



Percentage-Based Policing and Shaping

Feature History

Release	Modification
12.2(13)T	This feature was introduced.

Supported Platforms

For platforms supported in Cisco IOS Release 12.2(13)T, consult Cisco Feature Navigator.

This document describes the Percentage-Based Policing and Shaping feature in Cisco IOS Release 12.2(13)T. It includes the following sections:

- [Feature Overview, page 1](#)
- [Supported Platforms, page 3](#)
- [Supported Standards, MIBs, and RFCs, page 3](#)
- [Configuration Tasks, page 4](#)
- [Configuration Examples, page 6](#)
- [Command Reference, page 8](#)

Feature Overview

Cisco IOS quality of service (QoS) offers two kinds of traffic regulation mechanisms—traffic policing and traffic shaping. A traffic policer typically drops traffic that violates a specific rate. A traffic shaper typically delays excess traffic using a buffer to hold packets and shapes the flow when the data rate to a queue is higher than expected.

Traffic shaping and traffic policing can work in tandem and can be configured in a class map. Class maps organize data packets into specific categories (“classes”) that can, in turn, receive a user-defined QoS treatment when used in policy maps (sometimes referred to as “service policies”).

Before this feature, traffic policing and traffic shaping were configured on the basis of a user-specified amount of bandwidth available on the interface. Policy maps were then configured on the basis of that specific amount of bandwidth, meaning that separate policy maps were required for each interface.



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This feature provides the ability to configure traffic policing and traffic shaping based on a *percentage* of bandwidth available on the interface. Configuring traffic policing and traffic shaping in this manner enables customers to use the same policy map for multiple interfaces with differing amounts of bandwidth.

This feature also provides the option of specifying burst sizes in milliseconds (ms) when configuring traffic policing and shaping based on a percentage of bandwidth.

Configuring traffic policing and shaping based on a percentage of bandwidth is accomplished by using the **police** (percent) and **shape** (percent) commands. For more information about these commands, see the [Cisco IOS Quality of Service Solutions Command Reference](#).

For more information on traffic policing and traffic shaping, see the [“Policing and Shaping Overview”](#) module.

Benefits

Increased Flexibility

This feature provides the ability to configure traffic policing and traffic shaping based on a *percentage* of bandwidth available on an interface. Configuring traffic policing and traffic shaping in this manner enables customers to use the same policy map for multiple interfaces with differing amounts of bandwidth.

Restrictions

The **shape** (percent) command, when used in “child” (nested) policy maps, is not supported on the Cisco 7500, the Cisco 7200, or lower series routers. Therefore, the **shape** (percent) command cannot be configured for use in nested policy maps on these routers.

Related Features and Technologies

- Modular QoS command-line interface (CLI) (Modular QoS CLI)
- Class-based weighted fair queueing (CBWFQ)
- Class-based packet marking
- Cisco Express Forwarding (CEF) and Distributed CEF (dCEF)
- Traffic policing
- Two-rate policing
- Traffic shaping

Related Documents

- [“Applying QoS Features Using the MQC”](#) module
- [“Configuring Weighted Fair Queueing”](#) module
- [“Marking Network Traffic”](#) module
- [“Policing and Shaping Overview”](#) module

- “Traffic Policing” module
- “Two-Rate Policer” module
- “Policer Enhancements—Multiple Actions” module
- “Cisco Express Forwarding Overview” module
- *Cisco IOS Quality of Service Solutions Command Reference*
- *Cisco IOS Switching Services Command Reference*
- RFC 2697, *A Single Rate Three Color Marker*
- RFC 2698, *A Two Rate Three Color Marker*

Supported Platforms

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To obtain updated information about platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. In the release section, you can compare releases side by side to display both the features unique to each software release and the features that releases have in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

None

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

RFCs

- RFC 2697, *A Single Rate Three Color Marker*
- RFC 2698, *A Two Rate Three Color Marker*

Prerequisites

On a Cisco 7500 series router, Distributed Cisco Express Forwarding (dCEF) must be configured on the interface before you can use the Percentage-Based Policing and Shaping feature. For additional information on dCEF, see the “[Cisco Express Forwarding Overview](#)” module.

Configuration Tasks

See the following sections for configuration tasks for the Percentage-Based Policing and Shaping feature. Each task in the list is identified as either required or optional.

- [Configuring Policing and Shaping Based on Bandwidth Percentage, page 4](#) (required)
- [Attaching the Policy Map to an Interface or a VC, page 5](#) (required)
- [Verifying the Policing and Shaping Bandwidth Percentage Setting, page 5](#) (optional)

Configuring Policing and Shaping Based on Bandwidth Percentage

To configure traffic policing and shaping based on a percentage of bandwidth available on an interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router (config)# policy-map <i>policy-name</i>	Specifies the name of the policy map to be created. Enters policy-map configuration mode.
Step 2	Router(config-pmap)# class-map <i>class-map-name</i>	Specifies the name of the class map to be created. Enters policy-map class configuration mode.
Step 3	Router(config-pmap-c)# police cir percent percent [bc conform-burst-in-msec] [pir percent percent] [be peak-burst-in-msec]	Configures traffic policing.
Step 4	Router(config-pmap-c)# shape {average peak} percent percent [bc] [be]	Configures traffic shaping using either an average or peak traffic shaping rate based on a percentage of available bandwidth.
Step 5	Router (config-pmap-c)# service-policy <i>policy-map-name</i>	Specifies the name of a policy map to be used as a child policy map for this class.
Step 6	Router(config-pmap-c)# exit	Exits policy-map class configuration mode.

Attaching the Policy Map to an Interface or a VC

To attach the policy map to an interface or a virtual circuit (VC), use the following command in interface configuration mode. To attach the policy map to a VC, use the following command in ATM VC configuration mode.

Command	Purpose
Router(config-if)# service-policy output ¹ <i>policy-map-name</i>	Specifies the name of the policy map to be attached to the input direction of an interface or VC. The policy map evaluates all traffic entering that interface or VC.
or	
Router(config-if-atm-vc)# service-policy output <i>policy-map-name</i>	

1. Traffic shaping is supported on service policies attached to output interfaces or output VCs only.

Verifying the Policing and Shaping Bandwidth Percentage Setting

To verify the policing and shaping bandwidth percentages in the class map and the associated policy map, use the following commands in EXEC mode, as needed:

Command	Purpose
Router# show class-map	Displays all information about a class map, including the match criterion.
Router# show policy-map	Displays all configured policy maps.
Router# show policy-map interface <i>interface-name</i>	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 permanent virtual circuit (PVC) on the interface.

Troubleshooting Tips

- For input traffic policing on a Cisco 7500 series router, verify that dCEF is enabled on the interface on which traffic policing is configured.
- For output traffic policing on a Cisco 7500 series router, ensure that the incoming traffic is dCEF-switched. Traffic policing cannot be used on the switching path unless dCEF switching is enabled.

Configuration Examples

This section provides the following configuration examples:

- [Specifying Traffic Policing Based on a Bandwidth Percentage: Example, page 6](#)
- [Specifying Traffic Shaping Based on a Bandwidth Percentage: Example, page 6](#)
- [Verifying That CEF Is Enabled: Example, page 7](#)

Specifying Traffic Policing Based on a Bandwidth Percentage: Example

The following example configures traffic policing using a committed information rate (CIR) and a peak information rate (PIR) based on a percentage of bandwidth. In this example, a CIR of 20 percent and a PIR of 40 percent have been specified. Additionally, an optional bc value and be value (300 ms and 400 ms, respectively) have been specified.

```
Router (config)# policy-map policy1
Router (config-pmap)# class-map class1
Router (config-pmap-c)# police cir percent 20 bc 300 ms pir percent 40 be 400 ms
Router (config-pmap-c)# service-policy child-policy1
Router (config-pmap-c)# exit
Router (config-pmap-c)# interface serial 3/1
Router (config-if)# service-policy output policy1
```

The purpose of the burst parameters (bc and be values) is to drop packets gradually, as is done with Weighted Random Early Detection (WRED), and to avoid tail drop. Setting sufficiently high burst values helps to ensure good throughput.

Specifying Traffic Shaping Based on a Bandwidth Percentage: Example

The following example configures traffic shaping using an average shaping rate based on a percentage of bandwidth. In this example, 25 percent of the bandwidth has been specified. Additionally, an optional bc value and be value (300 ms and 400 ms, respectively) have been specified.

```
Router (config)# policy-map policy1
Router (config-pmap)# class-map class1
Router (config-pmap-c)# shape average percent 25 300 ms 400 ms
Router (config-pmap-c)# service-policy child-policy1
Router (config-pmap-c)# exit
Router (config-pmap-c)# interface serial 3/1
Router (config-if)# service-policy output policy1
```

The purpose of the bc and be values is to drop packets gradually, as is done with WRED, and to avoid tail drop. Setting sufficiently high burst values helps to ensure good throughput.

Verifying That CEF Is Enabled: Example

As mentioned previously, on a Cisco 7500 series router, dCEF must be configured on the interface before you can use the Percentage-Based Policing and Shaping feature. The **show ip cef summary** command can be used to confirm that dCEF is enabled and is being used for IP switching. In rare instances, this command displays “IP Distributed CEF without switching” in the command output. This indicates that dCEF is disabled. The following sample output of the **show ip cef summary** command indicates that dCEF is disabled:

```
Router# show ip cef summary

IP Distributed CEF with switching (Table Version 36), flags=0x0
 18 routes, 0 reresolve, 0 unresolved (0 old, 0 new), peak 3
 18 leaves, 19 nodes, 22136 bytes, 45 inserts, 27 invalidations
 0 load sharing elements, 0 bytes, 0 references
 universal per-destination load sharing algorithm, id 680E93E2
 3(0) CEF resets, 1 revisions of existing leaves
 Resolution Timer:Exponential (currently 1s, peak 1s)
 0 in-place/0 aborted modifications
 refcounts: 5136 leaf, 5120 node
```

For information on enabling dCEF, see the “[Cisco Express Forwarding Overview](#)” module.

When you configure a feature that requires special handling or is not yet supported in the dCEF switching paths, packets are forwarded to the next switching layer for handling. In this instance, the output of the **show cef interface** command displays “Packets switched to this interface on line card are dropped to next slow path” as shown in the following sample output.

```
Router# show cef interface Serial 10/0/0:28

Serial10/0/0:28 is up (if_number 38)
 Internet address is 90.0.0.1/8
 ICMP redirects are never sent
 Per packet loadbalancing is disabled
 Inbound access list is not set
 Interface is marked as point to point interface
 Packets switched to this interface on linecard are dropped to next slow path
 Hardware idb is Serial10/0/0:28
 Fast switching type 4, interface type 20
 IP Distributed CEF switching enabled
 Fast flags 0x0. ifindex 37(37)
 Slot 10 Slot unit 0 VC 28
 Hardware transmit queue ptr 0x48001AE0 (0x48001AE0)
 Transmit limit accumulator 0x48000102 (0x48000102)
 IP MTU 1500
```

For more information about the **show ip cef interface** command, see the [Cisco IOS Switching Services Command Reference](#).

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS Quality of Service Solutions Command Reference* at http://www.cisco.com/en/US/docs/ios/qos/command/reference/qos_book.html. For information about all Cisco IOS commands, use the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or a Cisco IOS master commands list.

- **police (percent)**
- **shape (percent)**
- **show policy-map**
- **show policy-map interface**

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