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Brocade 5600 vRouter QoS

Reference Guide

Supporting Brocade 5600 vRouter 3.5R6

BROCADE

Contents

Preface

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
bold text	Identifies command names
	Identifies keywords and operands
	Identifies the names of user-manipulated GUI elements
	Identifies text to enter at the GUI
italic text	Identifies emphasis
	Identifies variables
	Identifies document titles
`Courier font`	Identifies CLI output
	Identifies command syntax examples

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
italic text	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, **--show** WWN.

Convention	Description
[ ]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ **x** | **y** | **z** }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options. In Fibre Channel products, square brackets may be used instead for this purpose.
x | **y**	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, *member*[*member*...].
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE
A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION
An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.

CAUTION
A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.

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About This Guide

This guide describes the QoS architecture and how to configure QoS on the Brocade 5600 vRouter (referred to as a virtual router, vRouter, or router in the guide).

QoS

Overview

This section covers the following topics of the quality of service (QoS) features on the Brocade vRouter:

QoS architecture

QoS is a VLAN-based feature that allows network administrators to identify different traffic flows and to treat them according to their individual requirements, rather than simply using the default mechanism which is directly forwarding traffic to hardware. QoS is based on queue prioritization on outgoing traffic. The policing is run based on each traffic class.

In addition to the default queuing mechanism, the Brocade vRouter provides a variety of QoS mechanisms for identifying and treating the various traffic flows that pass through an interface. In general, mechanisms apply to outbound traffic.

The QoS default queue priority is first in, first out (FIFO).

The general work flow for nondefault QoS mechanisms is as follows:

1. Create a QoS policy.
2. Apply the policy to an interface.

A QoS policy identifies traffic flows and specifies how each flow is to be treated. Policies are created per class and per interface and define how a packet is handled on outgoing traffic per interface. Traffic class is a priority queuing mechanism.

If no QoS policy is set on an interface, the default behavior allows traffic to skip QoS processing and pass directly to the destination interface.

To configure QoS on the Brocade vRouter, the commands can be found under the following configuration command nodes:

- **policy qos** *policy-name* **shaper bandwidth**
- **policy qos** *policy-name* **shaper burst**
- **policy qos** *policy-name* **shaper class**
- **policy qos** *policy-name* **shaper default**
- **policy qos** *policy-name* **shaper description**

- **policy qos** *policy-name* **shaper frame-overhead**
- **policy qos** *policy-name* **shaper profile**
- **policy qos** *policy-name* **shaper traffic-class**
- **policy qos** *policy-name* **shaper vlan**

To define QoS policy definitions, use the following command:

```
vyatta@vyatta# set policy qos policy1 shaper ?
Possible completions:
   bandwidth      Bandwidth limit
   burst          Burst size
+> class          Class number
   default        Qos profile for default traffic
   description    Description for this queuing policy
   frame-overhead Framing overhead
   period         Enforcement period (ms)
+> profile        QoS traffic profile
+> traffic-class  Traffic Class
+> vlan           Virtual Local Area Network (VLAN) ID
```

To assign a policy to an interface, use the following command:

set interface dataplane *interface_name* **qos-policy** *policy_name*

QoS is supported on all data plane interfaces, but not on virtual interfaces or tunnels.

Monitoring

To display QoS statistics and the configuration of the mapping of packets to queues, use the **show queuing** or **monitor queuing** operational commands.

Configuration limits

The following are the configuration limits of QoS:

- 1,048,576 classes
- 256 profiles
- 8 queues
- 4 traffic classes
- 4,095 VLANs

Queue and traffic classes

Queuing configuration is the QoS scheduling algorithm that is based on class, VLAN, and interface. A maximum of 4 queues are identified by an integer between 0 and 3. If no queues are defined, the system initializes 4 queues with strict-priority.

Queues are prioritized in ascending order. Queues 0 through 3 are associated with 4 strict traffic classes, 0 through 3, where 0 is the highest-priority traffic class. There are four weighted round robin slots for each queue.

TABLE 1 Queue-traffic class mapping

Queue	Traffic class	WRR slots
Queue 0	Traffic-class 3	4 WRR slots (1 through 100)

TABLE 1 Queue-traffic class mapping (Continued)

Queue	Traffic class	WRR slots
Queue 1	Traffic-class 2	4 WRR slots (1 through 100)
Queue 2	Traffic-class 1	4 WRR slots (1 through 100)
Queue 3	Traffic-class 0	4 WRR slots (1 through 100)

NOTE
While 8 queues are now supported, only a maximum 4 queues can share the same traffic class. It is possible to have unused traffic classes (that is, have no queues assigned).

Queues have the following attributes:

- A maximum of 4 queues can share a single traffic class.
- There are 4 strict-priority traffic classes.
- You can configure 4 WRR slots per queue.
- There is strict priority scheduling by traffic class within a pipe.
- You can configure a maximum of 4 queues with the same traffic-class.
- You can check the queues and their assigned traffic class by using the CLI during the validation stage.
- You can configure a traffic-class with no queues assigned.

Each queue has the following configurable parameters:

- Traffic class
  - Strict-priority assignment.
  - Must be set for each queue.
  - Priorities are ordered from 0 (highest priority) to 3 (lowest priority).
  - A maximum of 4 queues can have the same priority.
  - Queues are serviced by the round robin method.
- Weight
  - The Weighted Round Robin value.
  - Determines the proportion of bandwidth a queue receives when multiple queues share the same priority.
  - Can be a number between 1 and 100. This number does not necessarily need to represent a percentage.
  - The default weight is 1.

Mapping

QoS mapping is based on priority for IPv4 or IPv6 traffic. Packets are mapped to queues based on either 802.1p priority (if present) or Differentiated Services Code Point (DSCP) for IPv4 or IPv6 traffic.

Each profile has a table mapping of all the possible Port Control Protocol (PCP) and DSCP traffic to queue. For the default mapping of PCP traffic, the highest priority 802.1p value corresponds to highest priority traffic class. The default mapping of DSCP traffic is based on the highest order of bits (2 bits) since by default there are four priority queues.

To configure values for DSCP through the CLI, you must use either numeric, symbolic, or a range of numbers. The numeric form must conform to the standard POSIX input method: a decimal number and

a hex number preceded by 0x. Symbolic names are matched (not case sensitive) with those values in the system file, /etc/iproute/rtdsfield_ :

TABLE 2 DSCP values

Name	Decimal	Hex
default	0	0x00
af11	10	0x0A
af12	12	0x0C
af13	14	0x0E
af21	18	0x12
af22	20	0x14
af23	22	0x16
af31	26	0x1A
af32	28	0x1C
af33	30	0x1E
af41	34	0x22
af42	36	0x24
af43	38	0x26
cs1	8	0x08
cs2	16	0x10
cs3	24	0x18
cs4	32	0x20
cs5	40	0x28
cs6	48	0x30
cs7	56	0x38
ef	23	0x2E

Lists must be comma separated items or a number range separated by a minus sign (-).

PCP mapping takes precedence over DSCP. That is, DSCP is only evaluated for untagged or PCP=0. Non-IP traffic is treated as best effort (DSCP 0).

Classification

QoS classification uses a subset of the packet classification that is used in policy-based routing and firewall. QoS classification allows matching of packets based on the source and destination values of IP and MAC addresses as well as DSCP and PCP values.

The QoS classification process assigns a class to the packet. These classes are identified by one or more match rules based on a subset of the firewall command syntax.

Classes are evaluated in numerical order. The first class that matches is used (that is, they are final). The class numbers do not have to be sequential (and the system accepts gaps in the number sequence), but the largest class number determines the size of the internal data structures. Therefore, using large numbers is discouraged. Even though classes look like firewall rules, they are not stateful. Each class is either associated with an action which can either be a QoS scheduling profile or drop.

Classifying a packet based on the TCP/IP n-tuple can be configured through the following command:

set policy qos *policy-name* **shaper class** *class-name* **match** *match-name* **protocol tcp**

Remark

The ACL can include rules to remark a packet by changing the DSCP or PCP values. Changes that are made during the classification process occur before the packet is evaluated for scheduling.

For example, if the QoS scheduler has a rule to set all DSCP packets to traffic class 0, then these packets are set to the lowest priority queue 3.

DSCP and PCP values can be remarked by the user through the **set policy qos** *policy-name* **shaper profile** *profile-name* **map** command.

Frame overhead

QoS can be adjusted to adapt to the constraints of the destination system. Configure frame overhead which makes allowances for additional bytes of a packet as a result of the underlying link-layer protocols. Use the **set policy qos** *policy-name* **shaper frame-overhead** command to configure frame overhead.

QoS policies

The following are the QoS policies supported by the Brocade vRouter on outbound traffic:

RED and WRED

QoS-policy random-detect mechanism is a congestion avoidance mechanism based on traffic class that includes Random Early Detection (RED) and Weighted Random Early Detection (WRED).

Congestion occurs when output buffers are allowed to fill such that packets must be dropped. Congestion can cause global resyncronization of TCP hosts as multiple hosts reduce their transmission rates to try to clear the congestion; this can significantly affect network performance. As congestion clears, the network increases transmission rates again until the point where congestion reoccurs. This cycle of congestion and clearing does not make the best use of the available bandwidth.

RED determines the likelihood of a packet being dropped in the outgoing queue and queues them accordingly to an interface.

RED reduces the chance that network congestion occurs by randomly dropping packets when the output interface begins to show signs of congestion. The packet-drops acts as a signal to the source to decrease its transmission rate which, in turn, helps avoid conditions of congestion and reduces the chance of global synchronization, making better use of network bandwidth.

WRED takes RED one step further by providing a way to attach precedence to different traffic streams. Differential quality of service can then be provided to different traffic streams by dropping more packets from some streams than from others.

The optional Random Early Detection (RED) feature can be enabled at the highest-level of definition for a traffic-class.

RED is configured per queue weight, probability, and a maximum and minimum threshold queue depth. After a minimum threshold is met, QoS begins to drop packets at increasing rates until the maximum threshold is met, at which time the system drops all packets.

Exponentially weighted moving average (EWMA) tracks traffic statistics based on their intensity and the passage of time. EWMA can be assigned a filter with a weight value.

Unless RED is enabled, all traffic-classes are handled as strict drop tail (drop packets when queue is full).

Bandwidth

Limits based on the percentage of interface bandwidth are user configurable.

Round-robin

The QoS-policy round-robin mechanism is a simple scheduling algorithm. In round-robin queuing, classes of traffic are identified and bandwidth is divided equally among the defined classes.

Weighted Round-Robin (WRR) is designed to balance traffic classes. WRR assigns a weight value to a queue that determines the bandwidth allocated to that queue.

Traffic shaper

The QoS-policy shaper mechanism controls the transmission rate of outgoing traffic, particularly limiting bursts of packets and limiting bandwidth.

When a policy is configured, it can be applied to a class of a packet and a behavior can be applied to packet to direct how the packet is handled at the outgoing interface.

The QoS-policy shaper provides queuing that is based on the token bucket shaping algorithm. This algorithm allows for bursting if a bucket has tokens to spend.

The shaper algorithm limits bandwidth usage based on class and then allocates any leftover bandwidth.

Round-robin, on the other hand, attempts to divide all available bandwidth equally between the defined classes.

Traffic class

The QoS-policy priority-queue mechanism is a scheduling algorithm. It provides up to eight queues, each with a different priority. Packets are placed in the queues based on match criteria associated with each queue. Packets are retrieved from the queues in priority order. Packets in lower priority queues will not be transmitted until those is higher priority queues have been sent. If packets continually fill higher priority queues, those waiting on lower priority queues will not be serviced until the higher priority traffic load abates.

Default-traffic prioritization

By default, a packet is prioritized based on the value in its DSCP field and sent to one of the queues. The packets on the highest priority queue are sent out first, followed by those on the next-highest priority queue, followed by those on the lowest priority queue. Within each queue, packets are sent through the interface based on a strict-priority handling, then on a WWR handling.

If traffic arrives at a queue faster than it can be delivered (for example, because of bandwidth limitations), it is buffered within the system. If more data arrives than the system can buffer, the excess is dropped.

Data traffic is divided in this way because providing equal levels of service for all traffic is not always desirable. Some types of traffic, by their nature, should be treated differently than others. For example, voice traffic is very sensitive to delay and, if it is not processed accordingly, may be unintelligible. Data, on the other hand, is sensitive not to delay but to corruption.

QoS Configuration Examples

Configuration examples

This section provides the following quality of service (QoS) configuration examples for implementing QoS traffic shaping on outbound traffic:

Configuring a class profile

The profile is the description of a policy for a customer. The profile is used to describe different throughput groups. For example, Premium, Normal, Guest.

Table 3 shows how to configure a class profile:

TABLE 3 Configuring a class profile

Step	Command
Create the profile and assign it a name.	`vyatta@R1# set policy qos policy1`
Define the required maximum bandwidth attribute of 10 Mbps for this policy.	`vyatta@R1# set policy qos policy1 shaper bandwidth 20mbps`
Define the maximum burst size attribute of 50 kb for this the policy.	`vyatta@R1# set policy qos policy1 shaper burst 50`
Define the enforcement interval period (in milliseconds) of the profile.	`vyatta@R1# set policy qos policy1 shaper period 1000`
Define the mapping of the queue. In this example, DSCP traffic is sent to queue 3.	`vyatta@R1# set policy qos policy1 shaper profile profile1 map dscp af11 to 3`
Define the queue ID to be applied to this profile.	`vyatta@R1# set policy qos policy1 shaper profile profile1 queue 1`

TABLE 3 Configuring a class profile (Continued)

Step	Command
Define the traffic class to be applied to this profile.	`vyatta@R1# set policy qos policy1 traffic-class 1`
Create the default policy.	`vyatta@R1# set policy qos policy1 shaper default foo`
Define the bandwidth of default profile.	`vyatta@R1# set policy qos policy1 shaper profile foo bandwidth 10mbps`
Commit the configuration.	`vyatta@R1# commit`

Configuring a class policy

A policy is defined per class and per interface. If no policy is set on an interface, the traffic skips the QoS processing completely and passes directly through the outgoing interface.

Table 4 shows how to configure a class policy:

TABLE 4 Traffic shaping

Step	Command
Define a VLAN ID to be applied to a policy.	`vyatta@R1# set policy qos policy1 shaper vlan 3`
Create a description for this policy to identify it in the **show policy** command output.	`vyatta@R1# set policy qos policy1 shaper vlan 3 description`
Define this profile for default traffic.	`vyatta@R1# set policy qos policy1 shaper vlan 3 default vlan3`
Create the default profile for vlan3.	`vyatta@R1# set policy qos policy1 shaper profile vlan3`
Define the burst limit for this policy.	`vyatta@R1# set policy qos policy1 shaper vlan 3 burst 3750000`
Define the maximum bandwidth for this policy.	`vyatta@R1# set policy qos policy1 shaper vlan 3 bandwidth 32mbit`
Define the enforcement period in seconds for this policy.	`vyatta@R1# set policy qos policy1 shaper vlan 3 period 10`
Assign a data-plane interface to this policy by using the **set interfaces** command.	`vyatta@R1# set interfaces dataplane dp0p1p1 qos-policy policy1`
Create the default policy.	`vyatta@R1# set policy qos policy1 shaper default foo`
Define the default profile for the policy.	`vyatta@R1# set policy qos policy1 shaper profile foo`
Commit the configuration.	`vyatta@R1# commit`

Configuring traffic-class

Configuring traffic class is applied globally per VLAN and per profile.

Table 5 shows how to configure traffic class.

TABLE 5 Configuring traffic class

Step	Command
Create the traffic class and assign it a name.	`vyatta@R1# set policy qos policy1 shaper traffic-class 0`
Define the bandwidth for the traffic class.	`vyatta@R1# set policy qos policy1 shaper traffic-class 0 bandwidth 100mbit`
Define the burst size in the number of consecutive bytes that is sent before the system re-evaluates the bandwidth.	`vyatta@R1# set policy qos policy1 shaper traffic-class burst 3750000`
Define the queue limit in the number of packets queued before dropping.	`vyatta@R1# set policy qos policy1 shaper traffic-class queue-limit 2048`
Configure the frame overhead. The scheduler takes into account the additional bytes added by the underlying link layer protocols.	`vyatta@R1# set policy qos policy1 shaper frame-overhead 32`
Create the default policy.	`vyatta@R1# set policy qos policy1 shaper default foo`
Define the default profile for the policy.	`vyatta@R1# set policy qos policy1 shaper profile foo`
Commit the configuration.	`vyatta@R1# commit`

Configuring RED

Table 6 shows how to configure RED.

TABLE 6 Configuring random early detection (RED)

Step	Command
Create a traffic class and assign it a number from 0 through 3.	`vyatta@R1# set policy qos policy1 shaper traffic-class 1`
Configure the exponentially weighted moving average (EWMA) filter weight with a number from 1 through 12.	`vyatta@R1# set policy qos policy1 shaper traffic-class 1 random-detect filter-weight 1`
Configure the maximum value for the inverse of packet marking probability with a number from 1 through 255.	`vyatta@R1# set policy qos policy1 shaper traffic-class 1 random-detect mark-probability 2`
Configure the maximum threshold for the queue with the number of packets from 1 through 1023.	`vyatta@R1# set policy qos policy1 shaper traffic-class 1 random-detect max-threshold 100`
Configure the minimum threshold for the queue with of the number of packets from 1 through 1022.	`vyatta@R1# set policy qos policy1 shaper traffic-class 1 random-detect min-threshold 5`

Configuring mapping

Table 7 shows how to configure mapping for DSCP traffic.

TABLE 7 Configuring mapping

Step	Command
Create a mapping of DSCP traffic type to queue 3.	`vyatta@R1# set policy qos policy1 shaper profile profile1 map dscp 5-8 to 3`
Create a mapping of DSCP traffic type to queue 1.	`vyatta@R1# set policy qos policy1 shaper profile profile1 map dscp 10,11-13 to 1`
Create a mapping of DSCP traffic type to queue 1.	`vyatta@R1# set policy qos policy1 shaper profile profile1 map dscp af21 to 1`
Commit the configuration.	`vyatta@R1# commit`

Configuring ACLs

Access Control Lists (ACLs) are based on the source and destination values for IP and MAC addresses.

Table 8 shows how to configure an ACL:

TABLE 8 Configuring an ACL

Step	Command
Create a class that matches the policy rule.	`vyatta@R1# set policy qos policy1 shaper class 1`
Create a profile for class 1.	`vyatta@R1# set policy qos policy1 shaper class 1 profile profile1`
Define the protocol type of the traffic to match.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-in protocol tcp`
Define the source port of the traffic to match.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-in source port http`
Define the destination port of the traffic to match.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-out destination port http`
Define the protocol type of the traffic to match.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-out protocol tcp`
Create class 2 that matches the policy rule.	`vyatta@R1# set policy qos policy1 shaper class 1`
Define the ACL action to drop packets of the class.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-in action drop`
Define a match criteria that matches fragment packets.	`vyatta@R1# set policy qos policy1 shaper class 1 match http-in fragment`
Create the default policy.	`vyatta@R1# set policy qos policy1 shaper default foo`
Define the default profile for the policy.	`vyatta@R1# set policy qos policy1 shaper profile foo`
Commit the configuration.	`vyatta@R1# commit`

TABLE 8 Configuring an ACL (Continued)

Step	Command

View the configuration using the **show policy** command.	vyatta@R1:~$ show policy
	policy {
	qos policy1 {
	shaper {
	class 1 {
	match http-in {
	action drop
	fragment
	protocol tcp
	source {
	port http
	}
	}
	match http-out {
	destination {
	port http
	}
	protocol tcp
	}
	profile profile1
	}
	default foo
	profile foo
	profile profile1
	}
	}
	}

Configuring WRR

Table 9 shows how to configure WRR:

TABLE 9 Traffic shaping

Step	Command
Define the traffic class for the queue.	vyatta@R1# set policy qos policy1 shaper profile profile1 queue 3 traffic-class 3
Define the weight value of the queue.	vyatta@R1# set policy qos policy1 shaper profile profile1 queue 3 weight 100
Commit the configuration.	vyatta@R1# commit

View the configuration using the **show policy** command.	vyatta@R1# show policy
	policy {
	qos policy1 {
	shaper {
	profile profile1 {
	queue 3 {
	traffic-class 3
	weight 100
	}
	}
	}
	}
	}

Configuring remarking

If the QoS scheduler has a rule to set all DSCP packets to traffic class 0, then all packets are set to the lowest priority queue 3.

DSCP and PCP values can be remarked by the user through the **set policy qos** *policy-name* **shaper profile** *profile-name* **map** command.

Table 10 shows the remarking of DSCP packets:

TABLE 10 Configuring remarking

Step	Command
Create the class-matching rule and provide a description to identify it in the **show policy** command output.	`vyatta@R1# set policy qos policy1 shaper class 1 match match1 description "dscp class 40"`
Define the criteria to match	`vyatta@R1# set policy qos policy1 shaper class 1 match match1 destination port bgp`
Define the criteria to match DSCP packets for class 1.	`vyatta@R1# set policy qos policy1 shaper class 1 match match1 mark dscp 40`
Define the criteria to match a protocol.	`vyatta@R1# set policy qos policy1 shaper class 1 match match1 protocol tcp`
Commit the configuration.	`vyatta@R1# commit`

View the configuration to view the DSCP configuration.	`vyatta@R1# show policy`
	`policy {`
	`  qos policy1 {`
	`  shaper {`
	`  class 1 {`
	`  match match1 {`
	`  description "dscp class 40"`
	`  destination {`
	`  port bgp`
	`  }`
	`  mark {`
	`  dscp 40`
	`  }`
	`  protocol tcp`
	`  }`
	`  }`
	`  }`
	`  }`
	`}`

Configuring a VLAN

Packets with VLAN tags can be scheduled. You can configure the QoS scheduler with per-VLAN rules. If a VLAN subsection is defined in the CLI, then all packets matching that VLAN tag are evaluated according to that set of classification parameters and scheduling policies.

Untagged packets and packets that do not have a VLAN tag are evaluated according to default non-VLAN rules.

Profiles are only defined in the main policy section of the QoS commands.

Table 11 shows how to configure a VLAN :

TABLE 11 Configuring a VLAN

Step	Command
Define the profile name of the profile.	`vyatta@R1# set policy qos policy1 shaper vlan 1 class 1 profile vlan1`

TABLE 11 Configuring a VLAN (Continued)

Step	Command
Define the destination address for VLAN packets that are tagged with VLAN ID value of 1.	`vyatta@R1# set policy qos policy1 shaper vlan 1 class 1 match destination address 1.1.1.1`
Create the default policy for VLAN 1 traffic.	`vyatta@R1# set policy qos policy1 shaper vlan 1 default vlan1`
Define the default profile for vlan1.	`vyatta@R1# set policy qos policy1 shaper profile vlan1`
Create the default policy.	`vyatta@R1# set policy qos policy1 shaper default foo`
Define the default profile for the policy.	`vyatta@R1# set policy qos policy1 shaper profile foo`
Commit the configuration.	`vyatta@R1# commit`

QoS configuration example

The following example shows the configuration of four traffic classes:

```
vyatta@R1# show policy

policy {
     qos policy1 {
         shaper {
             default example-queue
             description "example"
             profile example-queue {
                 bandwidth 1Gbit
                 map {
                     dscp 24 {
                         to 1
                     }
                     dscp 25 {
                         to 1
                     }
                     dscp 40 {
                         to 0
                     }
                     dscp 46 {
                         to 0
                     }
                 }
                 queue 0 {
                     description pcp1
                     traffic-class 0
                 }
                 queue 1 {
                     description pcp2
                     traffic-class 3
                     weight 60
                 }
                 queue 2 {
                     description pcp3
                     traffic-class 3
                     weight 30
                 }
                 queue 3 {
                     description pcp4
                     traffic-class 3
                     weight 10
                 }
             }
             traffic-class 0 {
                 bandwidth 590000
                 description "Highest priority"
             }
```

```
            traffic-class 3 {
                description "Best effort"
                bandwidth 390000
            }
        }
    }
}
```

Monitoring QoS

This section provides the following QoS monitoring examples:

Statistics

The QoS scheduler keeps track of the number of packets and bytes that pass through the system.

To view the QoS statistics for all devices, use the following command:

```
vyatta@R1:~$ show queuing
```

To view the QoS statistics for a single interface, use the following command:

```
vyatta@R1:~$ show queuing interface
```

Example:

```
vyatta@R1:~$ show queuing dp0p2p1
```

To view the QoS statistics for a VLAN, use the following command:

```
vyatta@R1:~$ show queuing interface.vlanID
```

Example:

```
vyatta@R1:~$ show queuing dp0p2p1.100
```

Priority maps

To view individual DSCP maps, use the following command:

```
vyatta@R1:~$ show queuing interface map dscp
```

Example:

```
vyatta@R1:~$ show queuing dp0p2p1 map dscp
```

To view the 802.1p priority code point map, use the following command:

```
vyatta@R1:~$ show queuing interface map pcp
```

Example:

```
vyatta@R1:~$ show queuing dp0p2p1 map pcp
```

Monitoring QoS statistics

To monitor queuing, use the following command:

```
vyatta@R1:~$ monitor queuing
```

Use **Ctrl-C** to cancel this operation.

QoS Commands

interfaces <interface> <interface-name> qos-policy <policy-name>

Applies a QoS policy to an interface.

Syntax

set interfaces dataplane *interface-name* **qos-policy** *policy-name*

delete interfaces dataplane *interface-name* **qos-policy**

show interfaces dataplane *interface-name* **qos-policy**

Parameters

dataplane *interface-name*

The name of the data plane interface.

qos-policy *policy-name*

The name of a QoS policy.

Modes

Configuration mode

Configuration Statement

```
interfaces {
    dataplane interface-name {
        qos-policy policy-name
    }
}
```

Usage Guidelines

Use the **set** form of this command to apply a QoS policy to an interface.

Use the **delete** form of this command to delete a QoS policy from an interface.

Use the **show** form of this command to display the QoS policies that are applied to an interface.

policy qos <policy-name>

Creates a QoS policy.

Syntax

set policy qos *policy-name*

delete policy qos [*policy-name*]

show policy qos

Parameters

policy-name

A name for the QoS policy.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a QoS policy.

Use the **delete** form of this command to delete a QoS policy.

Use the **show** form of this command to display the QoS policy configuration.

policy qos <policy-name> shaper bandwidth

Defines the bandwidth of a QoS policy.

Syntax

set policy qos *policy-name* **shaper bandwidth** { *number* | *number-and-suffix* }

delete policy qos *policy-name* **shaper bandwidth** [*number* | *number-and-suffix*]

show policy qos *policy-name* **shaper bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second

mbit: Megabits per second

mbps: Megabytes per second

gbit: Gigabits per second

kbps: Kilobytes per second

gbps: Gigabytes per second

*x***%**: Percent of bandwidth inherited from parent

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            bandwidth
                bandwidth number%
                bandwidth number
                bandwidth number-and-suffix
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the bandwidth of a QoS policy.

Use the **delete** form of this command to delete the bandwidth of a QoS policy.

Use the **show** form of this command to display the bandwidth of a QoS policy.

policy qos <policy-name> shaper burst <limit>

Sets the burst size limit of a QoS policy.

Syntax

set policy qos *policy-name* **shaper burst** *limit*

delete policy qos *policy-name* **shaper burst** [*limit*]

show policy qos *policy-name* **shaper burst**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            burst limit
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to set the burst size limit of a QoS policy. Using the **set** command to define the protocol for an existing QoS policy burst size limit replaces the existing limit.

Use the **delete** form of this command to delete the burst size limit of a QoS policy.

Use the **show** form of this command to display the burst size limit of a QoS policy.

policy qos <policy-name> shaper class <class-id> description <description>

Describes a QoS policy class for ease of identification when viewing a configuration.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **description** *description*

delete policy qos *policy-name* **shaper class** *class-id* **description**

show policy qos *policy-name* **shaper class** *class-id* **description**

Parameters

policy-name

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class-id

The number of the QoS policy class. The number ranges from 1 through 999999.

description

A description of the QoS policy class.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                description description
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a description of a QoS policy class.

Use the **delete** form of this command to delete the description of a QoS policy class.

Use the **show** form of this command to display the description of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> action <action>

Defines the action to take on packets when the packets meets the match criteria.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **action** { **drop** | **pass** }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **action** [**drop** | **pass**]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **action**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    action drop
                    action pass
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the action to take on packets when the packets meets the match criteria.

Use the **delete** form of this command to delete the configuration that defines the action to take on packets when the packets meet the match criteria.

Use the **show** form of this command to display the configuration that defines the action to take on packets when the packets meet the match criteria.

policy qos <policy-name> shaper class <class-id> match <rule-name> description

Describes a QoS policy class for ease of identification when viewing a configuration.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **description** *description*

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **description**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match {
                    description description
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the destination address of a QoS policy class.

Use the **delete** form of this command to delete the destination address of a QoS policy class.

Use the **show** form of this command to display the destination address of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> destination

Defines a destination address of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **destination** { **address** *address* | **port** *port* }

delete policy qos *policy-name* **shaper class** *class-id* **destination** [*address* | *port*]

show policy qos *policy-name* **shaper class** *class-id* **destination**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

address *address*

An address parameter in the form of an IPv4 address and prefix length (*x.x.x.x/x*) or an IPv6 address and a prefix length (*h.h.h.h.h.h.h.h/x*).

port *port*

A port address parameter in one of the following forms:

- *port name*: A port name (as shown in /etc/services, for example, http).
- *1-65535*: A numbered port within the range from 1 through 65535.
- *start-end*: A range of numbered ports (the *start* through *end* port numbers, for example, 1001-1005).

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                destination {
                   address address
                    port port
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the destination address of a QoS policy class.

Use the **delete** form of this command to delete the destination address of a QoS policy class.

Use the **show** form of this command to display the destination address of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> dscp <number>

Defines DSCP as the match criteria of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **dscp** *number*

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **dscp** [*number*]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name*

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

dscp *number*

The DSCP number of a packet. the numbers can range from 0 through 63.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    dscp number
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define DSCP as a match criteria of a QoS policy class.

Use the **delete** form of this command to delete DSCP as a match criteria of a QoS policy class.

Use the **show** form of this command to display the match criteria of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> fragment

Define fragmented packets as the match criteria of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **fragment**

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **fragment**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **fragment**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                    match rule-name
                    fragment
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define fragmented packets as the match criteria of a class.

Use the **delete** form of this command to delete fragmented packets as the match criteria of a class.

Use the **show** form of this command to display the match criteria of a class.

policy qos <policy-name> shaper class <class-id> match <rule-name> log

Enables logging for a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **log**

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **log**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name*

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    log
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to enable logging for a QoS rule.

Use the **delete** form of this command to disable logging for a QoS rule.

Use the **show** form of this command to display the match criteria of a class.

policy qos <policy-name> shaper class <class-id> match <rule-name> mark pcp <number>

Defines PCP as a match criteria of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **pcp** *number*

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **pcp** [*number*]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name*

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

pcp *number*

The PCP number that ranges from 0 through 7. PCP matches packets with headers containing the 802.1 priority code point.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match name {
                    pcp number
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define PCP as a match criteria of a QoS policy class.

Use the **delete** form of this command to delete PCP as a match criteria of a QoS policy class.

Use the **show** form of this command to display the match criteria of a class.

policy qos <policy-name> shaper class <class-id> match <rule-name> police bandwidth <limit>

De fines the policing rule for bandwidth for a QoS policy class.

Syntax **set policy qos** *policy-name* **shaper class** *class-id* **match** *rule-name* **police bandwidth** { *rate* | *rate-and-suffix* }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police bandwidth** [*rate* | *rate-and-suffix*]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example,10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    police {
                        bandwidth number
                        bandwidth number-and-suffix
                        bandwidth 100%
                    }
                }
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define the bandwidth policing rule of a QoS policy class.

Use the **delete** form of this command to delete the bandwidth policing rule of a QoS policy class.

Use the **show** form of this command to display the bandwidth policing rule of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> police burst <limit>

De fines the policing rule for traffic burst size limit for a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police** { **burst** *limit* }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police** [**burst** *limit*]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    police {
                        burst limit
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the burst size limit policing rule of a QoS policy class.

Use the **delete** form of this command to delete the burst size limit policing rule of a QoS policy class.

Use the **show** form of this command to display the burst size limit policing rule of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> police ratelimit <limit>

De fines the rate limit in packets per second for a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police ratelimit** *limit*

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police ratelimit**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police ratelimit**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

ratelimit *limit*

The number of packets that can be sent in a second.

*n***kpps**: Thousands of packets per second.

*n***mpps**: Millions packets per second.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    police {
                        ratelimit limit
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the rate limit in packets per second for a QoS policy class.

Use the **delete** form of this command to delete the rate limit in packets per second for a QoS policy class.

Use the **show** form of this command to display the rate limit in packets per second for a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> police then action <action>

Defines drop or pass action on packets for a QoS policy class when traffic exceeds policed bandwidth.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police then action** { **drop** | **pass** }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police then action**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                   police  {
                        then
                            action drop
                            action pass
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the drop or pass configuration on packets for a QoS policy class when traffic exceeds policed bandwidth.

Use the **delete** form of this command to delete the drop or pass configuration on packets for a QoS policy class when traffic exceeds policed bandwidth.

Use the **show** form of this command to display the drop or pass configuration policing rule of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> police then mark <type>

Defines the policing rule for DSCP or PCP marking of packets. when traffic exceeds policed bandwidth, for a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police then mark** { **dscp** | **pcp** }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police then mark** [**dscp** | **pcp**]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **police then mark**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    police {
                        then
                            mark dscp
                            mark pcp
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the policing rule for DSCP or PCP marking of packets. when traffic exceeds policed bandwidth, for a QoS policy class.

Use the **delete** form of this command to delete the policing rule for DSCP or PCP marking of packets. when traffic exceeds policed bandwidth, for a QoS policy class.

Use the **show** form of this command to display the policing rule for DSCP or PCP marking of packets. when traffic exceeds policed bandwidth, for a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> protocol <protocol>

Defines a protocol of a QoS policy class.

Syntax **set policy qos** *policy-name* **shaper class** *class-id* **match** *rule-name* **protocol** { *text* | *0-255* | **tcp_udp** | **all** }

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **protocol** [*text* | *0-255* | **tcp_udp** | **all**]

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **protocol**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

protocol { *text* | *0-255* | **tcp_udp** | **all** }

The name of an IP protocol.

text: IP protocol name from /etc/protocols, for example, **tcp** or **udp**.

0-255: The IP protocol number located in the IP header.

tcp_udp: TCP and UDP protocols.

all: All IP protocols

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    protocol protocol
                }
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define the protocol of a QoS policy class.

Use the **delete** form of this command to delete a protocol of a QoS policy class.

Use the **show** form of this command to display a protocol of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> source <source>

Defines a destination address of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **source** [**address** *address* | **port** *port*]

delete policy qos *policy-name* **shaper class** *class-id* **source** [**address** | **port**]

show policy qos *policy-name* **shaper class** *class-id* **destination**

Parameters

profile *profile-name*

The name of a QoS profile.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

address *address*

An address parameter in the form of an IPv4 address and prefix length (*x.x.x.x/x*) or an IPv6 address and a prefix length (*h.h.h.h.h.h.h.h/x*).

port *port*

A port address parameter in one of the following forms:

- *port name*: A port name (as shown in /etc/services, for example, http).
- *1-65535*: A numbered port within the range from 1 through 65535)
- *start-end*: A range of numbered ports (the *start* through *end* port numbers, for example, 1001-1005).

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    address address
                    port port
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the destination address of a QoS policy class.

Use the **delete** form of this command to delete the destination address of a QoS policy class.

Use the **show** form of this command to display the destination address of a QoS policy class.

policy qos <policy-name> shaper class <class-id> match <rule-name> tcp

Defines TCP packets as the match criteria for a QoS policy.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **tcp**

delete policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **tcp**

show policy qos *policy-name* **shaper class** *class-id* **match** *rule-name* **tcp**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

address *address*

An address parameter in the form of an IPv4 address and prefix length (*x.x.x.x/x*) or an IPv6 address and a prefix length (*h.h.h.h.h.h.h.h/x*).

port *port*

A port address parameter in one of the following forms:

- *port name*: A port name (as shown in /etc/services, for example, http).
- *1-65535*: A numbered port within the range from 1 through 65535.
- *start-end*: A range of numbered ports (the *start* through *end* port numbers, for example, 1001-1005).

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                match rule-name {
                    tcp
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define TCP packets as the match criteria for a QoS policy.

Use the **delete** form of this command to delete TCP packets as the match criteria for a QoS policy.

Use the **show** form of this command to display the criteria for a QoS policy.

policy qos <policy-name> shaper class <class-id> profile <profile-name>

Creates the profile name of a QoS policy class.

Syntax

set policy qos *policy-name* **shaper class** *class-id* **profile** *profile-name*

delete policy qos *policy-name* **shaper class** *class-id* **profile** [*profile-name*]

show policy qos *policy-name* **shaper class** *class-id* **profile**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

profile *profile-name*

The name of a QoS profile.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            class class-id {
                profile profile-name
             }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create the profile name of a QoS policy class.

Use the **delete** form of this command to delete the profile name of a QoS policy class.

Use the **show** form of this command to display the profile name of a QoS policy class.

policy qos <policy-name> shaper default <default-name>

Defines a QoS traffic-queuing policy to apply to default traffic.

Syntax **set policy qos** *policy-name* **shaper default** *default-name*

delete policy qos *policy-name* **shaper default** [*default-name*]

show policy qos *policy-name* **shaper default** *default-name*

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

default *default-name*

The name of a QoS policy profile to apply to default traffic. This attribute is required and must be configured.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            default default-name {
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define the QoS policy to apply to default traffic.

Use the **delete** form of this command to delete a QoS policy for default traffic.

Use the **show** form of this command to display a QoS policy for default traffic.

policy qos <policy-name> shaper description <description>

Describes a QoS policy.

Syntax

set policy qos *policy-name* **shaper description** *description*

delete policy qos *policy-name* **description**

show policy qos *policy-name* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            description description {
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to describe a QoS queuing policy.

Use the **delete** form of this command to delete the description of a QoS policy.

Use the **show** form of this command to display the description of a QoS policy.

policy qos <policy-name> shaper frame-overhead <bytes>

Enables the frame overhead scheduler which takes into account the additional bytes added by the underlying link layer protocols.

Syntax

set policy qos *policy-name* **shaper frame-overhead** *bytes*

delete policy qos *policy-name* **shaper frame-overhead** [*bytes*]

show policy qos *policy-name* **shaper frame-overhead**

Command Default

The Ethernet frame overhead of 22 bytes.

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

frame-overhead *number*

The Ethernet frame overhead in bytes. The number range is 0 through 1000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            frame-overhead bytes {
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to enable the frame overhead scheduler which takes into account the additional bytes added by the underlying link layer protocols.

Use the **delete** form of this command to delete the configuration for the frame overhead scheduler.

Use the **show** form of this command to display the configuration for the frame overhead scheduler.

policy qos <policy-name> shaper profile <profile-name>

Creates a QoS policy profile.

Syntax **set policy qos** *policy-name* **shaper profile** *profile-name*

delete policy qos *policy-name* **shaper profile** [*profile-name*]

show policy qos *policy-name* **shaper profile**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
            }
        }
    }
}
```

Usage Guidelines After a profile has been created, use other QoS commands to configure attributes for bandwidth, burst, class, default, description, map, queue, size, and VLAN ID.

Use the **set** form of this command to create a QoS profile.

Use the **delete** form of this command to delete a QoS profile.

Use the **show** form of this command to display a QoS profile.

policy qos <policy-name> shaper profile <profile-name> bandwidth <limit>

Defines the bandwidth rate of a QoS traffic-queuing profile.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **bandwidth** { *number* | *number-and-suffix* }

delete policy qos *policy-name* **shaper profile** *profile-name* **bandwidth** [*number* | *number-and-suffix*]

show policy qos *policy-name* **shaper profile** *profile-name* **bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

*x***%**: Percent of bandwidth inherited from parent.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                bandwidth number%
                bandwidth number
                bandwidth number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the bandwidth of a QoS policy.

Use the **delete** form of this command to delete the bandwidth of a QoS policy.

Use the **show** form of this command to display the bandwidth of a QoS policy.

policy qos <policy-name> shaper profile <profile-name> burst <limit>

Defines the burst limit for a QoS profile.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **burst** { *number* | *number-and-suffix* }

delete policy qos *policy-name* **shaper profile** *profile-name* **burst** [*number* | *number-and-suffix*]

show policy qos *policy-name* **shaper profile** *profile-name* **burst**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                burst number
                burst number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the burst size limit of a QoS policy.

Use the **delete** form of this command to delete the burst size limit of a QoS policy.

Use the **show** form of this command to display the burst size limit of a QoS policy.

policy qos <policy-name> shaper profile <profile-name> description

Describes a QoS policy profile.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **description** *description*

delete policy qos *policy-name* **shaper profile** *profile-name* **description**

show policy qos *policy-name* **shaper profile** *profile-name* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                description description
            }
        }
    }
}
```

Usage Guidelines

The text entered as the description must be kept in quotation marks. The description must be kept to a single line; this command does not support carriage returns, otherwise there are no restrictions of the use of text.

Use the **set** form of this command to create the description of a QoS policy class.

Use the **delete** form of this command to delete the description of a QoS policy class.

Use the **show** form of this command to display the description of a QoS policy class.

policy qos <policy-name> shaper profile <profile-name> map dscp <dscp-number> to <queue-number>

Defines the mapping of DSCP traffic to a queue for a QoS policy.

Syntax **set policy qos** *policy-name* **shaper profile** *profile-name* **map dscp** *dscp-number* **to** *queue-number*

delete policy qos *policy-name* **shaper profile** *profile-name* **map dscp** *dscp-number* **to** [*queue-number*]

show policy qos *policy-name* **shaper profile** *profile-name* **map dscp**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of the QoS profile.

dscp *dscp-number*

Specifies the DSCP number as the match criteria. The supported values are AF11 through AF13, AF21 through AF23, AF31 through AF33, AF41 through AF43, CS1 through CS7, default, and EF.

to *queue-number*

Specifies the number of the destination queue. The queue number that ranges from 0 through 7.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                map {
                    dscp dscp-number {
                        to queue-number
                    }
                }
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to map DSCP traffic to a queue for a QoS policy.

Use the **delete** form of this command to delete the mapping of DSCP traffic to a queue for a QoS policy.

Use the **show** form of this command to display the mapping of DSCP traffic to a queue for a QoS policy.

policy qos <policy-name> shaper profile <profile-name> map pcp <number> to <number>

Defines the mapping of PCP traffic to a queue for a QoS policy.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **map pcp** *pcp-number* **to** *queue-number*

delete policy qos *policy-name* **shaper profile** *profile-name* **map pcp** *pcp-number* **to** [*queue-number*]

show policy qos *policy-name* **shaper profile** *profile-name* **map pcp**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

pcp *pcp-number*

The priority-code point number.

to *queue-number*

Specifies the number of the destination queue. The queue number that ranges from 0 through 7.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                map {
                    pcp number {
                        to number
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to map PCP traffic to a queue for a QoS policy.

Use the **delete** form of this command to delete the mapping of PCP traffic to a queue for a QoS policy.

Use the **show** form of this command to display the mapping of PCP traffic to a queue for a QoS policy.

policy qos <policy-name> shaper profile <profile-name> period <number>

Define the enforcement interval period (in milliseconds) of the profile.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **period** *number*

delete policy qos *policy-name* **shaper profile** *profile-name* **period** [*number*]

show policy qos *policy-name* **shaper profile** *profile-name* **period**

Parameters

qos *policy-name*

The name of the QoS policy.

profile *profile-name*

The name of the QoS profile.

period *number*

The enforcement period in milliseconds. The numbers range from 1 through 60000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                period number
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the enforcement interval period of the profile.

Use the **delete** form of this command to delete the enforcement interval period of the profile.

Use the **show** form of this command to display the enforcement interval period (in milliseconds) of the profile.

policy qos <policy-name> shaper profile <profile-name> queue <number>

Defines the queue ID number on the output port of a packet for forwarding or scheduling depending on how it is configured.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **queue** *number*

delete policy qos *policy-name* **shaper profile** *profile-name* **queue** [*number*]

show policy qos *policy-name* **shaper profile** *profile-name* **queue**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

queue *number*

Packet queue identification number. The numbers range from 0 through 3).

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                queue number
                queue number
                queue number
            }
        }
    }
}
```

Usage Guidelines

The queue ID number is associated with a QoS policy profile. The queue can restrict traffic based on bandwidth and burst.

A total of four queues (0 through 3) can be configured for a policy.

Use the **set** form of this command to define the queue ID number on the output port of a packet for forwarding or scheduling depending on what is configured.

Use the **delete** form of this command to delete the queue ID number on the output port of a packet for forwarding or scheduling depending on what is configured.

Use the **show** form of this command to display the queue ID number on the output port of a packet for forwarding or scheduling depending on what is configured.

policy qos <policy-name> shaper profile <profile-name> queue <queue-id> description <description>

Describes a QoS queue.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-id* **description** *description*

delete policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-id* **description**

show policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-id* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

queue *queue-id*

The packet queue ID number. The numbers range from 0 through 3.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                queue number {
                    description description
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to describe a QoS queue.

Use the **delete** form of this command to delete the description to a QoS queue.

Use the **show** form of this command to display the description to a QoS queue.

policy qos <policy-name> shaper profile <profile-name> queue <queue-number> traffic-class <class-id>

Defines the traffic class ID of a queue for a QoS policy.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **traffic-class** *class-id*

delete policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **traffic-class** [*class-id*]

show policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **traffic-class**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

queue *queue-number*

Packet queue identification number. The numbers range from 0 through 7.

traffic-class *class-id*

Class identification number. The numbers range from 0 through 3.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                queue number {
                    qos-traffic number
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the traffic class ID of a queue for a QoS policy.

Use the **delete** form of this command to delete the traffic class ID of a queue for a QoS policy.

Use the **show** form of this command to display the traffic class ID of a queue for a QoS policy.

policy qos <policy-name> shaper profile <profile-name> queue <queue-number> weight <weight-number>

Defines the WRR weight number for a queue.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **weight** *weight-number*

delete policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **weight** [*weight-number*]

show policy qos *policy-name* **shaper profile** *profile-name* **queue** *queue-number* **weight**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

queue-number

Packet queue identification number. The numbers range from 0 through 7.

weight *weight-number*

WWR numerical number. The numbers range from 1 through 100.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                queue queue-number {
                   weight weight-number
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the WRR weight number for a queue.

Use the **delete** form of this command to delete the WRR weight number for a queue.

Use the **show** form of this command to display the WRR weight number for a queue.

policy qos <policy-name> shaper profile <profile-name> traffic-class <class-id> bandwidth <limit>

Defines the bandwidth limit of a traffic class.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *class-id* **bandwidth** { *number* | *number-and-suffix* }

delete policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *class-id* **bandwidth** [*number* | *number-and-suffix*]

show policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *class-id* **bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

queue-id

The packet queue ID number. The numbers range from 0 through 3.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                queue number {
                     bandwidth number
                     bandwidth number-and-suffix
                     bandwidth 100%
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the bandwidth limit of a traffic class.

Use the **delete** form of this command to delete the bandwidth limit of a traffic class.

Use the **show** form of this command to display the bandwidth limit of a traffic class.

policy qos <policy-name> shaper profile <profile-name> traffic-class <class-id> burst

Defines the burst size limit for a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **burst** *limit*

delete policy qos *policy-name* **shaper profile** *profile-name* **burst** [*limit*]

show policy qos *policy-name* **shaper profile** *profile-name* **burst**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                burst number
                burst number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the burst size limit of a QoS policy.

Use the **delete** form of this command to delete the burst size limit of a QoS policy.

Use the **show** form of this command to display the burst size limit of a QoS policy.

policy qos <policy-name> shaper profile <profile-name> traffic-class <traffic-class> description <description>

Describes a QoS policy profile.

Syntax

set policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *traffic-class* **description** *description*

delete policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *traffic-class* **description**

show policy qos *policy-name* **shaper profile** *profile-name* **traffic-class** *traffic-class* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

profile *profile-name*

The name of a QoS profile.

traffic-class *traffic-class*

The name of the QoS traffic class.

description *description*

The description of a traffic class as a reference notation when viewing the configuration. Description must be entered inside quotation marks. Text with carriage returns are not supported inside the quotation marks. There are no restrictions of the use of text.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            profile profile-name {
                traffic-class traffic-class {
                    description description
                }
            }
        }
    }
}
```

Usage Guidelines

The text entered as the description must be kept in quotation marks. The description must be kept to a single line; this command does not support carriage returns, otherwise there are no restrictions of the use of text.

Use the **set** form of this command to define the description of a QoS traffic class.

Use the **delete** form of this command to delete the description of a QoS traffic class.

Use the **show** form of this command to display the description of a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-id> bandwidth <limit>

Defines the bandwidth rate of a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **bandwidth** { *number* **%** | number-and-suffix }

delete policy qos *policy-name* **shaper traffic-class** *class-id* **bandwidth** [*number* **%** | *number-and-suffix*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **bandwidth**

Parameters

qos *policy-name*

The name of the QoS policy.

queue *queue-id*

The packet queue ID number. The numbers range from 0 through 3.

traffic-class *class-name*

The name of the traffic class.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

*x***%**: Percent of bandwidth inherited from parent.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            queue queue-id {
                bandwidth number%
                bandwidth number
                bandwidth number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the bandwidth of a QoS policy.

Use the **delete** form of this command to delete the bandwidth of a QoS policy.

Use the **show** form of this command to display the bandwidth of a QoS policy.

policy qos <policy-name> shaper traffic-class <class-id> burst <number>

Defines the burst size limit of a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **burst** { *number* | *number-and-suffix* }

delete policy qos *policy-name* **shaper traffic-class** *class-id* **burst** [*number* | number-and-suffix]

show policy qos *policy-name* **shaper traffic-class** *class-id* **burst**

Parameters

qos *policy-name*

The name of the QoS policy.

queue *queue-id*

The packet queue ID number. The numbers range from 0 through 3.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            queue text {
                burst
                number
                number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the burst size limit of a QoS traffic class.

Use the **delete** form of this command to delete the burst size limit of a QoS traffic class.

Use the **show** form of this command to display the burst size limit of a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-name> description

Describes a traffic-class for ease of identification when viewing a configuration.

Syntax **set policy qos** *policy-name* **shaper traffic-class** *class-id* **description** *description*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **description**

show policy qos *policy-name* **shaper traffic-class** *class-id* **description**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            traffic-class class-id {
                description description
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define a traffic-class for ease of identification when viewing a configuration.

Use the **delete** form of this command to delete the traffic-class for ease of identification when viewing a configuration.

Use the **show** form of this command to display the traffic-class for ease of identification when viewing a configuration.

policy qos <policy-name> shaper traffic-class <class-id> queue-limit <number>

Defines the queue limit of a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **queue-limit** *number*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **queue-limit** [*number*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **queue-limit**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

queue-limit *number*

The queue limit in number of bytes. The numbers range from 1 through 65535 and in a power of 2.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            traffic-classs class-id {
              queue-limit
              number
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the queue limit of a QoS traffic class.

Use the **delete** form of this command to deletes the queue limit of a QoS traffic class.

Use the **show** form of this command to display the queue limit of a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-id> random-detect filter-weight <weight>

Defines the exponentially weighted moving average (EWMA) filter parameter for a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect filter-weight** *filter-weight*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect filter-weight** [*filter-weight*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect filter-weight**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

filter-weight *filter-weight*

The exponentially weighted moving average (EWMA) filter weight. The number ranges from 1 through 12.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        traffic-class class-id {
            random-detect {
                filter-weight filter-weight
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the exponentially weighted moving average (EWMA) filter parameter for a QoS traffic class.

Use the **delete** form of this command to delete the exponentially weighted moving average (EWMA) filter parameter for a QoS traffic class.

Use the **show** form of this command to display the exponentially weighted moving average (EWMA) filter parameter for a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-id> random-detect mark-probability <number>

Defines the packet marking probability (in an inverse) filter number for a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect mark-probability** *mark-probability*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect mark-probability** [*mark-probability*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect mark-probability**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

mark-probability *mark-probability*

The maximum value for the inverse packet marking probability filter for a QoS traffic class—a rate of 1/*x* where *x* is the mark-probability number. The number ranges from 1 through 255.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        traffic-class class-id {
            random-detect {
                mark-probability mark-probability
            }
        }
    }
}
```

Usage Guidelines

When the maximum queue depth is met, the system drops packets at a rate of 1/*x* where x is the mark-probability number.

Use the **set** form of this command to define the inverse of packet marking probability filter number for a QoS traffic class.

Use the **delete** form of this command to delete the inverse of packet marking probability filter number for a QoS traffic class.

Use the **show** form of this command to display the inverse of packet marking probability filter number for a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-id> random-detect max-threshold <level>

Defines the maximum threshold level for a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect max-threshold** *max-threshold*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect max-threshold** [*max-threshold*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect max-threshold**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

max-threshold *max-threshold*

The maximum threshold level number. The number ranges from 1 through 12.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        traffic-class class-id {
            random-detect {
                max-threshold max-threshold
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the maximum threshold number for a QoS traffic class.

Use the **delete** form of this command to delete the maximum threshold number for a QoS traffic class.

Use the **show** form of this command to display the maximum threshold number for a QoS traffic class.

policy qos <policy-name> shaper traffic-class <class-id> random-detect min-threshold <level>

Defines the minimum threshold level for a QoS traffic class.

Syntax

set policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect min-threshold** *min-threshold*

delete policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect min-threshold** [*min-threshold*]

show policy qos *policy-name* **shaper traffic-class** *class-id* **random-detect min-threshold**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

min-threshold *min-threshold*

The minimum threshold level number. The number ranges from 1 through 1022.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        traffic-class class-id {
            random-detect {
                min-threshold min-threshold
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the minimum threshold level for a QoS traffic class.

Use the **delete** form of this command to delete the minimum threshold level for a QoS traffic class.

Use the **show** form of this command to display the minimum threshold level for a QoS traffic class.

policy qos <policy-name> shaper vlan <vlan-id>

Specifies the VLAN of a QoS policy.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id*

delete policy qos *policy-name* **shaper vlan** [*vlan-id*]

show policy qos *policy-name* **shaper vlan**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

Performs a match based on VLAN ID. The numbers range from 1 through 4096.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            queue {
                vlan vlan-id
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to specify the VLAN of a QoS policy.

Use the **delete** form of this command to delete the VLAN of a QoS policy.

Use the **show** form of this command to display the VLAN of a QoS policy.

policy qos <policy-name> shaper vlan <vlan-id> bandwidth <limit>

Defines the bandwidth rate limit of a VLAN for a QoS policy.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **bandwidth** { *number* | *number -and- suffix* }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **bandwidth** [*number* | *number -and- suffix*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

Performs a match based on VLAN ID number. The numbers range from 1 through 4096.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

*x***%**: Percent of bandwidth inherited from parent.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                bandwidth number%
                bandwidth number
                bandwidth number-and-suffix
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the bandwidth rate limit of a QoS policy.

Use the **delete** form of this command to delete the bandwidth rate limit of a QoS policy.

Use the **show** form of this command to display the bandwidth of a QoS policy.

policy qos <policy-name> shaper vlan <vlan-id> burst <limit>

Defines the burst size limit of an interface.

Syntax **set policy qos** *policy-name* **shaper vlan** *vlan-id* **burst** { *bytes* | *bytes -and-suffix* }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **burst** [*bytes* | *bytes -and-suffix*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **burst**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                burst
                     number
                    number-and-suffix
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define the burst size limit of an interface.

Use the **delete** form of this command to delete the burst size limit of an interface.

Use the **show** form of this command to display the burst size limit of an interface.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id>

Define a QoS policy class.

Syntax **set policy qos** *policy-name* **shaper vlan** *vlan-id* **class** *class-id*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** [*class-id*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class**

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to create a QoS traffic VLAN class.

Use the **delete** form of this command to delete a QoS policy VLAN class.

Use the **show** form of this command to display a QoS traffic VLAN class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> description

Describes a QoS policy class for ease of identification when viewing a configuration.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description** *description*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                   description description
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a description for a QoS policy class.

Use the **delete** form of this command to delete a description for a QoS policy class.

Use the **show** form of this command to display a description for a QoS policy class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> action <action>

Defines the drop or pass of packets as an action on packets that meet the match criteria of a QoS class.

Syntax **set policy qos** *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **action** { **drop** | **pass** }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **action** [**drop** | **pass**]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **action**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define the drop or pass of packets as an action on packets that meet the match criteria of a QoS class.

Use the **delete** form of this command to delete the drop or pass of packets as an action on packets that meet the match criteria of a QoS class.

Use the **show** form of this command to display the drop or pass of packets as an action on packets that meet the match criteria of a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> description

Describes a match criteria for ease of identification when viewing a configuration.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** [*class-id*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a QoS traffic VLAN class.

Use the **delete** form of this command to delete a QoS policy VLAN class.

Use the **show** form of this command to display a QoS traffic VLAN class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> destination

Defines a destination as the match criteria for a VLAN class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **destination** { **address** *address* | **mac-address** *address* | **port** *port* }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** [*class-id*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

address *address*

An address parameter in the form of an IPv4 address and prefix length (*x.x.x.x/x*) or an IPv6 address and a prefix length (*h.h.h.h.h.h.h.h/x*).

mac-address *address*

The MAC address to be statically mapped to the specified IP address. Matches the media access control (MAC) address in the source address. The address format is six 8-bit numbers, separated by colons, in hexadecimal; for example, 00:0a:59:9a:f2:ba.

port *port*

A port address parameter in one of the following forms:

- *port name*: A port name (as shown in /etc/services, for example, http).
- *1-65535*: A numbered port within the range from 1 through 65535.
- *start-end*: A range of numbered ports (the *start* through *end* port numbers, for example, 1001-1005).

Modes

Configuration mode

Configuration Statement

```
policy {
   qos policy-name {
      shaper {
         vlan vlan-id {
            class class-id {
               destination {
                  address address
                  address mac-address
                  address port
               }
            }
         }
      }
   }
}
```

Usage Guidelines Use the **set** form of this command to create a QoS traffic VLAN class.

Use the **delete** form of this command to delete a QoS policy VLAN class.

Use the **show** form of this command to display a QoS traffic VLAN class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> dscp <number>

Defines a DSCP value as the match criteria for a QoS class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **dscp** *number*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **dscp** *number*

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **dscp**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

dscp *number*

Specifies the DSCP number as the match criteria. The number ranges from 0 through 63. DSCP matches packets with headers that include this DSCP number.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        dscp number
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a DSCP value as the match criteria for a QoS class.

Use the **delete** form of this command to delete a DSCP value as the match criteria for a QoS class.

Use the **show** form of this command to display a DSCP value as the match criteria for a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> fragment

Defines fragment packets as a match criteria for a QoS class.

Syntax **set policy qos** *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **fragment**

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **fragment**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name*

Parameters **qos** *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name fragment
                }
            }
        }
    }
}
```

Usage Guidelines Use the **set** form of this command to define fragment packets as a match criteria for a QoS class.

Use the **delete** form of this command to delete fragment packets as a match criteria for a QoS class.

Use the **show** form of this command to display the match criteria for a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> log

Enables logging for a QoS rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **log**

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **log**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **log**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        log
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a QoS traffic VLAN class.

Use the **delete** form of this command to delete a QoS policy VLAN class.

Use the **show** form of this command to display a QoS traffic VLAN class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> mark <code-point>

Marks packets with DSCP or PCP for a match rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **mark** [**dscp** | **pcp**]

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **mark** [**dscp** | **pcp**]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **mark**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        mark dscp
                        mark pcp
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to mark packets with DSCP or PCP for a match rule.

Use the **delete** form of this command to delete the configuration to mark packets with DSCP or PCP for a match rule.

Use the **show** form of this command to display the configuration to mark packets for a match rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> pcp

Defines PCP as the match criteria for a QoS class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **pcp**

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **pcp**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name*

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        pcp
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define PCP as the match criteria for a QoS class.

Use the **delete** form of this command to delete PCP as the match criteria for a QoS class.

Use the **show** form of this command to display the match criteria for a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police bandwidth <limit>

Defines the policing rule for bandwidth as the match criteria for a QoS class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police bandwidth** *number-and-suffix*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police bandwidth** [*number-and-suffix*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police bandwidth**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

bandwidth *limit*

The bandwidth rate as a number followed by no space and a scaling suffix representing the rate (for example, 10mbit). The following suffixes are supported:

No suffix: Kilobits per second.

mbit: Megabits per second.

mbps: Megabytes per second.

gbit: Gigabits per second.

kbps: Kilobytes per second.

gbps: Gigabytes per second.

*x***%**: Percent of bandwidth inherited from parent.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          bandwidth number%
                          bandwidth number
                          bandwidth number-and-suffix
                       }
                    }
                }
            }
        }
```

```
        }
}
```

Usage Guidelines Use the **set** form of this command to define PCP as the match criteria for a QoS class.

Use the **delete** form of this command to delete PCP as the match criteria for a QoS class.

Use the **show** form of this command to display the match criteria for a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police burst <limit>

Defines the policing rule for burst size limit of packets as the match criteria for a QoS class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police burst** *limit*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police burst** *limit*

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police burst**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

burst *limit*

The burst size limit in number of bytes. The number can range from 0 through 312500000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          burst limit
                       }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define PCP as the match criteria for a QoS class.

Use the **delete** form of this command to delete PCP as the match criteria for a QoS class.

Use the **show** form of this command to display the match criteria for a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police ratelimit <limit>

De fines the rate limit in packets per second for a VLAN policy class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police ratelimit** *limit*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police ratelimit**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police ratelimit**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

ratelimit *limit*

The number of packets that can be sent in a second.

*n***kpps**: Thousands of packets per second.

*n***mpps**: Millions packets per second.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          ratelimit limit
                       }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the rate limit in packets per second for a VLAN policy class.

Use the **delete** form of this command to delete the rate limit in packets per second for a VLAN policy class.

Use the **show** form of this command to display the rate limit in packets per second for a VLAN policy class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police then action <action>

Defines the drop or pass of packets as an action for the match criteria of a QoS class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then action** { **drop** | **pass** }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then action** [**drop** | **pass**]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then action**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          then {
                             action drop
                             action pass
                          }
                       }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the drop or pass of packets as an action for the match criteria of a QoS class.

Use the **delete** form of this command to delete the configuration for the drop or pass of packets as an action for the match criteria of a QoS class.

Use the **show** form of this command to display the configuration for the match criteria of a QoS class.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police then mark pcp <value>

Marks PCP on packets that meet the match criteria of a rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then mark** { **drop** | **pass** }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then action** [**drop** | **pass**]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then action**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          then {
                             mark drop
                             mark pass
                          }
                       }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to mark PCP on packets that meet the match criteria of a rule.

Use the **delete** form of this command to delete configuration that marks PCP on packets that meet the match criteria of a rule.

Use the **show** form of this command to display the configuration marks PCP on packets that meet the match criteria of a rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> police then mark dscp <dscp-number>

Marks DSCP on packets that meet the match criteria of a rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then mark dscp** *dscp-number*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then mark dscp** [*dscp-number*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **police then mark**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

dscp *number*

A DSCP number that ranges from 0 through 63. DSCP matches packets with headers that include this DSCP number.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                       police {
                          then {
                             dscp dscp-number
                          }
                       }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to mark PCP on packets that meet the match criteria of a rule.

Use the **delete** form of this command to delete configuration that marks PCP on packets that meet the match criteria of a rule.

Use the **show** form of this command to display the configuration marks PCP on packets that meet the match criteria of a rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> protocol <protocol>

Applies protocol to a match rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **protocol** *protocol*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **protocol**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **protocol**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

protocol *protocol*

The name of an IP protocol.

text: IP protocol name from /etc/protocols, for example, **tcp** or **udp**.

0-255: The IP protocol number located in the IP header.

tcp_udp: TCP and UDP protocols.

all: All IP protocols

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        protocol protocol
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to apply a protocol type to a match rule.

Use the **delete** form of this command to delete a protocol type to a match rule.

Use the **show** form of this command to display the protocol type of a match rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> source <source>

Applies the source address or address with port information to a match rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **source** { **address** *address* | **port** *port* }

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **source** { **address** | **port** }

show policy qos *policy-name* **shaper vlan** *vlan-id* **class match** *rule-name* **source** [**address** | **port**]

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

address *address*

An address parameter in the form of an IPv4 address and prefix length (*x.x.x.x/x*) or an IPv6 address and a prefix length (*h.h.h.h.h.h.h.h/x*).

port *port*

A port address parameter in one of the following forms:

- *port name*: A port name (as shown in /etc/services, for example, http).
- *1-65535*: A numbered port within the range from 1 through 65535.
- *start-end*: A range of numbered ports (the *start* through *end* port numbers, for example, 1001-1005).

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        source source
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create the source address or address with port information to a match rule.

Use the **delete** form of this command to delete the source address or address with port information to a match rule.

Use the **show** form of this command to display the source address or address with port information of a match rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> match <rule-name> tcp flags <match-criteria>

Applies TCP flags to a match rule.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **tcp flags** *match-criteria*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **tcp flags**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **match** *rule-name* **tcp flags**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

match *rule-name*

The name of the class-matching rule—the rule that specifies the class that must be matched.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    match rule-name {
                        tcp {
                            flags value
                        }
                    }
                }
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to apply TCP flags to a match rule.

Use the **delete** form of this command to delete TCP flags to a match rule.

Use the **show** form of this command to display the TCP flags configuration for a match rule.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> description <description>

Describes a QoS class for ease of identification when viewing a configuration.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description** *description*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description**

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **description**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

description *description*

A description of the QoS queuing policy to use as a reference when viewing the configuration. The description must be enclosed within double quotation marks, and text that includes carriage returns is not supported inside the quotation marks. There are no restrictions on the use of text. Creating a description for an existing QoS policy replaces any existing description.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id
                description description
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to create a description for a QoS policy.

Use the **delete** form of this command to delete the description for a QoS policy.

Use the **show** form of this command to display the description for a QoS policy.

policy qos <policy-name> shaper vlan <vlan-id> class <class-id> profile <profile-name>

Defines a QoS profile for a QoS policy class.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **profile** *profile-name*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **profile** [*profile-name*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **class** *class-id* **profile**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

class *class-id*

The ID number of the QoS policy class. The number ranges from 1 through 999999.

profile *profile-name*

The name of a QoS profile.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                class class-id {
                    profile profile-name
                 }
            }
        }
    }
}
```

Usage Guidelines

Once a profile has been created, use other QoS commands to configure attributes for bandwidth, burst, class, default, description, map, queue, size, and VLAN ID.

Use the **set** form of this command to define a QoS profile for a QoS policy class.

Use the **delete** form of this command to delete a QoS profile for a QoS policy class.

Use the **show** form of this command to display QoS profile configuration.

policy qos <policy-name> shaper vlan <vlan-id> default <default-name>

Defines the QoS traffic-queuing VLAN policy to be applied to default traffic.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **default** *default-name*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **default** [*default-name*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **default**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

default *default-name*

The default QoS policy profile to be applied to default traffic. This attribute is required and must be configured.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                default default-name
             }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the QoS policy to be applied to default traffic.

Use the **delete** form of this command to delete a QoS policy for default traffic.

Use the **show** form of this command to display a QoS policy for default traffic.

policy qos <policy-name> shaper vlan <vlan-id> period <number>

Defines the enforcement period for a QoS policy.

Syntax

set policy qos *policy-name* **shaper vlan** *vlan-id* **period** *number*

delete policy qos *policy-name* **shaper vlan** *vlan-id* **period** [*number*]

show policy qos *policy-name* **shaper vlan** *vlan-id* **period**

Parameters

qos *policy-name*

The name of a QoS policy. The policy name must be unique and must not be used with other QoS policy commands.

vlan *vlan-id*

VLAN ID number. The numbers range from 1 through 4094.

period *number*

The enforcement period in milliseconds. The numbers range from 1 through 60000.

Modes

Configuration mode

Configuration Statement

```
policy {
    qos policy-name {
        shaper {
            vlan vlan-id {
                period number
            }
        }
    }
}
```

Usage Guidelines

Use the **set** form of this command to define the enforcement period for a QoS policy.

Use the **delete** form of this command to delete the enforcement period for a QoS policy.

Use the **show** form of this command to display the enforcement period for a QoS policy.

show queuing <dataplane-interface>

Displays outgoing packet actions.

Syntax **show queuing** [*dataplane-interface*]

Parameters *dataplane-interface*

The type of data plane interface whose QoS policies you want to display.

Modes Operational mode

Usage Guidelines Use this command to display outgoing packet actions.

Examples The following example shows all outgoing QoS policies.

```
vyatta@vyatta:~$ show queuing
Interface   Queue    Packets            Bytes    Dropped
-------------------------------------------------------------
dp0p4p2         0          0                0          0
                1          0                0          0
                2 2516476820       2805480368 1732333195
                3          0                0          0
vyatta@vyatta:~$
```

The following example shows specific QoS policies.

```
vyatta@vyatta:~$ show queuing dp0p1p1
dp0p4p2 Queueing:
Class       Queue    Packets            Bytes    Dropped
0               0          0                0          0
                1          0                0          0
                2          0                0          0
                3          0                0          0
1               0          0                0          0
                1          0                0          0
                2 2683633772       2058105936 2275510035
                3          0                0          0
vyatta@vyatta:~$
```

show queuing <dataplane-interface>

List of Acronyms

Acronym	Description
ACL	access control list
ADSL	Asymmetric Digital Subscriber Line
AH	Authentication Header
AMI	Amazon Machine Image
API	Application Programming Interface
AS	autonomous system
ARP	Address Resolution Protocol
AWS	Amazon Web Services
BGP	Border Gateway Protocol
BIOS	Basic Input Output System
BPDU	Bridge Protocol Data Unit
CA	certificate authority
CCMP	AES in counter mode with CBC-MAC
CHAP	Challenge Handshake Authentication Protocol
CLI	command-line interface
DDNS	dynamic DNS
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol version 6
DLCI	data-link connection identifier
DMI	desktop management interface
DMVPN	dynamic multipoint VPN
DMZ	demilitarized zone
DN	distinguished name
DNS	Domain Name System
DSCP	Differentiated Services Code Point
DSL	Digital Subscriber Line
eBGP	external BGP
EBS	Amazon Elastic Block Storage
EC2	Amazon Elastic Compute Cloud
EGP	Exterior Gateway Protocol
ECMP	equal-cost multipath
ESP	Encapsulating Security Payload

Acronym	Description
FIB	Forwarding Information Base
FTP	File Transfer Protocol
GRE	Generic Routing Encapsulation
HDLC	High-Level Data Link Control
I/O	Input/Output
ICMP	Internet Control Message Protocol
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Management Protocol
IGP	Interior Gateway Protocol
IPS	Intrusion Protection System
IKE	Internet Key Exchange
IP	Internet Protocol
IPOA	IP over ATM
IPsec	IP Security
IPv4	IP Version 4
IPv6	IP Version 6
ISAKMP	Internet Security Association and Key Management Protocol
ISM	Internet Standard Multicast
ISP	Internet Service Provider
KVM	Kernel-Based Virtual Machine
L2TP	Layer 2 Tunneling Protocol
LACP	Link Aggregation Control Protocol
LAN	local area network
LDAP	Lightweight Directory Access Protocol
LLDP	Link Layer Discovery Protocol
MAC	medium access control
mGRE	multipoint GRE
MIB	Management Information Base
MLD	Multicast Listener Discovery
MLPPP	multilink PPP
MRRU	maximum received reconstructed unit
MTU	maximum transmission unit
NAT	Network Address Translation
NBMA	Non-Broadcast Multi-Access
ND	Neighbor Discovery

Acronym	Description
NHRP	Next Hop Resolution Protocol
NIC	network interface card
NTP	Network Time Protocol
OSPF	Open Shortest Path First
OSPFv2	OSPF Version 2
OSPFv3	OSPF Version 3
PAM	Pluggable Authentication Module
PAP	Password Authentication Protocol
PAT	Port Address Translation
PCI	peripheral component interconnect
PIM	Protocol Independent Multicast
PIM-DM	PIM Dense Mode
PIM-SM	PIM Sparse Mode
PKI	Public Key Infrastructure
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPTP	Point-to-Point Tunneling Protocol
PTMU	Path Maximum Transfer Unit
PVC	permanent virtual circuit
QoS	quality of service
RADIUS	Remote Authentication Dial-In User Service
RHEL	Red Hat Enterprise Linux
RIB	Routing Information Base
RIP	Routing Information Protocol
RIPng	RIP next generation
RP	Rendezvous Point
RPF	Reverse Path Forwarding
RSA	Rivest, Shamir, and Adleman
Rx	receive
S3	Amazon Simple Storage Service
SLAAC	Stateless Address Auto-Configuration
SNMP	Simple Network Management Protocol
SMTP	Simple Mail Transfer Protocol
SONET	Synchronous Optical Network
SPT	Shortest Path Tree

Acronym	Description
SSH	Secure Shell
SSID	Service Set Identifier
SSM	Source-Specific Multicast
STP	Spanning Tree Protocol
TACACS+	Terminal Access Controller Access Control System Plus
TBF	Token Bucket Filter
TCP	Transmission Control Protocol
TKIP	Temporal Key Integrity Protocol
ToS	Type of Service
TSS	TCP Maximum Segment Size
Tx	transmit
UDP	User Datagram Protocol
VHD	virtual hard disk
vif	virtual interface
VLAN	virtual LAN
VPC	Amazon virtual private cloud
VPN	virtual private network
VRRP	Virtual Router Redundancy Protocol
WAN	wide area network
WAP	wireless access point
WPA	Wired Protected Access