QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

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The QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router feature describes how Frame Relay (FR) works in Hierarchical Queueing Framework (HQF) to provide an FR service with fragmentation using the Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC).

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router" section on page 64.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

This feature operates on the Cisco 7200 series router only.

Restrictions for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

- Interfaces can support either MQC or legacy-style FR configurations, but not both at the same time.
- HQF does not support payload compression or legacy queueing commands.
- Map-class configurations do not support the dynamic changing of QoS; therefore, if you use a command that requires a different QoS mechanism, that command is blocked.
- Map-class traffic-shaping parameters do not tie a map class to legacy configurations; you must use the **traffic-shaping** command in interface configuration mode.

Information About QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

To use the QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router feature, you should understand the following concepts:

Background of QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

Historically, QoS for Frame Relay has been provided by using Frame Relay-specific commands within the CLI. MQC provides the means for you to configure QoS using a generic CLI applicable to all types of interfaces and protocols. MQC builds configurations that depend on HQF for queueing, shaping, policing, and marking. To support Frame Relay, extensions to the HQF mechanism were required so that fragmentation could be provided within the queueing framework. These extensions enable priority queueing (PQ) configurations to be set up to support latency-sensitive traffic.

Functions of QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

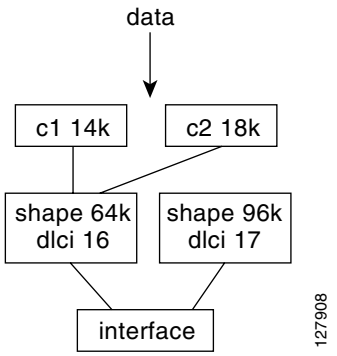
HQF provides queueing, shaping, policing, and marking capabilities. HQF is a logical engine used to support QoS features. The HQF hierarchy is a tree structure that is built using policy maps.

When data passes through an interface using HQF, the data is classified so that it traverses the branches of the tree. Data arrives at the top of the tree and is classified on one of the leaves. Data then traverses down the hierarchy (tree) until it is transmitted out the interface at the root (trunk).

For example, the following configuration builds the hierarchy shown in Figure 1:

```
policy-map class
  class c1
    bandwidth 14
  class c2
    bandwidth 18

policy-map map1
  class class-default
    service-policy class
    shape average 64000

policy-map map2
  class class-default
    shape average 96000

map-class frame-relay fr1
  service-policy output map1

map-class frame fr2
  service-policy output map2

interface serial4/1
  encapsulation frame-relay
  frame-relay interface-dlci 16
    class fr1
  frame-relay interface-dlci 17
    class fr2
```

Figure 1 HQF Tree Structure



HQF has a defined application programming interface (API) to load in fragmentation functions used by this feature to provide an FR fragmentation service. When installed on an interface, HQF takes over the interface queueing vectors. Because the vectors are also used by the legacy (nondistributed processing) QoS code, you need to save them while HQF is loaded and then restore the vectors to their previous values if a legacy restriction is imposed on an interface.

HQF and legacy QoS can be dynamically changed when you use the **frame-relay** *fragment-size* **end-to-end** command in interface configuration mode. The following features force legacy queueing to be loaded:

- Payload compression
- Frame interface queueing
- Legacy interface queueing (weighted fair queueing (WFQ), custom, and priority)

When you use map-class fragmentation to decrease interface delays while transmitting a packet, you cannot change the QoS mechanism dynamically; therefore, once set up, any commands that require HQF are blocked via the CLI. You can set legacy parameters in the map class while HQF is active because they are used only when enabling Frame Relay traffic at the interface. In this instance, legacy map-class parameters are ignored and the parameters specified in the service policy are used instead.

How to Configure QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

This section contains the following procedures:

- Configuring a Service Policy, page 5 (required)
- Attaching an MQC Policy to a Map Class, page 6 (required)
- Verifying the Configuration, page 8 (optional)

Configuring a Service Policy

Perform the following task to configure a service policy and attach it to the main interface. This action also installs HQF on the interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** [**type access-control**] *policy-map-name*
4. **class** [*class-name* | **class-default**]
5. **shape** [**average** | **peak**] *cir* [*bc*] [*be*]
6. **interface** *type number* [*name-tag*]
7. **encapsulation frame-relay** [**cisco** | **ietf**]
8. **service-policy** [**type access-control**] {**input** | **output**} *policy-map-name*
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**policy-map** [**type access-control**] *policy-map-name* **Example:** `Router(config)# policy-map shape`	Specifies the name of the policy map to be created. Enters policy-map configuration mode. • The optional **type access-control** keywords determine the exact pattern to look for in the protocol stack of interest. • Enter the policy-map name.
Step 4	**class** [*class-name* | **class-default**] **Example:** `Router(config-pmap)# class class-default`	Specifies the class so that you can configure or modify its policy. Enters policy-map class configuration mode. • Enter the *class-name* argument or the **class-default** keyword.

	Command or Action	Purpose
Step 5	**shape** [**average** | **peak**] *cir* [bc] [be] **Example:** `Router(config-pmap-c)# shape average 256000`	Shapes traffic to the indicated bit rate according to the algorithm specified. • Enter **average** or **peak** rate shaping. • Enter the committed information rate (CIR) in bits per second (bps). • (Optional) Enter the committed burst (bc) size or the excess burst (be) size in bits.
Step 6	**interface** *type number* [*name-tag*] **Example:** `Router(config-pmap-c)# interface serial4/3`	Configures the interface type specified and enters interface configuration mode. • Enter the interface type and number. • The optional *name-tag* argument specifies the logic name to identify the server configuration so that multiple server configurations can be entered. This optional argument is for use with the Redundant Link Manager (RLM) feature.
Step 7	**encapsulation frame-relay** [**cisco** | **ietf**] **Example:** `Router(config-if)# encapsulation frame-relay`	Enables Frame Relay encapsulation on an interface. • (Optional) Enter **cisco** or **ietf** to specify the encapsulation method.
Step 8	**service-policy** [**type access-control**] {**input** | **output**} *policy-map-name* **Example:** `Router(config-if)# service-policy output shape`	Specifies the name of the policy map to be attached to the input direction of the interface. **Note** You can configure policy maps on ingress or egress routers and attach them in the input or output direction of an interface. The direction (input or output) and the router (ingress or egress) to which the policy map should be attached varies according to your network configuration. • The optional **type access-control** keywords determine the exact pattern to look for in the protocol stack of interest. • Enter the **input** or **output** keyword followed by the policy map name.
Step 9	**end** **Example:** `Router(config-if)# end`	(Optional) Exits interface configuration mode.

Attaching an MQC Policy to a Map Class

Perform the following task to attach an MQC policy to a map class. This action also enables HQF.

SUMMARY STEPS

1. **enable**

2. **configure terminal**
3. **map-class frame-relay** *map-class-name*
4. **service-policy** [**type access-control**] {**input** | **output**} *policy-map-name*
5. **interface** *interface number* [*name-tag*]
6. **frame-relay class** *name*
7. **frame-relay interface-dlci** *dlci* [**cisco** | **ietf**] [**voice-cir** *cir*] [**ppp** *virtual-template-name*]
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**map-class frame-relay** *map-class-name* **Example:** `Router(config)# map-class frame-relay shape`	Specifies the name of a Frame Relay map class that is to be created or modified and enters map-class configuration mode. • Enter the map-class name.
Step 4	**service-policy** [**type access-control**] {**input** | **output**} *policy-map-name* **Example:** `Router(config-map-class)# service-policy output shape`	Specifies the name of the policy map to be attached to the input or output direction of the interface. **Note** You can configure policy maps on ingress or egress routers and attach them in the input or output direction of an interface. The direction (input or output) and the router (ingress or egress) to which the policy map should be attached varies according to your network configuration. • The optional **type access-control** keywords determine the exact pattern to look for in the protocol stack of interest. • Enter the **input** or **output** keyword followed by the policy map name.
Step 5	**interface** *type number* [*name-tag*] **Example:** `Router(config-map-class)# interface serial4/3`	Configures the interface type specified and enters interface configuration mode. • Enter the interface type and number. • The optional *name-tag* argument specifies the logic name to identify the server configuration so that multiple server configurations can be entered. This optional argument is for use with the Redundant Link Manager (RLM) feature.

	Command or Action	Purpose
Step 6	**frame-relay class** *name* **Example:** `Router(config-if)# frame-relay class shape`	Associates a map class with an interface or subinterface. • Enter the name of the map class.
Step 7	**frame-relay interface-dlci** *dlci* [**cisco** | **ietf**] [**voice-cir** *cir*] [**ppp** *virtual-template-name*] **Example:** `Router(config-if)# frame-relay interface-dlci 16`	Assigns a data-link connection identifier (DLCI) to a specified Frame Relay subinterface on a router and enters Frame Relay DLCI interface configuration mode. • Enter the DLCI number. • (Optional) Enter **cisco** or **ietf** for the encapsulation type. • (Optional; supported on the Cisco MC3810 only) Enter **voice-cir** and *cir* to specify the upper limit on the voice bandwidth that may be reserved for this DLCI. The default is the committed information rate (CIR) configured for the Frame Relay map class. • (Optional) Enter **ppp** to enable the circuit to use the PPP in Frame Relay encapsulation. • (Optional) Enter the virtual template name to specify to which virtual template interface to apply the PPP connection.
Step 8	**end** **Example:** `Router(config-fr-dlci)# end`	(Optional) Exits Frame Relay DLCI interface configuration mode.

Verifying the Configuration

Perform the following task to verify that HQF has been installed and enabled on an interface.

SUMMARY STEPS

1. **enable**
2. **show policy-map interface** [**type access-control**] *interface-name* [**vc** [*vpi*/] *vci*] [**dlci** *dlci*] [**input** | **output**]
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show policy-map interface** [**type access-control**] *interface-name* [**vc** [*vpi*/] *vci*] [**dlci** *dlci*] [**input** | **output**] **Example:** `Router# show policy-map interface serial4/3`	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface. • Enter the interface name.
Step 3	**exit** **Example:** `Router# exit`	Exits privileged EXEC mode.

Configuration Examples for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

This section provides configuration examples for the QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router feature.

- Configuring the QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router Feature: Example, page 9
- Verifying the Configuration: Example, page 10

Configuring the QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router Feature: Example

There are two main tasks for configuring this feature:

- Configuring a policy map
- Attaching the policy map to a map class

In the following example, a policy map called shape is configured on serial interface 4/3 and attached in the output direction. Its parameters include a class class-default, a traffic shaping average of 256000 bps, and Frame Relay encapsulation.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# policy-map shape
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 256000
Router(config-pmap-c)# interface serial4/3
Router(config-if)# encapsulation frame-relay
Router(config-if)# service-policy output shape
Router(config-if)# end
```

In the following example, the policy map called shape that is attached to the serial interface 4/3 in the output direction and is associated with a map class called shape. There is also a PVC being associated with DLCI 16.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# map-class frame-relay shape
Router(config-map-class)# service-policy output shape
Router(config-map-class)# interface serial4/3
Router(config-if)# frame-relay class shape
Router(config-if)# frame interface-dlci 16
Router(config-fr-dlci)# end
```

Verifying the Configuration: Example

In the following example, shaping is active with HQF installed on the serial interface 4/3. All traffic is classified to the class-default queue.

```
Router# show policy-map interface serial4/3

 Serial4/3

  Service-policy output: shape

    Class-map: class-default (match-any)
      2203 packets, 404709 bytes
      30 second offered rate 74000 bps, drop rate 14000 bps
      Match: any
      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 64/354/0
      (pkts output/bytes output) 1836/337280
      shape (average) cir 128000, bc 1000, be 1000
      target shape rate 128000
        lower bound cir 0,  adapt to fecn 0

      Service-policy : LLQ

        queue stats for all priority classes:

          queue limit 64 packets
          (queue depth/total drops/no-buffer drops) 0/0/0
          (pkts output/bytes output) 0/0

        Class-map: c1 (match-all)
          0 packets, 0 bytes
          30 second offered rate 0 bps, drop rate 0 bps
          Match: ip precedence 1
          Priority: 32 kbps, burst bytes 1500, b/w exceed drops: 0

        Class-map: class-default (match-any)
          2190 packets, 404540 bytes
          30 second offered rate 74000 bps, drop rate 14000 bps
          Match: any

          queue limit 64 packets
          (queue depth/total drops/no-buffer drops) 63/417/0
          (pkts output/bytes output) 2094/386300
```

Additional References

The following sections provide references related to the QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router feature.

Related Documents

Related Topic	Document Title
Frame Relay commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Wide-Area Networking Command Reference*, Release 12.4T
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Quality of Service Solutions Command Reference*, Release 12.4T
MQC	*Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.4

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents new and modified commands only.

New Commands

- **debug frame-relay hqf**

Modified Commands

- **show frame-relay pvc**
- **show policy-map**
- **show policy-map interface**
- **show traffic-shape queue**

debug frame-relay hqf

To display debug messages for Frame Relay (FR) hierarchical queueing framework (HQF) events, use the **debug frame-relay hqf** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug frame-relay hqf

no debug frame-relay hqf

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(28)SB	This command was introduced.

Usage Guidelines

Use the **debug frame-relay hqf** command to track which quality of service (QoS) features are being used on an interface. QoS for a given FR interface changes depending on the commands being used.

Note You cannot configure weighted fair queueing (WFQ) with HQF; they are mutually exclusive.

To use HQF on an interface, you must complete the following tasks:

- Install an interface level service policy without legacy queueing or payload compression.
- Attach a Modular Quality of Service (QoS) Command-Line Interface (CLI) (MQC) service policy to a permanent virtual circuit (PVC) with no legacy restrictions.

  This task is accomplished by adding a service policy to a frame map class. A valid MQC service policy shapes all traffic via the class default and has a child policy to support any further traffic classification, as shown in the following example:

```
policy-map llq
 class voice
  priority 32
policy-map shape1
 class class-default
  shape average 96000
  service-policy llq
policy-map shape2
 class class-default
  shape average 128000
  service-policy llq
map-class frame-relay mqc-class1
 service-policy output shape1
map-class frame-relay mqc-class2
 service-policy output shape2

interface serial4/0
```

```
encapsulation frame-relay
frame-relay class mqc-class1 <----- Map-class installed
frame-relay interface-dlci 16 <----- Inherits map-class1
frame-relay interface-dlci 17
class mqc-class2 <----- Map-class installed for DLCI 17
```

Examples

The following is sample output from the **debug frame-relay hqf** command:

```
Router# debug frame-relay hqf

debug frame-relay hqf is enabled


Router# show running-configuration
.
.
.
00:25:54: %SYS-5-CONFIG_I: Configured from console by console serial4/1
Building configuration...

Current configuration : 167 bytes
!
interface Serial4/1
 serial restart-delay 0
 service-policy output shape
end
```

The following commands and subsequent output show events that occur when HQF is enabled or disabled as a result of queueing changes at the interface level while debugging is on:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial4/1
Router(config-if)# policy-map shape
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 128000 1000
Router(config-pmap-c)# interface serial4/1
Router(config-if)# encapsulation frame-relay
Router(config-if)# frame-relay fragment 80 end-to-end
Router(config-if)# service-policy output shape
Router(config-if)# frame-relay map ip 10.0.0.1 16 payload frf9 stac

00:26:52: Serial4/1- Setting up interface for legacy QOS. <---Indicates legacy QoS is
being installed on an interface.

00:26:52: Legacy fair-queueing installed on interface. <---Indicates that legacy QoS is
being installed and HQF is being removed. You see this only with interface fragmentation
and service policies since these policies must be able to support both QoS mechanisms.
This usually means that either payload compression has been enabled on an interface or
legacy queueing has been set up on the main interface.

Router(config-if)# no frame-relay map ip 10.0.0.1 16 payload frf9 stac

00:27:08: Serial4/1- Setting up HQF/MQC QOS. <---Indicates that the last legacy
restriction has been removed and HQF is being installed on the interface.

00:27:08: Serial4/1- Setting up interface for legacy QOS. <--- Indicates that legacy QoS
is being installed on the interface.

Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial4/1
```

```
Router(config-if)# frame-relay map ip 10.0.0.1 16
Router(config-if)# no service-policy output shape
Router(config-if)# no frame-relay fragment 80 end-to-end
```

The following commands and subsequent output show events that occur when HQF is enabled or disabled as a result of queueing changes at the PVC level while debugging is on:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial4/1
Router(config-if)# map-class frame-relay frts-shape
Router(config-map-class)# frame-relay fragment 80
Router(config-map-class)# service-policy output shape
Router(config-map-class)# interface serial4/1
Router(config-if)# frame-relay interface-dlci 16
Router(config-fr-dlci)# class frts-shape

00:28:54: Serial4/1- Setting up HQF/MQC QOS. <---Indicates that the last legacy
restriction has been removed and that HQF is being installed on the interface.

Router(config-fr-dlci)# no class frts-shape

00:29:02: Serial4/1- Setting up interface for legacy QOS. <--- Indicates that legacy QoS
has been installed on the interface.
```

Related Commands

Command	Description
show debug	Displays active debug output.

show frame-relay pvc

To display statistics about Frame Relay permanent virtual circuits (PVCs), use the **show frame-relay pvc** command in privileged EXEC mode.

show frame-relay pvc [[interface *interface*] [*dlci*] [**64-bit**] | **summary** [**all**]]

Syntax Description

interface	(Optional) Specific interface for which PVC information will be displayed.
interface	(Optional) Interface number containing the data-link connection identifiers (DLCIs) for which you wish to display PVC information.
dlci	(Optional) A specific DLCI number used on the interface. Statistics for the specified PVC are displayed when a DLCI is also specified.
64-bit	(Optional) Displays 64-bit counter statistics.
summary	(Optional) Displays a summary of all PVCs on the system.
all	(Optional) Displays a summary of all PVCs on each interface.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(1)T	This command was modified to display statistics about virtual access interfaces used for PPP connections over Frame Relay.
12.0(3)XG	This command was modified to include the fragmentation type and size associated with a particular PVC when fragmentation is enabled on the PVC.
12.0(4)T	This command was modified to include the fragmentation type and size associated with a particular PVC when fragmentation is enabled on the PVC.
12.0(5)T	This command was modified to include information on the special voice queue that is created using the **queue** keyword of the **frame-relay voice bandwidth** command.
12.1(2)T	This command was modified to display the following information: • Details about the policy map attached to a specific PVC. • The priority configured for PVCs within Frame Relay PVC interface priority queueing. • Details about Frame Relay traffic shaping and policing on switched PVCs.
12.0(12)S	This command was modified to display reasons for packet drops and complete status information for switched NNI PVCs.
12.1(5)T	This command was modified to display the following information: • The number of packets in the post-hardware-compression queue. • The reasons for packet drops and complete status information for switched network-to-network PVCs.

Release	Modification
12.0(17)S	This command was modified to display the number of outgoing packets dropped and the number of outgoing bytes dropped because of QoS policy.
12.2 T	This command was modified to show that when payload compression is configured for a PVC, the throughput rate reported by the PVC is equal to the rate reported by the interface.
12.2(4)T	The **64-bit** keyword was added.
12.2(11)T	This command was modified to display the number of outgoing packets dropped and the number of outgoing bytes dropped because of QoS policy.
12.2(13)T	This command was modified to support display of Frame Relay PVC bundle information.
12.2(15)T	This command was modified to support display of Frame Relay voice-adaptive fragmentation information.
12.2(27)SBC	The **summary** and **all** keywords were added.
12.2(28)SB	This command was modified to support hierarchical queueing framework (HQF).

Usage Guidelines

Use this command to monitor the PPP link control protocol (LCP) state as being open with an up state or closed with a down state.

When "vofr" or "vofr cisco" has been configured on the PVC, and a voice bandwidth has been allocated to the class associated with this PVC, configured voice bandwidth and used voice bandwidth are also displayed.

Statistics Reporting

To obtain statistics about PVCs on all Frame Relay interfaces, use this command with no arguments.

To obtain statistics about a PVC that include policy-map configuration or the priority configured for that PVC, use this command with the *dlci* argument.

To display a summary of all PVCs on the system, use the **show frame-relay pvc** command with the **summary** keyword. To display a summary of all PVCs per interface, use the **summary all** keywords.

Per-VC counters are not incremented at all when either autonomous or silicon switching engine (SSE) switching is configured; therefore, PVC values will be inaccurate if either switching method is used.

You can change the period of time over which a set of data is used for computing load statistics. If you decrease the load interval, the average statistics are computed over a shorter period of time and are more responsive to bursts of traffic. To change the length of time for which a set of data is used to compute load statistics for a PVC, use the **load-interval** command in Frame-Relay DLCI configuration mode.

Traffic Shaping

Congestion control mechanisms are currently not supported on terminated PVCs nor on PVCs over ISDN. Where congestion control mechanisms are supported, the switch passes forward explicit congestion notification (FECN) bits, backward explicit congestion notification (BECN) bits, and discard eligible (DE) bits unchanged from entry points to exit points in the network.

Examples

The various displays in this section show sample output for a variety of PVCs. Some of the PVCs carry data only; some carry a combination of voice and data. This section contains the following examples:

Summary of Frame Relay PVCs Example

The following example shows sample output of the **show frame-relay pvc** command with the **summary** keyword. The **summary** keyword displays all PVCs on the system.

```
Router# show frame-relay pvc summary

Frame-Relay VC Summary

               Active     Inactive      Deleted       Static
  Local           0           12            0            0
  Switched        0            0            0            0
  Unused          0            0            0            0
```

The following example shows sample output for the **show frame-relay pvc** command with the **summary** and **all** keywords. The **summary** and **all** keywords display all PVCs per interface.

```
Router# show frame-relay pvc summary all

VC Summary for interface Serial3/0 (Frame Relay DTE)

               Active     Inactive      Deleted       Static
  Local           0            7            0            0
  Switched        0            0            0            0
  Unused          0            0            0            0

VC Summary for interface Serial3/1 (Frame Relay DTE)

               Active     Inactive      Deleted       Static
  Local           0            5            0            0
  Switched        0            0            0            0
  Unused          0            0            0            0
```

Frame Relay Generic Configuration Example

The following sample output shows a generic Frame Relay configuration on DLCI 100:

```
Router# show frame-relay pvc 100

PVC Statistics for interface Serial4/0/1:0 (Frame Relay DTE)

DLCI = 100, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE (EEK UP), INTERFACE = Serial4/0/1:0.1

  input pkts 4360          output pkts 4361         in bytes 146364
  out bytes 130252         dropped pkts 3735        in pkts dropped 0
  out pkts dropped 3735             out bytes dropped 1919790
  late-dropped out pkts 3735        late-dropped out bytes 1919790
  in FECN pkts 0           in BECN pkts 0           out FECN pkts 0
  out BECN pkts 0          in DE pkts 0             out DE pkts 0
  out bcast pkts 337       out bcast bytes 102084
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  pvc create time 05:34:06, last time pvc status changed 05:33:38
```

Frame Relay Voice-Adaptive Fragmentation Example

The following sample output indicates that Frame Relay voice-adaptive fragmentation is active on DLCI 202 and there are 29 seconds left on the deactivation timer. If no voice packets are detected in the next 29 seconds, Frame Relay voice-adaptive fragmentation will become inactive.

```
Router# show frame-relay pvc 202

PVC Statistics for interface Serial3/1 (Frame Relay DTE)

DLCI = 202, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial3/1.2

  input pkts 0             output pkts 479          in bytes 0
  out bytes 51226          dropped pkts 0           in pkts dropped 0
  out pkts dropped 0               out bytes dropped 0
  in FECN pkts 0           in BECN pkts 0           out FECN pkts 0
  out BECN pkts 0          in DE pkts 0             out DE pkts 0
  out bcast pkts 0         out bcast bytes 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 5000 bits/sec, 5 packets/sec
  pvc create time 00:23:36, last time pvc status changed 00:23:31
  fragment type end-to-end fragment size 80 adaptive active, time left 29 secs
```

Frame Relay PVC Bundle Example

The following sample output indicates that PVC 202 is a member of VC bundle MAIN-1-static:

```
Router# show frame-relay pvc 202

PVC Statistics for interface Serial1/4 (Frame Relay DTE)

DLCI = 202, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial1/4

  input pkts 0             output pkts 45           in bytes 0
  out bytes 45000          dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 0         out bcast bytes 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 2000 bits/sec, 2 packets/sec
  pvc create time 00:01:25, last time pvc status changed 00:01:11
  VC-Bundle MAIN-1-static
```

Frame Relay 64-Bit Counter Example

The following sample output displays the Frame Relay 64-bit counters:

```
Router# show frame-relay pvc 35 64-bit

DLCI = 35, INTERFACE = Serial0/0
  input pkts 0                      output pkts 0
  in bytes 0                        out bytes 0
```

Frame Relay Fragmentation and Hardware Compression Example

The following is sample output for the **show frame-relay pvc** command for a PVC configured with Cisco-proprietary fragmentation and hardware compression:

```
Router# show frame-relay pvc 110

PVC Statistics for interface Serial0/0 (Frame Relay DTE)

DLCI = 110, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial0/0

  input pkts 409           output pkts 409          in bytes 3752
  out bytes 4560           dropped pkts 1           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 0          out bcast bytes 0
  pvc create time 3d00h, last time pvc status changed 2d22h
  Service type VoFR-cisco
   Voice Queueing Stats: 0/100/0 (size/max/dropped)
  Post h/w compression queue: 0
  Current fair queue configuration:
   Discard     Dynamic      Reserved
   threshold   queue count  queue count
   64          16           2
  Output queue size 0/max total 600/drops 0
  configured voice bandwidth 16000, used voice bandwidth 0
  fragment type VoFR-cisco         fragment size 100
  cir 64000     bc   640       be 0         limit 80     interval 10
  mincir 32000     byte increment 80    BECN response no
  frags 428       bytes 4810      frags delayed 24        bytes delayed 770
  shaping inactive
  traffic shaping drops 0
  ip rtp priority parameters 16000 32000 20000
```

Switched PVC Example

The following is sample output from the **show frame-relay pvc** command for a switched Frame Relay PVC. This output displays detailed information about Network-to-Network Interface (NNI) status and why packets were dropped from switched PVCs.

```
Router# show frame-relay pvc

 PVC Statistics for interface Serial2/2 (Frame Relay NNI)

 DLCI = 16, DLCI USAGE = SWITCHED, PVC STATUS = INACTIVE, INTERFACE = Serial2/2
 LOCAL PVC STATUS = INACTIVE, NNI PVC STATUS = INACTIVE

   input pkts 0             output pkts 0            in bytes 0
   out bytes 0              dropped pkts 0           in FECN pkts 0
   in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
   in DE pkts 0             out DE pkts 0
   out bcast pkts 0         out bcast bytes 0
   switched pkts0
   Detailed packet drop counters:
   no out intf 0            out intf down 0          no out PVC 0
```

```
  in PVC down 0            out PVC down 0           pkt too big 0
  shaping Q full 0         pkt above DE 0           policing drop 0
  pvc create time 00:00:07, last time pvc status changed 00:00:07
```

Frame Relay Congestion Management on a Switched PVC Example

The following is sample output from the **show frame-relay pvc** command that shows the statistics for a switched PVC on which Frame Relay congestion management is configured:

```
Router# show frame-relay pvc 200

PVC Statistics for interface Serial3/0 (Frame Relay DTE)

DLCI = 200, DLCI USAGE = SWITCHED, PVC STATUS = ACTIVE, INTERFACE = Serial3/0

  input pkts 341           output pkts 390          in bytes 341000
  out bytes 390000         dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 390
  out bcast pkts 0          out bcast bytes 0            Num Pkts Switched 341

  pvc create time 00:10:35, last time pvc status changed 00:10:06
  Congestion DE threshold 50
  shaping active
  cir 56000     bc 7000      be 0         byte limit 875    interval 125
  mincir 28000     byte increment 875   BECN response no
  pkts 346       bytes 346000    pkts delayed 339       bytes delayed 339000
  traffic shaping drops 0
  Queueing strategy:fifo
  Output queue 48/100, 0 drop, 339 dequeued
```

Frame Relay Policing on a Switched PVC Example

The following is sample output from the **show frame-relay pvc** command that shows the statistics for a switched PVC on which Frame Relay policing is configured:

```
Router# show frame-relay pvc 100

PVC Statistics for interface Serial1/0 (Frame Relay DCE)

DLCI = 100, DLCI USAGE = SWITCHED, PVC STATUS = ACTIVE, INTERFACE = Serial1/0

  input pkts 1260          output pkts 0            in bytes 1260000
  out bytes 0              dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 0          out bcast bytes 0            Num Pkts Switched 1260

  pvc create time 00:03:57, last time pvc status changed 00:03:19
  policing enabled, 180 pkts marked DE
  policing Bc  6000        policing Be  6000        policing Tc  125 (msec)
  in Bc pkts   1080        in Be pkts   180         in xs pkts   0
  in Bc bytes  1080000     in Be bytes  180000      in xs bytes  0
```

Frame Relay PVC Priority Queueing Example

The following is sample output for a PVC that has been assigned high priority:

```
Router# show frame-relay pvc 100

PVC Statistics for interface Serial0 (Frame Relay DTE)

DLCI = 100, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0
```

```
  input pkts 0             output pkts 0            in bytes 0
  out bytes 0              dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 0          out bcast bytes 0
  pvc create time 00:00:59, last time pvc status changed 00:00:33
  priority high
```

Low Latency Queueing for Frame Relay Example

The following is sample output from the **show frame-relay pvc** command for a PVC shaped to a 64000 bps committed information rate (CIR) with fragmentation. A policy map is attached to the PVC and is configured with a priority class for voice, two data classes for IP precedence traffic, and a default class for best-effort traffic. Weighted Random Early Detection (WRED) is used as the drop policy on one of the data classes.

```
Router# show frame-relay pvc 100

PVC Statistics for interface Serial1/0 (Frame Relay DTE)

DLCI = 100, DLCI USAGE = LOCAL, PVC STATUS = INACTIVE, INTERFACE = Serial1/0.1

  input pkts 0             output pkts 0            in bytes 0
  out bytes 0              dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 0          out bcast bytes 0
  pvc create time 00:00:42, last time pvc status changed 00:00:42
  service policy mypolicy
 Class voice
  Weighted Fair Queueing
      Strict Priority
      Output Queue: Conversation 72
        Bandwidth 16 (kbps) Packets Matched 0
        (pkts discards/bytes discards) 0/0
 Class immediate-data
  Weighted Fair Queueing
      Output Queue: Conversation 73
        Bandwidth 60 (%) Packets Matched 0
        (pkts discards/bytes discards/tail drops) 0/0/0
        mean queue depth: 0
        drops: class  random   tail     min-th   max-th   mark-prob
               0      0        0        64       128      1/10
               1      0        0        71       128      1/10
               2      0        0        78       128      1/10
               3      0        0        85       128      1/10
               4      0        0        92       128      1/10
               5      0        0        99       128      1/10
               6      0        0        106      128      1/10
               7      0        0        113      128      1/10
               rsvp   0        0        120      128      1/10
 Class priority-data
  Weighted Fair Queueing
      Output Queue: Conversation 74
        Bandwidth 40 (%) Packets Matched 0 Max Threshold 64 (packets)
        (pkts discards/bytes discards/tail drops) 0/0/0
 Class class-default
  Weighted Fair Queueing
      Flow Based Fair Queueing
      Maximum Number of Hashed Queues 64  Max Threshold 20 (packets)
  Output queue size 0/max total 600/drops 0
  fragment type end-to-end         fragment size 50
  cir 64000     bc   640       be 0         limit 80     interval 10
```

```
  mincir 64000     byte increment 80    BECN response no
  frags 0         bytes 0         frags delayed 0         bytes delayed 0
  shaping inactive
  traffic shaping drops 0
```

PPP over Frame Relay Example

The following is sample output from the **show frame-relay pvc** command that shows the PVC statistics for serial interface 5 (slot 1 and DLCI 55 are up) during a PPP session over Frame Relay:

```
Router# show frame-relay pvc 55

PVC Statistics for interface Serial5/1 (Frame Relay DTE)
DLCI = 55, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial5/1.1
     input pkts 9             output pkts 16           in bytes 154
     out bytes 338            dropped pkts 6           in FECN pkts 0
     in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
     in DE pkts 0             out DE pkts 0
     out bcast pkts 0         out bcast bytes 0
     pvc create time 00:35:11, last time pvc status changed 00:00:22
     Bound to Virtual-Access1 (up, cloned from Virtual-Template5)
```

Voice over Frame Relay Example

The following is sample output from the **show frame-relay pvc** command for a PVC carrying Voice over Frame Relay (VoFR) traffic configured via the **vofr cisco** command. The **frame-relay voice bandwidth** command has been configured on the class associated with this PVC, as has fragmentation. The fragmentation type employed is proprietary to Cisco.

A sample configuration for this situation is shown first, followed by the output for the **show frame-relay pvc** command.

```
interface serial 0
 encapsulation frame-relay
 frame-relay traffic-shaping
 frame-relay interface-dlci 108
  vofr cisco
  class vofr-class
map-class frame-relay vofr-class
 frame-relay fragment 100
 frame-relay fair-queue
 frame-relay cir 64000
 frame-relay voice bandwidth 25000

Router# show frame-relay pvc 108

PVC Statistics for interface Serial0 (Frame Relay DTE)
DLCI = 108, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial0
  input pkts 1260          output pkts 1271         in bytes 95671
  out bytes 98604          dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 1271       out bcast bytes 98604
  pvc create time 09:43:17, last time pvc status changed 09:43:17
  Service type VoFR-cisco
  configured voice bandwidth 25000, used voice bandwidth 0
  voice reserved queues 24, 25
  fragment type VoFR-cisco         fragment size 100
  cir 64000     bc 64000     be 0         limit 1000   interval 125
  mincir 32000     byte increment 1000  BECN response no
  pkts 2592      bytes 205140    pkts delayed 1296      bytes delayed 102570
  shaping inactive
  shaping drops 0
  Current fair queue configuration:
```

```
   Discard     Dynamic      Reserved
   threshold   queue count  queue count
    64          16           2
  Output queue size 0/max total 600/drops 0
```

FRF.12 Fragmentation Example

The following is sample output from the **show frame-relay pvc** command for an application employing pure FRF.12 fragmentation. A sample configuration for this situation is shown first, followed by the output for the **show frame-relay pvc** command.

```
interface serial 0
 encapsulation frame-relay
 frame-relay traffic-shaping
 frame-relay interface-dlci 110
  class frag
map-class frame-relay frag
 frame-relay fragment 100
 frame-relay fair-queue
 frame-relay cir 64000

Router# show frame-relay pvc 110

PVC Statistics for interface Serial0 (Frame Relay DTE)
DLCI = 110, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial0
  input pkts 0             output pkts 243          in bytes 0
  out bytes 7290           dropped pkts 0           in FECN pkts 0
  in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
  in DE pkts 0             out DE pkts 0
  out bcast pkts 243        out bcast bytes 7290
  pvc create time 04:03:17, last time pvc status changed 04:03:18
  fragment type end-to-end         fragment size 100
  cir 64000     bc 64000     be 0         limit 1000   interval 125
  mincir 32000     byte increment 1000  BECN response no
  pkts 486       bytes 14580     pkts delayed 243       bytes delayed 7290
  shaping inactive
  shaping drops 0
  Current fair queue configuration:
   Discard     Dynamic      Reserved
   threshold   queue count  queue count
   64          16           2
  Output queue size 0/max total 600/drops 0
```

Note that when voice is not configured, voice bandwidth output is not displayed.

Multipoint Subinterfaces Transporting Data

The following is sample output from the **show frame-relay pvc** command for multipoint subinterfaces carrying data only. The output displays both the subinterface number and the DLCI. This display is the same whether the PVC is configured for static or dynamic addressing. Note that neither fragmentation nor voice is configured on this PVC.

```
Router# show frame-relay pvc

DLCI = 300, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.103
input pkts 10  output pkts 7  in bytes 6222
out bytes 6034  dropped pkts 0  in FECN pkts 0
in BECN pkts 0  out FECN pkts 0  out BECN pkts 0
in DE pkts 0  out DE pkts 0
outbcast pkts 0  outbcast bytes 0
pvc create time 0:13:11  last time pvc status changed 0:11:46
DLCI = 400, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial0.104
input pkts 20  output pkts 8  in bytes 5624
out bytes 5222  dropped pkts 0  in FECN pkts 0
```

```
in BECN pkts 0  out FECN pkts 0  out BECN pkts 0
in DE pkts 0  out DE pkts 0
outbcast pkts 0  outbcast bytes 0
pvc create time 0:03:57  last time pvc status changed 0:03:48
```

PVC Shaping When HQF is Enabled

The following is sample output from the **show frame-relay pvc** command for a PVC when HQF is enabled:

```
Router# show frame-relay pvc 16

PVC Statistics for interface Serial4/1 (Frame Relay DTE)

DLCI = 16, DLCI USAGE = LOCAL, PVC STATUS = ACTIVE, INTERFACE = Serial4/1

  input pkts 1             output pkts 1            in bytes 34
  out bytes 34             dropped pkts 0           in pkts dropped 0
  out pkts dropped 0                 out bytes dropped 0
  in FECN pkts 0           in BECN pkts 0           out FECN pkts 0
  out BECN pkts 0          in DE pkts 0             out DE pkts 0
  out bcast pkts 1         out bcast bytes 34
  pvc create time 00:09:07, last time pvc status changed 00:09:07
  shaping inactive
```

PVC Transporting Voice and Data

The following is sample output from the **show frame-relay pvc** command for a PVC carrying voice and data traffic, with a special queue specifically for voice traffic created using the **frame-relay voice bandwidth** command **queue** keyword:

```
Router# show frame-relay pvc interface serial 1 45

 PVC Statistics for interface Serial1 (Frame Relay DTE)

 DLCI = 45, DLCI USAGE = LOCAL, PVC STATUS = STATIC, INTERFACE = Serial1

   input pkts 85            output pkts 289          in bytes 1730
   out bytes 6580           dropped pkts 11          in FECN pkts 0
   in BECN pkts 0           out FECN pkts 0          out BECN pkts 0
   in DE pkts 0             out DE pkts 0
   out bcast pkts 0          out bcast bytes 0
   pvc create time 00:02:09, last time pvc status changed 00:02:09
   Service type VoFR
   configured voice bandwidth 25000, used voice bandwidth 22000
   fragment type VoFR         fragment size 100
   cir 20000     bc   1000      be 0         limit 125    interval 50
   mincir 20000     byte increment 125   BECN response no
   fragments 290       bytes 6613      fragments delayed 1         bytes delayed 33
   shaping inactive
   traffic shaping drops 0
    Voice Queueing Stats: 0/100/0 (size/max/dropped)
   ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
   Current fair queue configuration:
    Discard     Dynamic      Reserved
    threshold   queue count  queue count
    64          16           2
   Output queue size 0/max total 600/drops 0
```

Table 1 describes the significant fields shown in the displays.

Table 1 show frame-relay pvc Field Descriptions

Field	Description
DLCI	One of the DLCI numbers for the PVC.
DLCI USAGE	Lists SWITCHED when the router or access server is used as a switch, or LOCAL when the router or access server is used as a DTE device.
PVC STATUS	Status of the PVC: ACTIVE, INACTIVE, or DELETED.
INTERFACE	Specific subinterface associated with this DLCI.
LOCAL PVC STATUS[1]	Status of PVC configured locally on the NNI interface.
NNI PVC STATUS[1]	Status of PVC learned over the NNI link.
input pkts	Number of packets received on this PVC.
output pkts	Number of packets sent on this PVC.
in bytes	Number of bytes received on this PVC.
out bytes	Number of bytes sent on this PVC.
dropped pkts	Number of incoming and outgoing packets dropped by the router at the Frame Relay level.
in pkts dropped	Number of incoming packets dropped. Incoming packets may be dropped for a number of reasons, including the following: • Inactive PVC • Policing • Packets received above DE discard level • Dropped fragments • Memory allocation failures • Configuration problems
out pkts dropped	Number of outgoing packets dropped, including shaping drops and late drops.
out bytes dropped	Number of outgoing bytes dropped.
late-dropped out pkts	Number of outgoing packets dropped because of QoS policy (such as with VC queuing or Frame Relay traffic shaping). This field is not displayed when the value is zero.
late-dropped out bytes	Number of outgoing bytes dropped because of QoS policy (such with as VC queuing or Frame Relay traffic shaping). This field is not displayed when the value is zero.
in FECN pkts	Number of packets received with the FECN bit set.
in BECN pkts	Number of packets received with the BECN bit set.
out FECN pkts	Number of packets sent with the FECN bit set.
out BECN pkts	Number of packets sent with the BECN bit set.
in DE pkts	Number of DE packets received.
out DE pkts	Number of DE packets sent.
out bcast pkts	Number of output broadcast packets.
out bcast bytes	Number of output broadcast bytes.

Table 1 show frame-relay pvc Field Descriptions (Continued)

Field	Description
switched pkts	Number of switched packets.
no out intf[2]	Number of packets dropped because there is no output interface.
out intf down[2]	Number of packets dropped because the output interface is down.
no out PVC[2]	Number of packets dropped because the outgoing PVC is not configured.
in PVC down[2]	Number of packets dropped because the incoming PVC is inactive.
out PVC down[2]	Number of packets dropped because the outgoing PVC is inactive.
pkt too big[2]	Number of packets dropped because the packet size is greater than media MTU[3].
shaping Q full[2]	Number of packets dropped because the Frame Relay traffic-shaping queue is full.
pkt above DE[2]	Number of packets dropped because they are above the DE level when Frame Relay congestion management is enabled.
policing drop[2]	Number of packets dropped because of Frame Relay traffic policing.
pvc create time	Time at which the PVC was created.
last time pvc status changed	Time at which the PVC changed status.
VC-Bundle	PVC bundle of which the PVC is a member.
priority	Priority assigned to the PVC.
pkts marked DE	Number of packets marked DE because they exceeded the Bc.
policing Bc	Committed burst size.
policing Be	Excess burst size.
policing Tc	Measurement interval for counting Bc and Be.
in Bc pkts	Number of packets received within the committed burst.
in Be pkts	Number of packets received within the excess burst.
in xs pkts	Number of packets dropped because they exceeded the combined burst.
in Bc bytes	Number of bytes received within the committed burst.
in Be bytes	Number of bytes received within the excess burst.
in xs bytes	Number of bytes dropped because they exceeded the combined burst.
Congestion DE threshold	PVC queue percentage at which packets with the DE bit are dropped.
Congestion ECN threshold	PVC queue percentage at which packets are set with the BECN and FECN bits.
Service type	Type of service performed by this PVC. Can be VoFR or VoFR-cisco.
Post h/w compression queue	Number of packets in the post-hardware-compression queue when hardware compression and Frame Relay fragmentation are configured.
configured voice bandwidth	Amount of bandwidth in bits per second (bps) reserved for voice traffic on this PVC.
used voice bandwidth	Amount of bandwidth in bps currently being used for voice traffic.
service policy	Name of the output service policy applied to the VC.

Table 1 show frame-relay pvc Field Descriptions (Continued)

Field	Description
Class	Class of traffic being displayed. Output is displayed for each configured class in the policy.
Output Queue	The WFQ[4] conversation to which this class of traffic is allocated.
Bandwidth	Bandwidth in kbps or percentage configured for this class.
Packets Matched	Number of packets that matched this class.
Max Threshold	Maximum queue size for this class when WRED is not used.
pkts discards	Number of packets discarded for this class.
bytes discards	Number of bytes discarded for this class.
tail drops	Number of packets discarded for this class because the queue was full.
mean queue depth	Average queue depth, based on the actual queue depth on the interface and the exponential weighting constant. It is a moving average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
drops:	WRED parameters.
class	IP precedence value.
random	Number of packets randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence value.
tail	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence value.
min-th	Minimum WRED threshold in number of packets.
max-th	Maximum WRED threshold in number of packets.
mark-prob	Fraction of packets dropped when the average queue depth is at the maximum threshold.
Maximum Number of Hashed Queues	(Applies to class default only) Number of queues available for unclassified flows.
fragment type	Type of fragmentation configured for this PVC. Possible types are as follows: • end-to-end—Fragmented packets contain the standard FRF.12 header • VoFR—Fragmented packets contain the FRF.11 Annex C header • VoFR-cisco—Fragmented packets contain the Cisco proprietary header
fragment size	Size of the fragment payload in bytes.
adaptive active/inactive	Indicates whether Frame Relay voice-adaptive fragmentation is active or inactive.
time left	Number of seconds left on the Frame Relay voice-adaptive fragmentation deactivation timer. When this timer expires, Frame Relay fragmentation turns off.
cir	Current CIR in bps.
bc	Current committed burst (Bc) size, in bits.

Table 1 show frame-relay pvc Field Descriptions (Continued)

Field	Description
be	Current excess burst (Be) size, in bits.
limit	Maximum number of bytes sent per internal interval (excess plus sustained).
interval	Interval being used internally (may be smaller than the interval derived from Bc/CIR; this happens when the router determines that traffic flow will be more stable with a smaller configured interval).
mincir	Minimum CIR for the PVC.
byte increment	Number of bytes that will be sustained per internal interval.
BECN response	Indication that Frame Relay has BECN adaptation configured.
pkts	Number of packets associated with this PVC that have gone through the traffic-shaping system.
frags	Total number of fragments shaped on this VC.
bytes	Number of bytes associated with this PVC that have gone through the traffic-shaping system.
pkts delayed	Number of packets associated with this PVC that have been delayed by the traffic-shaping system.
frags delayed	Number of fragments delayed in the shaping queue before being sent.
bytes delayed	Number of bytes associated with this PVC that have been delayed by the traffic-shaping system.
shaping	Indication that shaping will be active for all PVCs that are fragmenting data; otherwise, shaping will be active if the traffic being sent exceeds the CIR for this circuit.
shaping drops	Number of packets dropped by the traffic-shaping process.
Queueing strategy	Per-VC queueing strategy.
Output queue 48/100 0 drop 300 dequeued	State of the per-VC queue. • Number of packets enqueued/size of the queue • Number of packets dropped • Number of packets dequeued
Voice Queueing Stats	Statistics showing the size of packets, the maximum number of packets, and the number of packets dropped in the special voice queue created using the **frame-relay voice bandwidth** command **queue** keyword.
Discard threshold	Maximum number of packets that can be stored in each packet queue. Additional packets received after a queue is full will be discarded.
Dynamic queue count	Number of packet queues reserved for best-effort traffic.
Reserved queue count	Number of packet queues reserved for voice traffic.
Output queue size	Size in bytes of each output queue.
max total	Maximum number of packets of all types that can be queued in all queues.
drops	Number of frames dropped by all output queues.

1. The LOCAL PVC STATUS and NNI PVC STATUS fields are displayed only for PVCs configured on Frame Relay NNI interface types. These fields are not displayed if the PVC is configured on DCE or DTE interface types.

2. The detailed packet drop fields are displayed for switched Frame Relay PVCs only. These fields are not displayed for terminated PVCs.
3. MTU = maximum transmission unit.
4. WFQ = weighted fair queueing.

Related Commands

Command	Description
frame-relay accounting adjust	Enables byte count adjustment at the PVC level so that the number of bytes sent and received at the PVC corresponds to the actual number of bytes sent and received on the physical interface.
frame-relay interface-queue priority	Enables FR PIPQ on a Frame Relay interface and assigns priority to a PVC within a Frame Relay map class.
frame-relay pvc	Configures Frame Relay PVCs for FRF.8 Frame Relay-ATM Service Interworking.
service-policy	Attaches a policy map to an input interface or VC or an output interface or VC.
show dial-peer voice	Displays configuration information and call statistics for dial peers.
show frame-relay fragment	Displays Frame Relay fragmentation details.
show frame-relay map	Displays the current Frame Relay map entries and information about the connections
show frame-relay vc-bundle	Displays attributes and other information about a Frame Relay PVC bundle.

show policy-map

To display the configuration of all classes for a specified service policy map or all classes for all existing policy maps, use the **show policy-map** command in privileged EXEC mode.

show policy-map [*policy-map*]

Syntax Description

policy-map	(Optional) Name of the service policy map whose complete configuration is to be displayed.

Defaults

All existing policy map configurations are displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.2(13)T	The output of this command was modified for the Percentage-Based Policing and Shaping feature and includes the bandwidth percentage used when calculating traffic policing and shaping.
12.0(28)S	The output of this command was modified for the QoS: Percentage-Based Policing feature to display the committed (conform) burst (bc) and excess (peak) burst (be) sizes in milliseconds (ms).
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and its output was modified to display class-based policies when using hierarchical queueing framework (HQF) on an interface.

Usage Guidelines

The **show policy-map** command displays the configuration of a service policy map created using the **policy-map** command. You can use the **show policy-map** command to display all class configurations comprising any existing service policy map, whether or not that service policy map has been attached to an interface.

Examples

The following is sample output from the **show policy-map** command. This sample output displays the contents of a policy map called "policy1." In policy 1, traffic policing on the basis of a committed information rate (CIR) of 20 percent has been configured, and the bc and be have been specified in milliseconds. As part of the traffic policing configuration, optional conform, exceed, and violate actions have been specified.

```
Router# show policy-map policy1
  Policy Map policy1
```

```
Class class1
 police cir percent 20 bc 300 ms pir percent 40 be 400 ms
   conform-action transmit
   exceed-action drop
   violate-action drop
```

Table 2 describes the significant fields shown in the display.

Table 2 show policy-map Field Descriptions

Field	Description
Policy Map	Name of policy map displayed.
Class	Name of class configured in policy map displayed.
police	Indicates that traffic policing on the basis of specified percentage of bandwidth has been enabled. The committed burst (bc) and excess burst (be) sizes have been specified in milliseconds (ms), and optional conform, exceed, and violate actions have been specified.

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show policy-map interface	Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.

show policy-map interface

To display the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific permanent virtual circuit (PVC) on the interface, use the **show policy-map interface** command in privileged EXEC mode.

show policy-map interface [**type access-control**] *interface-name* [**vc** [*vpi*/] *vci*] [**dlci** *dlci*] [**input** | **output**]

ATM Shared Port Adapter

show policy-map interface atm *slot*/*subslot*/*port*[**.***subinterface*]

Syntax Description

type access-control	(Optional) Displays class maps configured to determine the exact pattern to look for in the protocol stack of interest.
interface-name	Name of the interface or subinterface whose policy configuration is to be displayed.
vc	(Optional) For ATM interfaces only, shows the policy configuration for a specified PVC. The name can be up to 16 characters long.
vpi/	(Optional) ATM network virtual path identifier (VPI) for this PVC. On the Cisco 7200 and 7500 series routers, this value ranges from 0 to 255. The *vpi* and *vci* arguments cannot both be set to 0; if one is 0, the other cannot be 0.
vci	(Optional) ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the **atm vc-per-vp** command. Typically, the lower values 0 to 31 are reserved for specific traffic (F4 Operation, Administration, and Maintenance (OAM), switched virtual circuit (SVC) signaling, Integrated Local Management Interface (ILMI), and so on) and should not be used. The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only. The *vpi* and *vci* arguments cannot both be set to 0; if one is 0, the other cannot be 0.
dlci	(Optional) Indicates that a specific PVC for which policy configuration will be displayed.
dlci	(Optional) A specific data-link connection identifier (DLCI) number used on the interface. Policy configuration for the corresponding PVC will be displayed when a DLCI is specified.
input	(Optional) Indicates that the statistics for the attached input policy will be displayed.
output	(Optional) Indicates that the statistics for the attached output policy will be displayed.

slot	(ATM Shared Port Adapter only) Chassis slot number. Refer to the appropriate hardware manual for slot information. For SIPs, refer to the platform-specific SPA hardware installation guide or the corresponding "Identifying Slots and Subslots for SIPs and SPAs" topic in the platform-specific SPA software configuration guide.
/subslot	(ATM Shared Port Adapter only) Secondary slot number on a SPA interface processor (SIP) where a SPA is installed. Refer to the platform-specific SPA hardware installation guide and the corresponding "Specifying the Interface Address on a SPA" topic in the platform-specific SPA software configuration guide for subslot information.
/port	(ATM Shared Port Adapter only) Port or interface number. Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding "Specifying the Interface Address" topics in the platform-specific SPA software configuration guide.
.*subinterface*	(ATM Shared Port Adapter only — Optional) Subinterface number. The number that precedes the period must match the number to which this subinterface belongs. The range is 1 to 4,294,967,293.

Defaults

The absence of both the forward slash (**/**) and a *vpi* value defaults the *vpi* value to 0. If this value is omitted, information for all virtual circuits (VCs) on the specified ATM interface or subinterface is displayed.

ATM Shared Port Adapter

When used with the ATM shared port adapter, this command has no default behavior or values.

Command Modes

Privileged EXEC

ATM Shared Port Adapter

When used with the ATM shared port adapter, EXEC or privileged EXEC.

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(5)XE	This command was integrated into Cisco IOS Release 12.0(5)XE.
12.0(7)S	This command was integrated into Cisco IOS Release 12.0(7)S.
12.1(1)E	This command was integrated into Cisco IOS Release 12.1(1)E.
12.1(2)T	This command was modified to display information about the policy for all Frame Relay PVCs on the interface, or, if a DLCI is specified, the policy for that specific PVC. This command was also modified to display the total number of packets marked by the quality of service (QoS) set action.
12.1(3)T	This command was modified to display per-class accounting statistics.
12.2(4)T	This command was modified for two-rate traffic policing. It now can display burst parameters and associated actions.

Release	Modification
12.2(8)T	The command was modified for the Policer Enhancement — Multiple Actions feature and the WRED — Explicit Congestion Notification (ECN) feature. For the Policer Enhancement — Multiple Actions feature, the command was modified to display the multiple actions configured for packets conforming to, exceeding, or violating a specific rate. For the WRED — Explicit Congestion Notification (ECN) feature, the command displays ECN marking information
12.2(13)T	The following modifications were made: • This command was modified for the Percentage-Based Policing and Shaping feature. • This command was modified for the Class-Based RTP and TCP Header Compression feature. • This command was modified as part of the Modular QoS CLI (MQC) Unconditional Packet Discard feature. Traffic classes in policy maps can now be configured to discard packets belonging to a specified class. • This command was modified to display the Frame Relay DLCI number as a criterion for matching traffic inside a class map. • This command was modified to display Layer 3 packet length as a criterion for matching traffic inside a class map. • This command was modified for the Enhanced Packet Marking feature. A mapping table (table map) can now be used to convert and propagate packet-marking values.
12.2(15)T	This command was modified to display Frame Relay voice-adaptive traffic-shaping information.
12.0(28)S	This command was modified for the QoS: Percentage-Based Policing feature to include milliseconds when calculating the committed (conform) burst (bc) and excess (peak) burst (be) sizes.
12.3(14)T	This command was modified to display bandwidth estimation parameters.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE. This command was modified to display aggregate WRED statistics for the ATM shared port adapter. Note that changes were made to the syntax, defaults, and command modes. These changes are labelled “ATM Shared Port Adapter.”
12.4(4)T	The **type access-control** keywords were added to support flexible packet matching.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and its output was modified to display either legacy (nondistributed processing) QoS or hierarchical queueing framework (HQF) parameters on FR interfaces or PVCs.

Usage Guidelines

The **show policy-map interface** command displays the packet statistics for classes on the specified interface or the specified PVC only if a service policy has been attached to the interface or the PVC.

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

The counters displayed after the **show policy-map interface** command is entered are updated only if congestion is present on the interface.

The **show policy-map interface** command displays policy information about Frame Relay PVCs only if Frame Relay Traffic Shaping (FRTS) is enabled on the interface.

The **show policy-map interface** command displays ECN marking information only if ECN is enabled on the interface.

To determine if shaping is active with HQF, check the queue depth field of the "(queue depth/total drops/no-buffer drops)" line in the **show policy-map interface** command output.

Examples

This section provides sample output from typical **show policy-map interface** commands. Depending upon the interface in use and the options enabled, the output you see may vary slightly from the ones shown below.

Example of Weighted Fair Queueing (WFQ) on Serial Interface

The following sample output of the **show policy-map interface** command displays the statistics for the serial 3/1 interface, to which a service policy called mypolicy (configured as shown below) is attached. Weighted fair queueing (WFQ) has been enabled on this interface. See Table 3 for an explanation of the significant fields that commonly appear in the command output.

```
policy-map mypolicy
  class voice
    priority 128
  class gold
   bandwidth 100
  class silver
   bandwidth 80
   random-detect

Router# show policy-map interface serial3/1 output

 Serial3/1

  Service-policy output: mypolicy

    Class-map: voice (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: ip precedence 5
      Weighted Fair Queueing
        Strict Priority
        Output Queue: Conversation 264
        Bandwidth 128 (kbps) Burst 3200 (Bytes)
        (pkts matched/bytes matched) 0/0
        (total drops/bytes drops) 0/0

    Class-map: gold (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: ip precedence 2
      Weighted Fair Queueing
        Output Queue: Conversation 265
        Bandwidth 100 (kbps) Max Threshold 64 (packets)
        (pkts matched/bytes matched) 0/0
        (depth/total drops/no-buffer drops) 0/0/0

    Class-map: silver (match-all)
      0 packets, 0 bytes
```

```
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: ip precedence 1
      Weighted Fair Queueing
        Output Queue: Conversation 266
        Bandwidth 80 (kbps)
        (pkts matched/bytes matched) 0/0
        (depth/total drops/no-buffer drops) 0/0/0
         exponential weight: 9
         mean queue depth: 0

class     Transmitted       Random drop      Tail drop    Minimum Maximum  Mark
          pkts/bytes        pkts/bytes       pkts/bytes    thresh  thresh  prob
0              0/0               0/0              0/0          20      40  1/10
1              0/0               0/0              0/0          22      40  1/10
2              0/0               0/0              0/0          24      40  1/10
3              0/0               0/0              0/0          26      40  1/10
4              0/0               0/0              0/0          28      40  1/10
5              0/0               0/0              0/0          30      40  1/10
6              0/0               0/0              0/0          32      40  1/10
7              0/0               0/0              0/0          34      40  1/10
rsvp           0/0               0/0              0/0          36      40  1/10

Class-map: class-default (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
```

Example of Traffic Shaping on Serial Interface

The following sample output from the **show policy-map interface** command displays the statistics for the serial 3/2 interface, to which a service policy called p1 (configured as shown below) is attached. Traffic shaping has been enabled on this interface. See Table 3 for an explanation of the significant fields that commonly appear in the command output.

```
policy-map p1
  class c1
   shape average 320000

Router# show policy-map interface serial3/2 output

 Serial3/2

  Service-policy output: p1

    Class-map: c1 (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: ip precedence 0
      Traffic Shaping
        Target    Byte   Sustain   Excess    Interval  Increment Adapt
        Rate      Limit  bits/int  bits/int  (ms)      (bytes)   Active
        320000    2000   8000      8000      25        1000      -

        Queue     Packets   Bytes     Packets   Bytes     Shaping
        Depth                         Delayed   Delayed   Active
        0         0         0         0         0         no

    Class-map: class-default (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
```

Table 3 describes significant fields commonly shown in the displays. The fields in the table are grouped according to the relevant QoS feature.

Table 3 show policy-map interface Field Descriptions [1]

Field	Description
Fields Associated with Classes or Service Policies	
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Note In distributed architecture platforms (such as the C7500), the value of the transfer rate, calculated as the difference between the offered rate and the drop rate counters, can sporadically deviate from the average by up to 20 percent or more. This can occur while no corresponding burst is registered by independent traffic analyser equipment.	
Match	Match criteria specified for the class of traffic. Choices include criteria such as IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental (EXP) value, access groups, and QoS groups. For more information about the variety of match criteria options available, refer to the chapter "Configuring the Modular Quality of Service Command-Line Interface" in the *Cisco IOS Quality of Service Solutions Configuration Guide*.
Fields Associated with Queueing (if Enabled)	
Output Queue	The weighted fair queueing (WFQ) conversation to which this class of traffic is allocated.
Bandwidth	Bandwidth, in either kbps or percentage, configured for this class and the burst size.

Table 3 show policy-map interface Field Descriptions [1] (Continued)

Field	Description
pkts matched/bytes matched	Number of packets (also shown in bytes) matching this class that were placed in the queue. This number reflects the total number of matching packets queued at any time. Packets matching this class are queued only when congestion exists. If packets match the class but are never queued because the network was not congested, those packets are not included in this total. However, if process switching is in use, the number of packets is always incremented even if the network is not congested.
depth/total drops/no-buffer drops	Number of packets discarded for this class. No-buffer indicates that no memory buffer exists to service the packet.
Fields Associated with Weighted Random Early Detection (WRED) (if Enabled)	
exponential weight	Exponent used in the average queue size calculation for a WRED parameter group.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a fluctuating average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
class	IP precedence level.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED. **Note** If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped *after* the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as "no-buffer drops") are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence level.
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence level.
Minimum thresh	Minimum threshold. Minimum WRED threshold in number of packets.
Maximum thresh	Maximum threshold. Maximum WRED threshold in number of packets.
Mark prob	Mark probability. Fraction of packets dropped when the average queue depth is at the maximum threshold.
Fields Associated with Traffic Shaping (if Enabled)	
Target Rate	Rate used for shaping traffic.
Byte Limit	Maximum number of bytes that can be transmitted per interval. Calculated as follows: ((Bc+Be) /8) x 1
Sustain bits/int	Committed burst (Bc) rate.
Excess bits/int	Excess burst (Be) rate.
Interval (ms)	Time interval value in milliseconds (ms).

Table 3 show policy-map interface Field Descriptions [1] (Continued)

Field	Description
Increment (bytes)	Number of credits (in bytes) received in the token bucket of the traffic shaper during each time interval.
Queue Depth	Current queue depth of the traffic shaper.
Packets	Total number of packets that have entered the traffic shaper system.
Bytes	Total number of bytes that have entered the traffic shaper system.
Packets Delayed	Total number of packets delayed in the queue of the traffic shaper before being transmitted.
Bytes Delayed	Total number of bytes delayed in the queue of the traffic shaper before being transmitted.
Shaping Active	Indicates whether the traffic shaper is active. For example, if a traffic shaper is active, and the traffic being sent exceeds the traffic shaping rate, a "yes" appears in this field.

1. A number in parentheses may appear next to the service-policy output name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

Example of Precedence-Based Aggregate WRED on ATM Shared Port Adapter

The following sample output of the **show policy-map interface** command displays the statistics for the ATM shared port adapter interface 4/1/0.10, to which a service policy called prec-aggr-wred (configured as shown below) is attached. Because aggregate WRED has been enabled on this interface, the class through Mark Prob statistics are aggregated by subclasses. See Table 4 for an explanation of the significant fields that commonly appear in the command output.

```
Router(config)# policy-map prec-aggr-wred
Router(config-pmap)# class class-default
Router(config-pmap-c)# random-detect aggregate
Router(config-pmap-c)# random-detect precedence values 0 1 2 3 minimum thresh 10
maximum-thresh 100 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 4 5 minimum-thresh 40
maximum-thresh 400 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 6 minimum-thresh 60 maximum-thresh
600 mark-prob 10
Router(config-pmap-c)# random-detect precedence values 7 minimum-thresh 70 maximum-thresh
700 mark-prob 10
Router(config-pmap-c)# interface ATM4/1/0.10 point-to-point
Router(config-subif)# ip address 10.0.0.2 255.255.255.0
Router(config-subif)# pvc 10/110
Router(config-subif)# service-policy output prec-aggr-wred


Router# show policy-map interface a4/1/0.10
 ATM4/1/0.10: VC 10/110 -

  Service-policy output: prec-aggr-wred

    Class-map: class-default (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
        Exp-weight-constant: 9 (1/512)
        Mean queue depth: 0
```

```
      class       Transmitted     Random drop      Tail drop     Minimum   Maximum  Mark
  pkts/bytespkts/bytespkts/bytesthreshthreshprob

      0  1  2  3       0/0              0/0             0/0          10      100  1/10
      4  5             0/0              0/0             0/0          40      400  1/10
      6                0/0              0/0             0/0          60      600  1/10
      7                0/0              0/0             0/0          70      700  1/10
```

Example of DSCP-Based Aggregate WRED on ATM Shared Port Adapter

The following sample output of the **show policy-map interface** command displays the statistics for the ATM shared port adapter interface 4/1/0.11, to which a service policy called dscp-aggr-wred (configured as shown below) is attached. Because aggregate WRED has been enabled on this interface, the class through Mark Prob statistics are aggregated by subclasses. See Table 4 for an explanation of the significant fields that commonly appear in the command output.

```
Router(config)# policy-map dscp-aggr-wred
Router(config-pmap)# class class-default
Router(config-pmap-c)# random-detect dscp-based aggregate minimum-thresh 1 maximum-thresh
10 mark-prob 10
Router(config-pmap-c)# random-detect dscp values 0 1 2 3 4 5 6 7 minimum-thresh 10
maximum-thresh 20 mark-prob 10
Router(config-pmap-c)# random-detect dscp values 8 9 10 11 minimum-thresh 10
maximum-thresh 40 mark-prob 10
Router(config)# interface ATM4/1/0.11 point-to-point
Router(config-subif)# ip address 10.0.0.2 255.255.255.0
Router(config-subif)# pvc 11/101
Router(config-subif)# service-policy output dscp-aggr-wred


Router# show policy-map interface a4/1/0.11
 ATM4/1/0.11: VC 11/101 -

  Service-policy output: dscp-aggr-wred

    Class-map: class-default (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
        Exp-weight-constant: 0 (1/1)
        Mean queue depth: 0
        class       Transmitted     Random drop      Tail drop     Minimum   Maximum  Mark
                  pkts/bytespkts/bytespkts/bytesthreshthreshprob
        default          0/0              0/0             0/0            1       10  1/10
        0  1  2  3
        4  5  6  7       0/0              0/0             0/0           10       20  1/10
        8  9  10 11      0/0              0/0             0/0           10       40  1/10
```

Table 4 describes the significant fields shown in the display when aggregate WRED is configured for an ATM shared port adapter.

Table 4 show policy-map interface Field Descriptions—Configured for Aggregate WRED on ATM Shared Port Adapter

Field	Description
exponential weight	Exponent used in the average queue size calculation for a Weighted Random Early Detection (WRED) parameter group.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a fluctuating average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
Note When Aggregate Weighted Random Early Detection (WRED) is enabled, the following WRED statistics will be aggregated based on their subclass (either their IP precedence or differentiated services code point (DSCP) value).	
class	IP precedence level or differentiated services code point (DSCP) value.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED. **Note** If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped *after* the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as "no-buffer drops") are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence level or DSCP value.
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence level or DSCP value.
Minimum thresh	Minimum threshold. Minimum WRED threshold in number of packets.
Maximum thresh	Maximum threshold. Maximum WRED threshold in number of packets.
Mark prob	Mark probability. Fraction of packets dropped when the average queue depth is at the maximum threshold.

Frame Relay Voice-Adaptive Traffic-Shaping show policy interface Command Example

The following sample output shows that Frame Relay voice-adaptive traffic shaping is currently active and has 29 seconds left on the deactivation timer. With traffic shaping active and the deactivation time set, this means that the current sending rate on DLCI 201 is minCIR, but if no voice packets are detected for 29 seconds, the sending rate will increase to CIR.

```
Router# show policy interface Serial3/1.1

 Serial3/1.1:DLCI 201 -

  Service-policy output:MQC-SHAPE-LLQ1

    Class-map:class-default (match-any)
      1434 packets, 148751 bytes
```

```
    30 second offered rate 14000 bps, drop rate 0 bps
    Match:any
    Traffic Shaping
         Target/Average   Byte   Sustain   Excess    Interval  Increment
           Rate           Limit  bits/int  bits/int  (ms)      (bytes)
          63000/63000     1890   7560      7560      120       945

      Adapt  Queue     Packets   Bytes     Packets   Bytes     Shaping
      Active Depth                         Delayed   Delayed   Active
      BECN   0         1434      162991    26        2704      yes
      Voice Adaptive Shaping active, time left 29 secs
```

Table 5 describes the significant fields shown in the display. Significant fields that are not described in Table 5 are described in Table 3, "show policy-map interface Field Descriptions."

Table 5 show policy-map interface Field Descriptions—Configured for Frame Relay Voice-Adaptive Traffic Shaping

Field	Description
Voice Adaptive Shaping active/inactive	Indicates whether Frame Relay voice-adaptive traffic shaping is active or inactive.
time left	Number of seconds left on the Frame Relay voice-adaptive traffic shaping deactivation timer.

Two-Rate Traffic Policing show policy-map interface Command Example

The following is sample output from the **show policy-map interface** command when two-rate traffic policing has been configured. In the example below, 1.25 Mbps of traffic is sent ("offered") to a policer class.

```
Router# show policy-map interface serial3/0

 Serial3/0

  Service-policy output: policy1

   Class-map: police (match all)
    148803 packets, 36605538 bytes
    30 second offered rate 1249000 bps, drop rate 249000 bps
    Match: access-group 101
    police:
     cir 500000 bps, conform-burst 10000, pir 1000000, peak-burst 100000
     conformed 59538 packets, 14646348 bytes; action: transmit
     exceeded 59538 packets, 14646348 bytes; action: set-prec-transmit 2
     violated 29731 packets, 7313826 bytes; action: drop
     conformed 499000 bps, exceed 500000 bps violate 249000 bps
   Class-map: class-default (match-any)
    19 packets, 1990 bytes
    30 seconds offered rate 0 bps, drop rate 0 bps
    Match: any
```

The two-rate traffic policer marks 500 kbps of traffic as conforming, 500 kbps of traffic as exceeding, and 250 kbps of traffic as violating the specified rate. Packets marked as conforming will be sent as is, and packets marked as exceeding will be marked with IP Precedence 2 and then sent. Packets marked as violating the specified rate are dropped.

Table 6 describes the significant fields shown in the display.

Table 6 show policy-map interface Field Descriptions—Configured for Two-Rate Traffic Policing

Field	Description
police	Indicates that the **police** command has been configured to enable traffic policing. Also, displays the specified CIR, conform burst size, peak information rate (PIR), and peak burst size used for marking packets.
conformed	Displays the action to be taken on packets conforming to a specified rate. Displays the number of packets and bytes on which the action was taken.
exceeded	Displays the action to be taken on packets exceeding a specified rate. Displays the number of packets and bytes on which the action was taken.
violated	Displays the action to be taken on packets violating a specified rate. Displays the number of packets and bytes on which the action was taken.

Multiple Traffic Policing Actions show policy-map interface Command Example

The following is sample output from the **show policy-map** command when the Policer Enhancement — Multiple Actions feature has been configured. The sample output from the **show policy-map interface** command displays the statistics for the serial 3/2 interface, to which a service policy called "police" (configured as shown below) is attached.

```
policy-map police
  class class-default
   police cir 1000000 pir 2000000
     conform-action transmit
     exceed-action set-prec-transmit 4
     exceed-action set-frde-transmit
     violate-action set-prec-transmit 2
     violate-action set-frde-transmit

Router# show policy-map interface serial3/2

Serial3/2: DLCI 100 -

Service-policy output: police

    Class-map: class-default (match-any)
      172984 packets, 42553700 bytes
      5 minute offered rate 960000 bps, drop rate 277000 bps
      Match: any
     police:
         cir 1000000 bps, bc 31250 bytes, pir 2000000 bps, be 31250 bytes
       conformed 59679 packets, 14680670 bytes; actions:
         transmit
exceeded 59549 packets, 14649054 bytes; actions:
         set-prec-transmit 4
         set-frde-transmit
       violated 53758 packets, 13224468 bytes; actions:
         set-prec-transmit 2
         set-frde-transmit
       conformed 340000 bps, exceed 341000 bps, violate 314000 bps
```

The sample output from **show policy-map interface** command shows the following:

- 59679 packets were marked as conforming packets (that is, packets conforming to the CIR) and were transmitted unaltered.
- 59549 packets were marked as exceeding packets (that is, packets exceeding the CIR but not exceeding the PIR). Therefore, the IP Precedence value of these packets was changed to an IP Precedence level of 4, the discard eligibility (DE) bit was set to 1, and the packets were transmitted with these changes.
- 53758 packets were marked as violating packets (that is, exceeding the PIR). Therefore, the IP Precedence value of these packets was changed to an IP Precedence level of 2, the DE bit was set to 1, and the packets were transmitted with these changes.

Note Actions are specified by using the *action* argument of the **police** command. For more information about the available actions, see the **police** command reference page.

Table 7 describes the significant fields shown in the display.

Table 7 show policy-map interface Field Descriptions—Configured for Multiple Traffic Policing Actions

Field	Description
police	Indicates that the **police** command has been configured to enable traffic policing. Also, displays the specified CIR, conform burst size (BC), PIR, and peak burst size (BE) used for marking packets.
conformed, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as conforming to a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.
exceeded, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as exceeding a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.
violated, packets, bytes, actions	Displays the number of packets (also shown in bytes) marked as violating a specified rate and the actions taken on the packet. If there are multiple actions, each action is listed separately.

Explicit Congestion Notification show policy-map interface Command Example

The following is sample output from the **show policy-map interface** command when the WRED — Explicit Congestion Notification (ECN) feature has been configured. The words “explicit congestion notification” included in the output indicate that ECN has been enabled.

```
Router# show policy-map interface Serial4/1

 Serial4/1

  Service-policy output:policy_ecn
        Class-map:prec1 (match-all)
          1000 packets, 125000 bytes
          30 second offered rate 14000 bps, drop rate 5000 bps
          Match:ip precedence 1
          Weighted Fair Queueing
            Output Queue:Conversation 42
            Bandwidth 20 (%)
            Bandwidth 100 (kbps)
            (pkts matched/bytes matched) 989/123625
```

```
   (depth/total drops/no-buffer drops) 0/455/0
        exponential weight:9
        explicit congestion notification
        mean queue depth:0

class   Transmitted  Random drop  Tail drop   Minimum     Maximum     Mark
        pkts/bytes   pkts/bytes    pkts/bytes threshold   threshold   probability
  0       0/0          0/0          0/0          20          40         1/10
  1     545/68125      0/0          0/0          22          40         1/10
  2       0/0          0/0          0/0          24          40         1/10
  3       0/0          0/0          0/0          26          40         1/10
  4       0/0          0/0          0/0          28          40         1/10
  5       0/0          0/0          0/0          30          40         1/10
  6       0/0          0/0          0/0          32          40         1/10
  7       0/0          0/0          0/0          34          40         1/10
rsvp      0/0          0/0          0/0          36          40         1/10
class   ECN Mark
       pkts/bytes
  0     0/0
  1    43/5375
  2     0/0
  3     0/0
  4     0/0
  5     0/0
  6     0/0
  7     0/0
rsvp    0/0
```

Table 8 describes the significant fields shown in the display.

Table 8 show policy-map interface Field Descriptions—Configured for ECN

Field	Description
explicit congestion notification	Indication that Explicit Congestion Notification is enabled.
mean queue depth	Average queue depth based on the actual queue depth on the interface and the exponential weighting constant. It is a moving average. The minimum and maximum thresholds are compared against this value to determine drop decisions.
class	IP precedence value.
Transmitted pkts/bytes	Number of packets (also shown in bytes) passed through WRED and not dropped by WRED. **Note** If there is insufficient memory in the buffer to accommodate the packet, the packet can be dropped *after* the packet passes through WRED. Packets dropped because of insufficient memory in the buffer (sometimes referred to as “no-buffer drops”) are not taken into account by the WRED packet counter.
Random drop pkts/bytes	Number of packets (also shown in bytes) randomly dropped when the mean queue depth is between the minimum threshold value and the maximum threshold value for the specified IP precedence value.
Tail drop pkts/bytes	Number of packets dropped when the mean queue depth is greater than the maximum threshold value for the specified IP precedence value.
Minimum threshold	Minimum WRED threshold in number of packets.

Table 8 show policy-map interface Field Descriptions—Configured for ECN (Continued)

Field	Description
Maximum threshold	Maximum WRED threshold in number of packets.
Mark probability	Fraction of packets dropped when the average queue depth is at the maximum threshold.
ECN Mark pkts/bytes	Number of packets (also shown in bytes) marked by ECN.

Class-Based RTP and TCP Header Compression show policy-map interface Command Example

The following sample output from the **show policy-map interface** command shows the RTP header compression has been configured for a class called "prec2" in the policy map called "p1".

The **show policy-map interface** command output displays the type of header compression configured (RTP), the interface to which the policy map called "p1" is attached (Serial 4/1), the total number of packets, the number of packets compressed, the number of packets saved, the number of packets sent, and the rate at which the packets were compressed (in bits per second (bps)).

In this example, User Datagram Protocol (UDP)/RTP header compressions have been configured, and the compression statistics are included at the end of the display.

```
Router# show policy-map interface Serial4/1

Serial4/1

Service-policy output:p1

    Class-map:class-default (match-any)
      1005 packets, 64320 bytes
      30 second offered rate 16000 bps, drop rate 0 bps
      Match:any
compress:
          header ip rtp
          UDP/RTP Compression:
          Sent:1000 total, 999 compressed,
                41957 bytes saved, 17983 bytes sent
                3.33 efficiency improvement factor
                99% hit ratio, five minute miss rate 0 misses/sec, 0 max
                 rate 5000 bps
```

Table 9 describes the significant fields shown in the display.

Table 9 show policy-map interface Field Descriptions—Configured for Class-Based RTP and TCP Header Compression[1]

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.

Table 9 show policy-map interface Field Descriptions—Configured for Class-Based RTP and TCP Header Compression[1] (Continued)

Field	Description
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
UDP/RTP Compression	Indicates that RTP header compression has been configured for the class.
Sent total	Count of every packet sent, both compressed packets and full-header packets.
Sent compressed	Count of number of compressed packets sent.
bytes saved	Total number of bytes saved (that is, bytes not needing to be sent).
bytes sent	Total number of bytes sent for both compressed and full-header packets.
efficiency improvement factor	The percentage of increased bandwidth efficiency as a result of header compression. For example, with RTP streams, the efficiency improvement factor can be as much as 2.9 (or 290 percent).
hit ratio	Used mainly for troubleshooting purposes, this is the percentage of packets found in the context database. In most instances, this percentage should be high.
five minute miss rate	The number of new traffic flows found in the last five minutes.
misses/sec max	The average number of new traffic flows found per second, and the highest rate of new traffic flows to date.
rate	The actual traffic rate (in bits per second) after the packets are compressed.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

Modular QoS CLI (MQC) Unconditional Packet Discard show policy-map interface Command Example

The following sample output from the **show policy-map interface** command displays the statistics for the Serial2/0 interface, to which a policy map called "policy1" is attached. The discarding action has been specified for all the packets belonging to a class called "c1." In this example, 32000 bps of traffic is sent ("offered") to the class and all of them are dropped. Therefore, the drop rate shows 32000 bps.

```
Router# show policy-map interface Serial2/0

 Serial2/0

  Service-policy output: policy1

    Class-map: c1 (match-all)
       10184 packets, 1056436 bytes
       5 minute offered rate 32000 bps, drop rate 32000 bps
       Match: ip precedence 0
       drop
```

Table 10 describes the significant fields shown in the display.

Table 10 show policy-map interface Field Descriptions—Configured for MQC Unconditional Packet Discard[1]

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.

Table 10 show policy-map interface Field Descriptions—Configured for MQC Unconditional Packet Discard[1] (Continued)

Field	Description
Note	In distributed architecture platforms (such as the C7500), the value of the tranfer rate, calculated as the difference between the offered rate and the drop rate counters, can sporadically diviate from the average by up to 20 percent or more. This can occur while no corresponding burst is registered by independent traffic analyser equipment
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and QoS groups. For more information about the variety of match criteria options available, refer to the chapter "Configuring the Modular Quality of Service Command-Line Interface" in the *Cisco IOS Quality of Service Solutions Configuration Guide*.
drop	Indicates that the packet discarding action for all the packets belonging to the specified class has been configured.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

Percentage-Based Policing and Shaping show policy-map interface Command Example

The following sample output from the **show policy-map interface** command shows traffic policing configured using a CIR based on a bandwidth of 20 percent. The CIR and committed burst (Bc) in milliseconds (ms) are included in the display.

```
Router# show policy-map interface Serial3/1

 Serial3/1

  Service-policy output: mypolicy

    Class-map: gold (match-any)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
      police:
          cir 20 % bc 10 ms
          cir 2000000 bps, bc 2500 bytes
          pir 40 % be 20 ms
          pir 4000000 bps, be 10000 bytes
     conformed 0 packets, 0 bytes; actions:
      transmit
     exceeded 0 packets, 0 bytes; actions:
       drop
      violated 0 packets, 0 bytes; actions:
       drop
      conformed 0 bps, exceed 0 bps, violate 0 bps
```

Table 11 describes the significant fields shown in the display.

Table 11 show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping[1]

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
police	Indicates that traffic policing based on a percentage of bandwidth has been enabled. Also, displays the bandwidth percentage, the CIR, and the committed burst (Bc) size in ms.
conformed, actions	Displays the number of packets and bytes marked as conforming to the specified rates, and the action to be taken on those packets.
exceeded, actions	Displays the number of packets and bytes marked as exceeding the specified rates, and the action to be taken on those packets.

1. A number in parentheses may appear next to the service-policy output name and the class-map name. The number is for Cisco internal use only and can be disregarded.

Traffic Shaping show policy-map interface Command Example

The following sample output from the **show policy-map interface** command (shown below) displays the statistics for the serial 3/2 interface. Traffic shaping has been enabled on this interface, and an average rate of 20 percent of the bandwidth has been specified.

```
Router# show policy-map interface Serial3/2

Serial3/2

  Service-policy output: p1

    Class-map: c1 (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: any
```

```
Traffic Shaping
  Target/Average      Byte   Sustain    Excess      Interval  Increment  Adapt
  Rate              Limit  bits/int  bits/int    (ms)     (bytes)   Active
   20 %                        10 (ms)    20 (ms)
  201500/201500       1952   7808       7808        38         976       -

  Queue     Packets   Bytes     Packets   Bytes     Shaping
  Depth                         Delayed   Delayed   Active
  0         0         0         0         0         no
```

Table 12 describes the significant fields shown in the display.

Table 12 show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping (with Traffic Shaping Enabled)[1]

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and quality of service (QoS) groups. For more information about the variety of match criteria options that are available, refer to the chapter "Configuring the Modular Quality of Service Command-Line Interface" in the *Cisco IOS Quality of Service Solutions Configuration Guide*, Release 12.2.
Traffic Shaping	Indicates that traffic shaping based on a percentage of bandwidth has been enabled.
Target /Average Rate	Rate (percentage) used for shaping traffic and the number of packets meeting that rate.

Table 12 show policy-map interface Field Descriptions—Configured for Percentage-Based Policing and Shaping (with Traffic Shaping Enabled)[1] (Continued)

Field	Description
Byte Limit	Maximum number of bytes that can be transmitted per interval. Calculated as follows: ((Bc+Be) /8) x 1
Sustain bits/int	Committed burst (Bc) rate.
Excess bits/int	Excess burst (Be) rate.
Interval (ms)	Time interval value in milliseconds (ms).
Increment (bytes)	Number of credits (in bytes) received in the token bucket of the traffic shaper during each time interval.
Adapt Active	Indicates whether adaptive shaping is enabled.
Queue Depth	Current queue depth of the traffic shaper.
Packets	Total number of packets that have entered the traffic shaper system.
Bytes	Total number of bytes that have entered the traffic shaper system.
Packets Delayed	Total number of packets delayed in the queue of the traffic shaper before being transmitted.
Bytes Delayed	Total number of bytes delayed in the queue of the traffic shaper before being transmitted.
Shaping Active	Indicates whether the traffic shaper is active. For example, if a traffic shaper is active, and the traffic being sent exceeds the traffic shaping rate, a “yes” appears in this field.

1. A number in parentheses may appear next to the service-policy output name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

Packet Classification Based on Layer 3 Packet Length show policy-map interface Command Example

The following sample output from the **show policy-map interface** command displays the packet statistics for the Ethernet4/1 interface, to which a service policy called “mypolicy” is attached. The Layer 3 packet length has been specified as a match criterion for the traffic in the class called “class1”.

```
Router# show policy-map interface Ethernet4/1

 Ethernet4/1

  Service-policy input: mypolicy

    Class-map: class1 (match-all)
       500 packets, 125000 bytes
       5 minute offered rate 4000 bps, drop rate 0 bps
       Match: packet length min 100 max 300
       QoS Set
         qos-group 20
           Packets marked 500
```

Table 13 describes the significant fields shown in the display.

Table 13 show policy-map interface Field Descriptions—Configured for Packet Classification Based on Layer 3 Packet Length[1]

Field	Description
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class. **Note** If the packets are compressed over an outgoing interface, the improved packet rate achieved by packet compression is not reflected in the offered rate. Also, if the packets are classified *before* they enter a combination of tunnels (for example, a generic routing encapsulation (GRE) tunnel and an IP Security (IPSec) tunnel), the offered rate does not include all the extra overhead associated with tunnel encapsulation in general. Depending on the configuration, the offered rate may include no overhead, may include the overhead for only *one* tunnel encapsulation, or may include the overhead for *all* tunnel encapsulations. In most of the GRE and IPSec tunnel configurations, the offered rate includes the overhead for GRE tunnel encapsulation only.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP DSCP value, MPLS experimental value, access groups, and QoS groups.
QoS Set, qos-group, Packets marked	Indicates that class-based packet marking based on the QoS group has been configured. Includes the qos-group number and the number of packets marked.

1. A number in parentheses may appear next to the service-policy input name, class-map name, and match criteria information. The number is for Cisco internal use only and can be disregarded.

Enhanced Packet Marking show policy-map interface Command Example

The following sample output of the **show policy-map interface** command shows the service policies attached to a FastEthernet subinterface. In this example, a service policy called “policy1” has been attached. In “policy1”, a table map called “table-map1” has been configured. The values in “table-map1” will be used to map the precedence values to the corresponding class of service (CoS) values.

```
Router# show policy-map interface

 FastEthernet1/0.1

  Service-policy input: policy1

    Class-map: class-default (match-any)
      0 packets, 0 bytes
```

```
    5 minute offered rate 0 bps, drop rate 0 bps
    Match: any
    QoS Set
      precedence cos table table-map1
        Packets marked 0
```

Table 14 describes the fields shown in the display.

Table 14 show policy-map interface Field Descriptions—Configured for Enhanced Packet Marking [1]

Field	Description
Service-policy input	Name of the input service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets, bytes	Number of the packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of the packets coming into the class.
Match	Match criteria specified for the class of traffic. Choices include criteria such as Precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) group (set). For more information about the variety of match criteria options that are available, refer to the "Configuring the Modular Quality of Service Command-Line Interface" section in the *Cisco IOS Quality of Service Solutions Configuration Guide*.
QoS Set	Indicates that QoS group (set) has been configured for the particular class.
precedence cos table table-map1	Indicates that a table map (called "table-map1") has been used to determine the precedence value. The precedence value will be set according to the CoS value defined in the table map.
Packets marked	Total number of packets marked for the particular class.

1. A number in parentheses may appear next to the service-policy input name and the class-map name. The number is for Cisco internal use only and can be disregarded.

Traffic Policing show policy-map interface Command Example

The following is sample output from the **show policy-map interface** command. This sample displays the statistics for the serial 2/0 interface on which traffic policing has been enabled. The committed (conform) burst (bc) and excess (peak) burst (be) are specified in milliseconds (ms).

```
Router# show policy-map interface serial2/0
 Serial2/0

  Service-policy output: policy1 (1050)

    Class-map: class1 (match-all) (1051/1)
      0 packets, 0 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match: ip precedence 0  (1052)
      police:
          cir 20 % bc 300 ms
          cir 409500 bps, bc 15360 bytes
          pir 40 % be 400 ms
          pir 819000 bps, be 40960 bytes
```

```
      conformed 0 packets, 0 bytes; actions:
        transmit
      exceeded 0 packets, 0 bytes; actions:
        drop
      violated 0 packets, 0 bytes; actions:
        drop
      conformed 0 bps, exceed 0 bps, violate 0 bps

  Class-map: class-default (match-any) (1054/0)
    0 packets, 0 bytes
    5 minute offered rate 0 bps, drop rate 0 bps
    Match: any  (1055)
      0 packets, 0 bytes
      5 minute rate 0 bps
```

In this example, the CIR and PIR are displayed in bps, and both the committed burst (bc) and excess burst (be) are displayed in bits.

The CIR, PIR bc, and be are calculated on the basis of the formulas described below.

Formula for Calculating the CIR

When calculating the CIR, the following formula is used:

- CIR percentage specified (as shown in the output from the **show policy-map** command) * bandwidth (BW) of the interface (as shown in the output from the **show interfaces** command) = total bits per second

According to the output from the **show interfaces** command for the serial 2/0 interface, the interface has a bandwidth (BW) of 2048 kbps.

```
Router # show interfaces s2/0
Serial2/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec, rely 255/255, load 1/255
```

The following values are used for calculating the CIR:

20 % * 2048 kbps = 409600 bps

Formula for Calculating the PIR

When calculating the PIR, the following formula is used:

- PIR percentage specified (as shown in the output from the **show policy-map** command) * bandwidth (BW) of the interface (as shown in the output from the **show interfaces** command) = total bits per second

According to the output from the **show interfaces** command for the serial 2/0 interface, the interface has a bandwidth (BW) of 2048 kbps.

```
Router # show interfaces serial2/0
Serial2/0 is administratively down, line protocol is down
  Hardware is M4T
  MTU 1500 bytes, BW 2048 Kbit, DLY 20000 usec, rely 255/255, load 1/255
```

The following values are used for calculating the PIR:

40 % * 2048 kbps = 819200 bps

Note Discrepancies between this total and the total shown in the output from the **show policy-map interface** command can be attributed to a rounding calculation or to differences associated with the specific interface configuration.

Formula for Calculating the Committed Burst (bc)

When calculating the bc, the following formula is used:

- The bc in milliseconds (as shown in the **show policy-map** command) * the CIR in bits per seconds = total number bytes

The following values are used for calculating the bc:

300 ms * 409600 bps = 15360 bytes

Formula for Calculating the Excess Burst (be)

When calculating the bc and the be, the following formula is used:

- The be in milliseconds (as shown in the **show policy-map** command) * the PIR in bits per seconds = total number bytes

The following values are used for calculating the be:

400 ms * 819200 bps = 40960 bytes

Table 15 describes the significant fields shown in the display.

Table 15 show policy-map interface Field Descriptions

Field	Description
Service-policy output	Name of the output service policy applied to the specified interface or VC.
Class-map	Class of traffic being displayed. Output is displayed for each configured class in the policy. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class.
packets and bytes	Number of packets (also shown in bytes) identified as belonging to the class of traffic being displayed.
offered rate	Rate, in kbps, of packets coming in to the class.
drop rate	Rate, in kbps, at which packets are dropped from the class. The drop rate is calculated by subtracting the number of successfully transmitted packets from the offered rate.
Match	Match criteria specified for the class of traffic. Choices include criteria such as the Layer 3 packet length, IP precedence, IP differentiated services code point (DSCP) value, Multiprotocol Label Switching (MPLS) experimental value, access groups, and quality of service (QoS) groups. For more information about the variety of match criteria options that are available, refer to the "Configuring the Modular Quality of Service Command-Line Interface" chapter of the *Cisco IOS Quality of Service Solutions Configuration Guide*.
police	Indicates that traffic policing has been enabled. Display includes the CIR, PIR (in both a percentage of bandwidth and in bps) and the bc and be in bytes and milliseconds. Also displays the optional conform, exceed, and violate actions, if any, and the statistics associated with these optional actions.

Bandwidth Estimation show policy-map interface Command Example

The following sample output from the **show policy-map interface** command displays statistics for the FastEthernet 0/1 interface on which bandwidth estimates for quality of service (QoS) targets have been generated.

The Bandwidth Estimation section indicates that bandwidth estimates for QoS targets have been defined. These targets include the packet loss rate, the packet delay rate, and the timeframe in milliseconds. Confidence refers to the drop-one-in value (as a percentage) of the targets. Corvil Bandwidth means the bandwidth estimate in kilobits per second.

When no drop or delay targets are specified, "none specified, falling back to drop no more than one packet in 500" appears in the output.

```
Router# show policy-map interface FastEthernet0/1
 FastEthernet0/1

  Service-policy output: my-policy

    Class-map: icmp (match-all)
      199 packets, 22686 bytes
      30 second offered rate 0 bps, drop rate 0 bps
      Match: access-group 101
      Bandwidth Estimation:
        Quality-of-Service targets:
          drop no more than one packet in 1000 (Packet loss < 0.10%)
          delay no more than one packet in 100 by 40 (or more) milliseconds
            (Confidence: 99.0000%)
        Corvil Bandwidth: 1 kbits/sec

    Class-map: class-default (match-any)
      112 packets, 14227 bytes
      30 second offered rate 0 bps, drop rate 0 bps
      Match: any
      Bandwidth Estimation:
        Quality-of-Service targets:
          <none specified, falling back to drop no more than one packet in 500
        Corvil Bandwidth: 1 kbits/sec
```

Shaping with HQF Enabled show policy-map interface Command Example

The following sample output from the **show policy-map interface** command shows that shaping is active (as seen in the queue depth field) with HQF enabled on the serial 4/3 interface. All traffic is classified to the class-default queue.

```
Router# show policy-map interface serial4/3

 Serial4/3

  Service-policy output: shape

    Class-map: class-default (match-any)
      2203 packets, 404709 bytes
      30 second offered rate 74000 bps, drop rate 14000 bps
      Match: any
      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 64/354/0
      (pkts output/bytes output) 1836/337280
      shape (average) cir 128000, bc 1000, be 1000
      target shape rate 128000
        lower bound cir 0,  adapt to fecn 0

      Service-policy : LLQ

        queue stats for all priority classes:

          queue limit 64 packets
          (queue depth/total drops/no-buffer drops) 0/0/0
```

```
  (pkts output/bytes output) 0/0

Class-map: c1 (match-all)
  0 packets, 0 bytes
  30 second offered rate 0 bps, drop rate 0 bps
  Match: ip precedence 1
  Priority: 32 kbps, burst bytes 1500, b/w exceed drops: 0

Class-map: class-default (match-any)
  2190 packets, 404540 bytes
  30 second offered rate 74000 bps, drop rate 14000 bps
  Match: any

  queue limit 64 packets
  (queue depth/total drops/no-buffer drops) 63/417/0
  (pkts output/bytes output) 2094/386300
```

Related Commands

Command	Description
compression header ip	Configures RTP or TCP IP header compression for a specific class.
drop	Configures a traffic class to discard packets belonging to a specific class.
match fr-dlci	Specifies the Frame Relay DLCI number as a match criterion in a class map.
match packet length (class-map)	Specifies the length of the Layer 3 packet in the IP header as a match criterion in a class map.
police	Configures traffic policing.
police (percent)	Configures traffic policing on the basis of a percentage of bandwidth available on an interface.
police (two rates)	Configures traffic policing using two rates, the CIR and the PIR.
policy-map	Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.
random-detect ecn	Enables ECN.
shape (percent)	Specifies average or peak rate traffic shaping on the basis of a percentage of bandwidth available on an interface.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show interfaces	Displays statistics for all interfaces configured on a router or access server.
show policy-map	Displays the configuration of all classes for a specified service policy map or all classes for all existing policy maps.
show policy-map class	Displays the configuration for the specified class of the specified policy map.
show table-map	Displays the configuration of a specified table map or of all table maps.
table-map (value mapping)	Creates and configures a mapping table for mapping and converting one packet-marking value to another.

show traffic-shape queue

To display information about the elements queued by traffic shaping at the interface level or the data-link connection identifier (DLCI) level, use the **show traffic-shape queue** command in privileged EXEC mode.

show traffic-shape queue [*interface-number* [**dlci** *dlci-number*]]

Syntax Description

interface-number	(Optional) The number of the interface.
dlci	(Optional) The specific DLCI for which you wish to display information about queued elements.
dlci-number	(Optional) The number of the DLCI.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.0(3)XG	This command was integrated into Cisco IOS Release 12.0(3)XG. The *dlci* argument was added.
12.0(4)T	This command was integrated into Cisco IOS Release 12.0(4)T. The *dlci* argument was added.
12.0(5)T	This command was modified to include information on the special voice queue that is created using the **queue** keyword of the **frame-relay voice bandwidth** command.
12.2(28)SB	This command was modified to support hierarchical queueing framework (HQF) on Frame Relay (FR) interfaces or permanent virtual circuits (PVCs).

Usage Guidelines

When no parameters are specified with this command, the output displays information for all interfaces and DLCIs containing queued elements. When a specific interface and DLCI are specified, information is displayed about the queued elements for that DLCI only.

When you use this command with HQF, no output displays.

Examples

The following is sample output for the **show traffic-shape queue** command when weighted fair queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial1/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
  Queueing strategy: weighted fair
  Queueing Stats: 1/600/64/0 (size/max total/threshold/drops)
     Conversations  0/16 (active/max total)
     Reserved Conversations 0/2 (active/allocated)
  (depth/weight/discards) 1/4096/0
  Conversation 5, linktype: ip, length: 608
```

```
source: 172.21.59.21, destination: 255.255.255.255, id: 0x0006, ttl: 255,
  TOS: 0 prot: 17, source port 68, destination port 67
```

The following is sample output for the **show traffic-shape queue** command when priority queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial1/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
  Queueing strategy: priority-group 4
  Queueing Stats: low/1/80/0 (queue/size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command when first-come, first-serve queueing is configured on the map class associated with DLCI 16:

```
Router# show traffic-shape queue Serial1/1 dlci 16

Traffic queued in shaping queue on Serial1.1 dlci 16
  Queueing strategy: fcfs
  Queueing Stats: 1/60/0 (size/max total/drops)

Packet 1, linktype: cdp, length: 334, flags: 0x10000008
```

The following is sample output for the **show traffic-shape queue** command displaying statistics for the special queue for voice traffic that is created automatically when the **frame-relay voice bandwidth** command is entered:

```
Router# show traffic-shape queue Serial1/1 dlci 45

 Voice queue attached to traffic shaping queue on Serial1 dlci 45
 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    Voice Queueing Stats: 0/100/0 (size/max/dropped)
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
 Traffic queued in shaping queue on Serial1 dlci 45
   Queueing strategy: weighted fair
   Queueing Stats: 0/600/64/0 (size/max total/threshold/drops)
      Conversations  0/16 (active/max total)
      Reserved Conversations 0/2 (active/allocated)
```

Table 16 describes the significant fields shown in the display.

Table 16 show traffic-shape queue Field Descriptions

Field	Description
Queueing strategy	When Frame Relay Traffic Shaping (FRTS) is configured, the queueing type can be weighted fair, custom-queue, priority-group, or fcfs (first-come, first-serve), depending on what is configured on the Frame Relay map class for this DLCI. The default is fcfs for FRTS. When generic traffic shaping is configured, the only queueing type available is weighted fair queueing (WFQ).
Queueing Stats	Statistics for the configured queueing strategy, as follows: • size—Current size of the queue. • max total—Maximum number of packets of all types that can be queued in all queues. • threshold—For WFQ, the number of packets in the queue after which new packets for high-bandwidth conversations will be dropped. • drops—Number of packets discarded during this interval.
Conversations active	Number of currently active conversations.
Conversations max total	Maximum allowed number of concurrent conversations.
Reserved Conversations active	Number of currently active conversations reserved for voice.
Reserved Conversations allocated	Maximum configured number of conversations reserved.
depth	Number of packets currently queued.
weight	Number used to classify and prioritize the packet.
discards	Number of packets discarded from queues.
Packet	Number of queued packet.
linktype	Protocol type of the queued packet. (cdp = Cisco Discovery Protocol)
length	Number of bytes in the queued packet.
flags	Number of flag characters in the queued packet.
source	Source IP address.
destination	Destination IP address.
id	Packet ID.
ttl	Time to live count.
TOS	IP type of service.
prot	Layer 4 protocol number. Refer to RFC 943 for a list of protocol numbers. (17 = User Datagram Protocol (UDP))
source port	Port number of source port.
destination port	Port number of destination port.

Related Commands

Command	Description
show frame-relay fragment	Displays Frame Relay fragmentation details.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show frame-relay vofr	Displays details about FRF.11 subchannels being used on VoFR DLCIs.
show traffic-shape	Displays the current traffic-shaping configuration.
show traffic-shape statistics	Displays the current traffic-shaping statistics.

Glossary

latency—The delay on a router between the time a device receives a packet and the time that packet is forwarded out the destination port.

MQC—modular quality of service command line interface. A way to specify a traffic class independently of QoS policies.

policy map—Any defined rule that determines the use of resources within the network. A QoS policy map identifies the traffic class to which it applies and the instructions for one or more actions to take on that traffic.

QoS—quality of service. A measure of performance for a transmission system that reflects its transmission quality and service availability. Quality of service focuses on achieving appropriate network performance for networked applications; it is superior to best effort performance.

Note See *Internetworking Terms and Acronyms* for terms not included in this glossary.

Feature Information for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

Table 17 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note Table 17 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 17 Feature Information for QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router

Feature Name	Releases	Feature Information
QoS: QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router	12.2(28)SB	The QoS: Frame Relay QoS Hierarchical Queueing Framework Support on the Cisco 7200 Series Router feature describes how FR works in HQF to provide an FR service with fragmentation using the Modular Quality of Service (QoS) Command-Line Interface (CLI). In 12.2(28)SB, this feature was introduced.