVEL2 class: classid    =  0x3
      class name               =   cos4
      Policer average                 = 100 mbits/sec (100032 kbps)
      Policer conform burst           = dflt (3126000 bytes)
      Policer conform action          = SET EXP AND TX
      Policer conform action value    = 3
      Policer exceed  action          = SET EXP AND TX
      Policer exceed  action value    = 4

      LEVEL2 class: classid    =  0x4
      class name               =   cos5
      Policer average                 = 100 mbits/sec (100032 kbps)
      Policer conform burst           = dflt (3126000 bytes)
      Policer conform action          = SET EXP AND TX
      Policer conform action value    = 5
      Policer exceed  action          = SET EXP AND TX
      Policer exceed  action value    = 6

      LEVEL2 class: classid    =  0x5
      class name               =   class-default
RP/0/RSP0/CPU0:router:#show qos shared-policy-instance spi1 output location 0/1/cPU0

Instancespi1  --   Direction: output
```

```
Policy                   12_egress
Total number of classes:   2
----------------------------------------------
MPLS vmrid               17
IPV4 vmrid               16
IPV6 vmrid               24
    LEVEL1 class: classid    =  0x1
    class name               =   qos_grp1
    queue ID                 =   18
    port ID                  =   2 (Bandwidth = 1000000, MTU = 1522)
    Queue Max. BW.           =   250 mbits/sec (250000 kbps)
    Queue Max. Burst         =   200 ms (4194304 bytes)
    Queue Limit              =   16384 packets (16384 pkts)

    LEVEL1 class: classid    =  0x2
    class name               =   class-default
    queue ID                 =   19
    port ID                  =   2 (Bandwidth = 1000000, MTU = 1522)
    Weight                   =   1 ( BW Remaining % = 0)
    Queue Limit              =   16384 packets (16384 pkts)
```

Related Commands

Command	Description
show policy-map shared-policy-instance, on page 123	Displays the statistics for all details of the shared policy instance.

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.
set *options*	Configures the specified packet properties. Replace *options* with one of the following keywords or keyword arguments: • **cos** [**inner**] *value*—Sets the class of service value. Range is 0 to 7. ◦ **inner** —(Optional) Specifies the inner (CE) VLAN. • **discard-class** *value* —Sets the discard class value. Range is 0 to 7. • **dscp** *value*—Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values. • **mpls experimental** {**topmost** | **imposition**} *value*—Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost label or imposed label. Range is 0 to 7. • **precedence** *precedence*—Sets the IP precedence and sends the packet. See Table 5: IP Precedence Values and Names, on page 80 for a list of valid values. • **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

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.

For more information regarding the traffic policing feature refer to the police rate, on page 106 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 the following 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 147	Configures the action to take on packets that conform to the rate limit.
exceed-action, on page 55	Configures the action to take on packets that exceed the rate limit.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	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

For detailed information about congestion avoidance concepts, configuration tasks and examples, see the Configuring Congestion Avoidance module in the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

bandwidth (QoS)

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

bandwidth {*rate* [*units*]| **percent** *percentage-value*}

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

Syntax Description

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

Command Default

The default units is kbps.

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.

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.

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 the following 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 the following 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

The following 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
```

Related Commands

Command	Description
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
queue-limit, on page 152	Specifies or modifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
random-detect precedence, on page 165	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
show qos interface, on page 101	Displays QoS information for a specific interface.

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

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.

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

```
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)#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 percent 10
RP/0/RSP0/CPU0:router(config-pmap-c)# bandwidth remaining percent 80
```

In the following example, 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

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.

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 55	Configures the action to take on packets that exceed the rate limit.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	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

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 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 49	Defines a traffic class and the associated rules that match packets to the class.

Command	Description
policy-map, on page 110	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 169	Attachs 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: • **atm-clp value** —Sets the cell loss priority (CLP) bit. • **cos value** —Sets the class of service value. Range is 0 to7. • **cos** [**inner**]*value* —Sets the class of service value. Range is 0 to 7. • dei—Sets the drop eligible indicator (DEI). Can be 0 or 1. • **discard-class** *value* —Sets the discard class value. Range is 0 to 7. • **dscp** *value* —Sets the differentiated services code point (DSCP) value and sends the packet. See Table 4: IP DSCP Reserved Keywords, on page 75 for a list of valid values. • **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. • **mpls experimental** {**topmost** | **imposition**} *value* —Sets the experimental (EXP) value of the Multiprotocol Label Switching (MPLS) packet topmost label or imposed label. Range is 0 to 7. • **precedence** *precedence* —Sets the IP precedence and sends the packet See Table 2 for a list of valid values. • **precedence** [**tunnel**] *precedence* —Sets the IP precedence and sends the packet. See Table 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. • **qos-group** *value* —Sets the QoS group value. • **srp-priority** *value* —Sets the Spatial Reuse Protocol (SRP) priority. Range is 0 to 7.
transmit	(Optional) Transmits the packets.

Command Default

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

Command Modes

Policy map police configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.
Release 4.0.0	The **set dei** 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.

For more information regarding the traffic policing feature, see the police rate, on page 106 command.

- experimental, qos-group, and discard class values, or
- experimental and qos-group values, or
- experimental and discard class values

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 the following 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 142	Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.
conform-color, on page 150	(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 55	Configures the action to take on packets that exceed the rate limit.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 133	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

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.

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 106 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 142	Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
conform-action, on page 147	Configures the action to take on packets that conform to the rate limit.
exceed-action, on page 55	Configures the action to take on packets that exceed the rate limit.
exceed-color, on page 176	(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 64	Match packets on the basis of the Frame Relay discard eligibility (DE) bit setting.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 133	Configures the action to take on packets that violate the rate limit.

queue-limit

To specify or modify the maximum number of packets the queue can hold for a class policy configured in a policy map, use the **queue-limit** command in policy map class configuration mode. To remove the queue packet limit from a class, use the **no** form of this command.

queue-limit *value* [*unit*]

no queue-limit

Syntax Description

value	Maximum threshold for tail drop in bytes. Range is from 1 to 4294967295.
unit	(Optional) Units for the queue limit value. Values can be: • **bytes** —bytes • **kbytes** —kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **packets** —packets (default) • **us** —microseconds **Note** When the specified *units* is packets, packets are assumed to be 256 bytes in size.

Command Default

100 milliseconds: maximum threshold for tail drop

10 milliseconds: maximum threshold for high-priority queues

Maximum threshold units are in packets.

Note The default queue limit is 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.

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.

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

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

Queue Limit Default Values

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

- If QoS is not configured:
  - The queue limit is 100 ms at the interface rate.
- If QoS is configured and Weighted Random Early Detection (WRED) is not configured:
  - Queue limit is 100 ms at the guaranteed service rate of the queue for non-priority queues.
  - Queue limit is 10 ms at the interface rate for Level 1 priority classes.
  - Queue limit is 10 ms at parent guaranteed service rate for Level 2 priority classes.
- If QoS is configured and WRED is configured:
  - Queue limit is two times the WRED maximum threshold. The maximum threshold can be an explicitly configured value or an implicit 100 ms.
  - If more than one WRED profile is configured in the class, the maximum threshold is the maximum for all profiles.
  - When the **queue-limit** is configured in time units, the guaranteed service rate is used to compute the queue limit.

When the queue limit is configured in time units, the guaranteed service rate of the class is used to calculate the queue limit in bytes. For example: time_unit in ms * *guaranteed_service_rate in kbps / 8* is equivalent to queue-limit in bytes.

The following 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)

The following 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

The following 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
```

Related Commands

Command	Description
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show qos interface, on page 101	Displays QoS information for a specific interface.

random-detect

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

random-detect {**cos** *value*| **default**| **dei** *value*| **discard-class** *value*| **dscp** *value*| **exp** *value*| **precedence** *value*| *min-threshold* [*units*] *max-threshold* [*units*]}

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: • 0 or routine • 1 or priority • 2 or immediate • 3 or flash • 4 or flash-override • 5 or critical • 6 or internet • 7 or network
min-threshold	Minimum threshold in number of packets. The value range of this argument is from 0 to 1073741823 in bytes.
max-threshold	Maximum threshold the units specified. The value range of this argument is from the value of the *min-threshold* argument or 23, whichever is larger, to 1073741823. When the average queue length exceeds the maximum threshold, RED drops all packets with the specified discard class value.

units	(Optional) Units for the threshold values. Values can be: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes** —megabytes • **ms** —milliseconds • **packets** —packets (default) • **us** —microseconds

Command Default

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

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	This command was introduced.
Release 4.0.0	The **dei** 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 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.

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.

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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 165	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect cos

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

random-detect cos *cos-value min-threshold* [*units*] *max-threshold* [*units*]

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

Syntax Description

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

Command Default

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

min-threshold: 30 ms

max-threshold: 100 ms

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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 **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

The following 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
```

Related Commands

Command	Description
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show qos interface, on page 101	Displays QoS information for a specific interface.

random-detect dscp

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

random-detect dscp *dscp-value min-threshold* [*units*] *max-threshold* [*units*]

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

Syntax Description

dscp-value	DSCP value. Up to eight *dscp-values* (any combination of numbers, ranges, and reserved keywords) can be used separated by commas. The following arguments are supported: • Number from 0 to 63 that sets the DSCP value. • Range of DSCP values. Range is from 0 to 63. • Reserved keywords can be specified instead of numeric values. Table 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: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes**—megabytes • **ms**—milliseconds • **packets**—packets (default) • **us**—microseconds

Command Default

Match packets with default DSCP (000000).

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

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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

The following 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 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	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 165	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.

random-detect exp

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

random-detect exp *exp-value min-threshold* [*units*] *max-threshold* [*units*]

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

Syntax Description

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

Command Default

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

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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

The following 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 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	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 161	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a specific differentiated services code point (DSCP) value.
random-detect precedence, on page 165	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 119	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: • **bytes**—bytes • **gbytes**—gigabytes • **kbytes**—kilobytes • **mbytes**—megabytes • **ms**—milliseconds • **packets**—packets (default) • **us**—microseconds

Command Default

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

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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

The following 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 136	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
class (policy-map), on page 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	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 161	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 119	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

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 **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 the following 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

The following 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 136	Specifies the minimum bandwidth allocated to a class belonging to a policy map.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
priority (QoS), on page 112	Assigns a priority to a class of traffic belonging to a policy map.
service-policy (interface), on page 169	Attachs 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*]

no 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. **Note** 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

Layer 2 transport configuration

Subinterface 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 3.6.0	The command was supported in Layer 2 transport configuration mode.

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.

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

Task ID

Task ID	Operations
qos	read, write

Examples

The following 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
```

The following 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
```

The following 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
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

Command	Description
service-policy (policy map class), on page 167	Uses a service policy as a QoS policy within a policy map.
show policy-map interface, on page 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
show policy-map shared-policy-instance, on page 123	Displays the statistics for all details of the shared policy instance.

show qos summary

To list the interfaces at a specific location, use the **show qos summary** command in EXEC mode.

show qos summary [**shared-policy-instance** *instance-name* **location** *rack/slot/module/interface.subinterface*| **police** [**interface** *type instance*| **location** [*rack/slot/module/interface.subinterface*| *location-name*]]| **policy** *policy-name* [**interface** *type instance*| **location** *node-location*]| **queue** [**interface** *type instance*| **location** *node-location*]]

Syntax Description

shared-policy-instance *instance-name*	String of up to 32 characters to identify the shared policy instance.
location *rack/slot/module/ interface.subinterface*	Location of node in format rack/slot/module/interface.subinterface.
police	Show policer interface statistics.
interface *type instance*	Interface type and number.
location *location-name*	String to identify the fully qualified location specification.
policy *policy-name*	String to identify the policy.
location *node-location*	Identifies fully qualified location specification.
queue	Show queue statistics.

Command Default

No default behavior or values

Command Modes

EXEC

Command History

Release	Modification
Release 3.7.2	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.

Task ID

Task ID	Operations
qos	read, write

Examples

This example shows the results of the command to show interfaces at location 0/RSP0/CPU0 for a shared-policy-instance:

```
RP/0/RSP0/CPU0:router# show qos summary shared-policy-instance instancetwo location
0/RSP0/CPU0

list of interfaces retrieved
  TenGigE0/0/0.1
  TenGigE0/0/0.2
RP/0/RSP0/CPU0:router#
```

Related Commands

Command	Description
show policy-map shared-policy-instance, on page 123	Displays the statistics for all details of the shared policy instance.
show qos shared-policy-instance, on page 130	Lists interface details for a specific location of a specific shared policy instance, attached to either an input or output interface.

Hierarchical Modular QoS Commands

This chapter provides details of the Hierarchical QoS commands.

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 *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

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

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.

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 106 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 142	Prevents the parent policer from dropping any ingress traffic that conforms to the maximum rate specified in the child policer.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
conform-action, on page 147	Configures the action to take on packets that conform to the rate limit.
conform-color, on page 150	(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 55	Configures the action to take on packets that exceed the rate limit.
match fr-de, on page 64	Match packets on the basis of the Frame Relay discard eligibility (DE) bit setting.
police rate, on page 106	Configures traffic policing and enters policy map police configuration mode.
policy-map, on page 110	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 119	Displays policy configuration information for all classes configured for all service policies on the specified interface.
violate-action, on page 133	Configures the action to take on packets that violate the rate limit.

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

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 **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 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-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
match cos, on page 58	Identifies specified class of service (CoS) values as a match criteria in a class map.

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 4.0.0	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 **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 47	Specifies the name of the class whose policy you want to create or change.
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

Link Bundles Commands

A link bundle is a group of one or more ports that are aggregated together and treated as a single link. This chapter describes the commands used for QoS on link bundles. For detailed information on Link Bundles, related concepts and configuration tasks, see the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

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.

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.

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 169	Attachs 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 123	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 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
priority (QoS), on page 112	Assigns a priority to a class of traffic belonging to a policy map.

Deployment Scenarios Commands

This chapter provides commands used for QoS implementation of features that are described in other technology books, such as MPLS, L2VPN. For detailed deployment scenarios, see the *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*

random-detect discard-class

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

random-detect discard-class *discard-value min-threshold* [*units*] *max-threshold* [*units*]

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

Syntax Description

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

Command Default

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

Command Modes

Policy map class configuration

Command History

Release	Modification
Release 3.7.2	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.

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

The following 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 47	Specifies the name of the class whose policy you want to create or change.
policy-map, on page 110	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 165	Configures the Weighted Random Early Detection (WRED) thresholds for packets with a particular IP precedence.
show policy-map interface, on page 119	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

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.

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 the following 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 Gigabit Ethernet VLAN subinterface 0/1/0/9.100.

```
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-if)# service-policy output cos-set
```

Related Commands

Command	Description
class-map, on page 49	Defines a traffic class and the associated rules that match packets to the class.
policy-map, on page 110	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 169	Attachs a policy map to an input interface or output interface to be used as the service policy for that interface.

INDEX

S

V