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Traffic Policer Configuration

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Junos® OS Traffic Policer Configuration

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Table of Contents

Part 1 Overview

Chapter 1 **Introduction to Traffic Policing . . . 3**

Traffic Policing Overview . . . 3
- Congestion Management for IP Traffic Flows . . . 3
- Traffic Limits . . . 4
- Traffic Color Marking . . . 5
- Forwarding Classes and PLP Levels . . . 6
- Policer Application to Traffic . . . 6

Traffic Policer Types . . . 7
- Single-Rate Two-Color Policers . . . 7
  - Basic Single-Rate Two-Color Policer . . . 7
  - Bandwidth Policer . . . 8
  - Logical Bandwidth Policer . . . 8
- Three-Color Policers . . . 8
  - Single-Rate Three-Color Policers . . . 8
  - Two-Rate Three-Color Policers . . . 8
- Hierarchical Policers . . . 9
- Two-Color and Three-Color Policer Options . . . 9
  - Logical Interface (Aggregate) Policers . . . 9
  - Physical Interface Policers . . . 9
  - Policers Applied to Layer 2 Traffic . . . 10
  - Multifield Classification . . . 10

Order of Policer and Firewall Filter Operations . . . 10

Chapter 2 **Introduction to Policer Configuration . . . 13**

Statement Hierarchy for Configuring Policers . . . 13
Two-Color Policer Configuration Overview . . . 15
Three-Color Policer Configuration Overview . . . 19
Hierarchical Policer Configuration Overview . . . 22
Guidelines for Applying Traffic Policers . . . 24

Chapter 3 **Policer Rate Limits and Actions . . . 25**

Policer Bandwidth and Burst-Size Limits . . . 25
Policer Color-Marking and Actions . . . 26
Single Token Bucket Algorithm . . . 28
- Token Bucket Concepts . . . 28
- Single Token Bucket Algorithm . . . 29
- Conformance Measurement for Two-Color Marking . . . 29

Dual Token Bucket Algorithms . . . 30
- Token Bucket Concepts . . . 30
- Guaranteed Bandwidth for Three-Color Marking . . . 31

Nonconformance Measurement for Single-Rate Three-Color Marking 31
Nonconformance Measurement for Two-Rate Three-Color Marking 31

Chapter 4 Best Practices for Policer Configuration 33

Calculation of Policer Burst-Size Limit 33
Guidelines for Choosing a Burst-Size Limit 33
Burst-Size Limit Based on the Line Rate of the Interface 34
Burst-Size Limit Based on the MTU of Traffic on the Interface 35

Part 2 Configuration

Chapter 5 Single-Rate Two-Color Policers 39

Basic Single-Rate Two-Color Policers 39
Single-Rate Two-Color Policer Overview 39
Example: Configuring a Single-Rate Two-Color Policer 40
Example: Configuring Interface and Firewall Filter Policers at the Same Interface 46
Bandwidth Policers 55
Bandwidth Policer Overview 56
Guidelines for Configuring a Bandwidth Policer 56
Guidelines for Applying a Bandwidth Policer 56
Example: Configuring a Logical Bandwidth Policer 57
Filter-Specific Counters and Policers 64
Filter-Specific Policer Overview 64
Example: Configuring a Stateless Firewall Filter to Protect Against TCP and ICMP Floods 65
Prefix-Specific Counting and Policing Actions 71
Prefix-Specific Counting and Policing Overview 71
Separate Counting and Policing for Each IPv4 Address Range 71
Prefix-Specific Action Configuration 72
Counter and Policer Set Size and Indexing 73
Filter-Specific Counter and Policer Set Overview 74
Example: Configuring Prefix-Specific Counting and Policing 74
Prefix-Specific Counting and Policing Configuration Scenarios 81
Prefix Length of the Action and Prefix Length of Addresses in Filtered Packets 81
Scenario 1: Firewall Filter Term Matches on Multiple Addresses 82
Scenario 2: Subnet Prefix Is Longer Than the Prefix in the Filter Match Condition 84
Scenario 3: Subnet Prefix Is Shorter Than the Prefix in the Firewall Filter Match Condition 85
Multifield Classification 87
Multifield Classification Overview 87
Forwarding Classes and PLP Levels 87
Multifield Classification and BA Classification 88
Multifield Classification Used In Conjunction with Policers 88
Multifield Classification Requirements and Restrictions 89
Supported Platforms 89
CoS Tricolor Marking Requirement 90
Restrictions 90

Multifield Classification Limitations on M Series Routers 90
Problem: Output-Filter Matching on Input-Filter Classification 90
Workaround: Configure All Actions in the Ingress Filter 91
Example: Configuring Multifield Classification 92
Example: Configuring and Applying a Firewall Filter for a Multifield Classifier 98
Policer Overhead to Account for Rate Shaping in the Traffic Manager 102
Policer Overhead to Account for Rate Shaping Overview 102
Example: Configuring Policer Overhead to Account for Rate Shaping 103

Chapter 6 Three-Color Policers 111

Three-Color Policer Configuration Guidelines 111
Platforms Supported for Three-Color Policers 111
Color Modes for Three-Color Policers 111
Color-Blind Mode 112
Color-Aware Mode 112
Naming Conventions for Three-Color Policers 112
Basic Single-Rate Three-Color Policers 113
Single-Rate Three-Color Policer Overview 113
Example: Configuring a Single-Rate Three-Color Policer 114
Basic Two-Rate Three-Color Policers 119
Two-Rate Three-Color Policer Overview 119
Example: Configuring a Two-Rate Three-Color Policer 120

Chapter 7 Logical and Physical Interface Policers 127

Two-Color and Three-Color Logical Interface Policers 127
Logical Interface (Aggregate) Policer Overview 127
Example: Configuring a Two-Color Logical Interface (Aggregate) Policer . . 128
Example: Configuring a Three-Color Logical Interface (Aggregate) Policer 133
Two-Color and Three-Color Physical Interface Policers 139
Physical Interface Policer Overview 139
Example: Configuring a Physical Interface Policer for Aggregate Traffic at a Physical Interface 141

Chapter 8 Layer 2 Policers 149

Hierarchical Policers 149
Hierarchical Policer Overview 149
Example: Configuring a Hierarchical Policer 151
Two-Color and Three-Color Policers at Layer 2 156
Two-Color Policing at Layer 2 Overview 156
Guidelines for Configuring Two-Color Policing of Layer 2 Traffic 157
Statement Hierarchy for Configuring a Two-Color Policer for Layer 2 Traffic 157
Statement Hierarchy for Applying a Two-Color Policer to Layer 2 Traffic 157
Three-Color Policing at Layer 2 Overview 158
Guidelines for Configuring Three-Color Policing of Layer 2 Traffic 158
Statement Hierarchy for Configuring a Three-Color Policer for Layer 2 Traffic 158

Statement Hierarchy for Applying a Three-Color Policer to Layer 2 Traffic . . . 159
Example: Configuring a Three-Color Logical Interface (Aggregate) Policer . . . 159

Chapter 9 Policer Configuration Statements . . . 167

action . . . 167
aggregate (Hierarchical Policer) . . . 168
bandwidth-limit (Hierarchical Policer) . . . 169
bandwidth-limit (Policer) . . . 170
bandwidth-percent . . . 172
burst-size-limit (Hierarchical Policer) . . . 174
burst-size-limit (Policer) . . . 175
color-aware . . . 177
color-blind . . . 178
committed-burst-size . . . 179
committed-information-rate . . . 181
excess-burst-size . . . 183
filter-specific . . . 184
forwarding-class (Firewall Filter Action) . . . 185
hierarchical-policer . . . 186
if-exceeding (Hierarchical Policer) . . . 187
if-exceeding (Policer) . . . 188
input-hierarchical-policer . . . 189
input-policer . . . 189
input-three-color . . . 190
layer2-policer . . . 191
load-balance-group . . . 192
logical-bandwidth-policer . . . 192
logical-interface-policer . . . 193
loss-priority (Firewall Filter Action) . . . 193
loss-priority high then discard (Three-Color Policer) . . . 194
output-policer . . . 195
output-three-color . . . 196
peak-burst-size . . . 197
peak-information-rate . . . 199
physical-interface-filter . . . 200
physical-interface-policer . . . 201
policer (Applying to a Logical Interface) . . . 202
policer (Configuring) . . . 203
policer (Firewall Filter Action) . . . 204
prefix-action (Configuring) . . . 205
prefix-action (Firewall Filter Action) . . . 206
premium (Hierarchical Policer) . . . 207
single-rate . . . 208
three-color-policer (Configuring) . . . 209
three-color-policer (Firewall Filter Action) . . . 210
two-rate . . . 211

Part 3 Administration

Chapter 10 Traffic Policing Standards 215

Supported Standards for Policing 215

Chapter 11 Traffic Policing Reference 217

Using the CLI Editor in Configuration Mode 217

Chapter 12 Firewall Filter and Policer Operational Mode Commands 221

clear firewall 222
show firewall 223
show firewall filter version 226
show firewall log 227
show firewall prefix-action-stats 230
show policer 231

Part 4 Index

Index 235

List of Figures

Part 1 Overview

Chapter 1 Introduction to Traffic Policing 3

Figure 1: Network Traffic and Burst Rates 4
Figure 2: Incoming and Outgoing Policers and Firewall Filters 11

List of Tables

Part 1 Overview

Chapter 2 **Introduction to Policer Configuration 13**

Table 1: Two-Color Policer Configuration and Application Overview 15
Table 2: Three-Color Policer Configuration and Application Overview 20
Table 3: Hierarchical Policer Configuration and Application Summary 23

Chapter 3 **Policer Rate Limits and Actions 25**

Table 4: Policer Bandwidth Limits and Burst-Size Limits 25
Table 5: Implicit and Configurable Policer Actions Based on Color Marking 26

Chapter 4 **Best Practices for Policer Configuration 33**

Table 6: Example Calculations of Policer Burst-Size Limit 34

Part 2 Configuration

Chapter 5 **Single-Rate Two-Color Policers 39**

Table 7: Examples of Counter and Policer Set Size and Indexing 73
Table 8: Summary of Prefix-Specific Action Scenarios 81

Chapter 6 **Three-Color Policers 111**

Table 9: Recommended Naming Convention for Policers 113

Part 3 Administration

Chapter 12 **Firewall Filter and Policer Operational Mode Commands 221**

Table 10: show firewall Output Fields 224
Table 11: show firewall filter version Output Fields 226
Table 12: show firewall log Output Fields 227
Table 13: show firewall prefix-action-stats Output Fields 230
Table 14: show policer Output Fields 231

PART 1

Overview

- Introduction to Traffic Policing on page 3
- Introduction to Policer Configuration on page 13
- Policer Rate Limits and Actions on page 25
- Best Practices for Policer Configuration on page 33

CHAPTER 1

Introduction to Traffic Policing

- Traffic Policing Overview on page 3
- Traffic Policer Types on page 7
- Order of Policer and Firewall Filter Operations on page 10

Traffic Policing Overview

This topic covers the following information:

- Congestion Management for IP Traffic Flows on page 3
- Traffic Limits on page 4
- Traffic Color Marking on page 5
- Forwarding Classes and PLP Levels on page 6
- Policer Application to Traffic on page 6

Congestion Management for IP Traffic Flows

Traffic policing, also known *rate limiting*, is an essential component of network access security that is designed to thwart denial-of-service (DoS) attacks. Traffic policing enables you to control the maximum rate of IP traffic sent or received on an interface and also to partition network traffic into multiple priority levels, also known as *classes of service*. A policer defines a set of traffic rate limits and sets consequences for traffic that does not conform to the configured limits. Packets in a traffic flow that does not conform to traffic limits are either discarded or marked with a different forwarding class or packet loss priority (PLP) level.

With the exception of policers configured to rate-limit aggregate traffic (all protocol families and logical interfaces configured on a physical interface), you can apply a policer to all IP packets in a Layer 2 or Layer 3 traffic flow at a logical interface.

With the exception of policers configured to rate-limit based on physical interface media rate, you can apply a policer to specific IP packets in a Layer 3 traffic flow at a logical interface by using a stateless firewall filter.

You can apply a policer to inbound or outbound interface traffic. Policers applied to inbound traffic help to conserve resources by dropping traffic that does not need to be routed through a network. Dropping inbound traffic also helps to thwart denial-of-service (DoS) attacks. Policers applied to outbound traffic control the bandwidth used.

Traffic Limits

Junos OS policers use the *token-bucket* algorithm to enforce a limit on average transmit or receive rate of IP traffic at an interface while allowing bursts of traffic up to a maximum value based on the overall traffic load. The token-bucket algorithm offers more flexibility than the *leaky-bucket* algorithm in that you can allow a specified amount of bursting before starting to discard packets or apply a penalty to packet output-queuing priority or packet drop priority.

In the token-bucket model, the bucket represents the policing function. Tokens are added to the bucket at a fixed rate, but only up to the specified depth of the bucket. Each token represents a "credit" for some number of bits, and tokens in the bucket are "cashed in" for the ability to transmit or receive traffic at the interface. When sufficient tokens are present in the bucket, a traffic flow continues unrestricted. Otherwise, packets might be dropped or else re-marked with a lower forwarding class, a higher packet loss priority (PLP) level, or both.

- The rate at which tokens are added to the bucket represents the highest average transmit or receive rate in bits per second allowed for a given service level. You specify this highest average traffic rate as the *bandwidth limit* of the policer. If the traffic arrival rate is so high that at some point insufficient tokens are present in the bucket, then the traffic flow is no longer conforming to the traffic limit.
- The depth of the bucket in bytes controls the amount of back-to-back bursting allowed. You specify this factor as the *burst-size limit* of the policer. This second limit affects the average transmit or receive rate by limiting the number of bytes permitted in a transmission burst for a given interval of time. Bursts exceeding the current burst-size limit are dropped until there are sufficient tokens available to permit the burst to proceed.

Figure 1: Network Traffic and Burst Rates

As shown in the figure above, a UPC bar code is a good facsimile of what traffic looks like on the line; an interface is either transmitting (bursting at full rate) or it is not. The black lines represent periods of data transmission and the white space represents periods of silence when the token bucket can replenish.

Depending on the type of policer used, packets in a policed traffic flow that surpasses the defined limits might be implicitly set to a higher PLP level, assigned to a configured forwarding class or set to a configured PLP level (or both), or simply discarded. If packets

encounter downstream congestion, packets with a **low** PLP level are less likely to be discarded than those with a **medium-low**, **medium-high**, or **high** PLP level.

Traffic Color Marking

Based on the particular set of traffic limits configured, a policer identifies a traffic flow as belonging to one of either two or three categories that are similar to the colors of a traffic light used to control automobile traffic.

A *two-color-marking* policer categorizes traffic as either conforming to the traffic limits (green) or violating the traffic limits (red):

- Green—Two-color-marking policers implicitly set the packets in a green flow to the low PLP level, and you cannot configure any policer actions for conforming traffic.
- Red—Two-color-marking policers do not perform any implicit actions on packets in a red flow. Instead, those packets are handled according to the actions specified in the policer configuration. You can configure a two-color-marking policer to simply discard packets if the traffic flow is red. Alternatively, you can configure a two-color-marking policer to handle the packets in a red flow by setting the PLP level to either **low** or **high**, assigning the packets to any forwarding class already configured, or both.

  On MX Series, M120, and M320 routers and M7i and M10i routers with the Enhanced CFEB (CFEB-E) only, you can specify two additional PLP levels for packets in a red flow: **medium-low** or **medium-high**.

Three-color-marking policers categorize traffic as conforming to the traffic limits (green), violating the traffic limits (red), or exceeding the traffic limits but within an allowed range (yellow):

- Green—Like two-color-marking policers, three-color-marking policers implicitly set the packets in a green flow to the low PLP level, and you cannot configure any policer actions for conforming traffic.
- Yellow—Unlike two-color-marking policers, three-color-marking policers categorize a second type of nonconforming traffic: yellow.

  Single-rate three-color policing categorizes as yellow traffic that exceeds the traffic limits while conforming to a second defined burst-size limit. Two-rate three-color policing categorizes as yellow traffic that exceeds the traffic limits while conforming to both a second defined burst-size limit and a second defined bandwidth limit.

  Three-color-marking policers implicitly set the packets in a yellow flow to the medium-high PLP level so that the packets incur a less severe penalty than those in a red flow. You cannot configure any policer actions for yellow traffic.
- Red—Unlike two-color-marking policers, three-color-marking policers implicitly set the packets in a red flow to the high PLP level, which is the highest PLP value. You can also configure a three-color-marking policer to discard the packets in a red flow instead of forwarding them with a high PLP setting.

Two-color-marking policers allows bursts of traffic for short periods, whereas three-color-marking policers allow more sustained bursts of traffic.

Forwarding Classes and PLP Levels

A packet's forwarding class assignment and PLP level are used by the Junos OS class of service (CoS) features. The Junos CoS features include a set of mechanisms that you can use to provide differentiated services when best-effort traffic delivery is insufficient. For router interfaces that carry IPv4, IPv6, and MPLS traffic, you can configure CoS features to take in a single flow of traffic entering at the edge of your network and provide different levels of service across the network—internal forwarding and scheduling (queuing) for output—based on the forwarding class assignments and PLP levels of the individual packets.

NOTE: **Forwarding-class or loss-priority assignments performed by a policer or a stateless firewall filter override any such assignments performed on the ingress by the CoS default IP precedence classification at all logical interfaces or by any configured behavior aggregate (BA) classifier that is explicitly mapped to a logical interface.**

Based on CoS configurations, packets of a given forwarding class are transmitted through a specific output queue, and each output queue is associated with a transmission service level defined in a *scheduler*.

Based on other CoS configurations, when packets in an output queue encounter congestion, packets with higher loss-priority values are more likely to be dropped by the random early detection (RED) algorithm. Packet loss priority values affect the scheduling of a packet without affecting the packet's relative ordering within the traffic flow.

Policer Application to Traffic

After you have defined and named a policer, it is stored as a template. You can later use the same policer name to provide the same policer configuration each time you want to use it. This eliminates the need to define the same policer values more than once.

You can apply a policer to a traffic flow in either of two ways:

- You can configure a standard stateless firewall filter that specifies the **policer *policer-name*** nonterminating action or the **three-color-policer (single-rate | two-rate) *policer-name*** nonterminating action. When you apply the standard filter to the input or output at a logical interface, the policer is applied to all packets of the filter-specific protocol family that match the conditions specified in the filter configuration.

  With this method of applying a policer, you can define specific classes of traffic on an interface and apply traffic rate-limiting to each class.

- You can apply a policer directly to an interface so that traffic rate-limiting applies to all traffic on that interface, regardless of protocol family or any match conditions.

You can configure policers at the queue, logical interface, or Layer 2 (MAC) level. Only a single policer is applied to a packet at the egress queue, and the search for policers occurs in this order:

- Queue level
- Logical interface level
- Layer 2 (MAC) level

Related Documentation

- "Stateless Firewall Filter Overview" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Traffic Policer Types on page 7
- Order of Policer and Firewall Filter Operations on page 10
- Packet Flow Through the CoS Process Overview

Traffic Policer Types

This topic covers the following information:

- Single-Rate Two-Color Policers on page 7
- Three-Color Policers on page 8
- Hierarchical Policers on page 9
- Two-Color and Three-Color Policer Options on page 9

Single-Rate Two-Color Policers

You can use a single-rate two-color policer, or "policer" when used without qualification, to rate-limit a traffic flow to an average bits-per-second arrival rate (specified by the single specified bandwidth limit) while allowing bursts of traffic for short periods (controlled by the single specified burst-size limit). This type of policer categorizes a traffic flow as either green (conforming) or red (nonconforming). Packets in a green flow are implicitly set to a **low** loss priority and then transmitted. Packets in a red flow are handled according to actions specified in the policer configuration. Packets in a red flow can be marked—set to a specified forwarding class, set to a specified loss priority, or both—or they can be discarded.

A single-rate two-color policer is most useful for metering traffic at the port (physical interface) level.

Basic Single-Rate Two-Color Policer

You can apply a basic single-rate two-color policer to Layer 3 traffic in either of two ways: as an interface policer or as a firewall filter policer. You can apply the policer as an *interface policer*, meaning that you apply the policer directly to a logical interface at the protocol family level. If you want to apply the policer to selected packets only, you can apply the policer as a *firewall filter policer*, meaning that you reference the policer in a stateless firewall filter term and then apply the filter to a logical interface at the protocol family level.

Bandwidth Policer

A bandwidth policer is simply a single-rate two-color policer that is defined using a bandwidth limit specified as a percentage value rather than as an absolute number of bits per second. When you apply the policer (as an interface policer or as a firewall filter policer) to a logical interface at the protocol family level, the effective bandwidth limit is calculated based on either the physical interface media rate or the logical interface configured shaping rate.

Logical Bandwidth Policer

A logical bandwidth policer is a bandwidth policer for which the effective bandwidth limit is calculated based on the logical interface configured shaping rate. You can apply the policer as a firewall filter policer only, and the firewall filter must be configured as an interface-specific filter. When you apply an interface-specific filter to multiple logical interfaces on supported routing platforms, any **count** or **policer** actions act on the traffic stream entering or exiting each individual interface, regardless of the sum of traffic on the multiple interfaces.

Three-Color Policers

The Junos OS supports two types of three-color policers: single-rate and two-rate. The main difference between a single-rate and a two-rate policer is that the single-rate policer allows bursts of traffic for short periods, while the two-rate policer allows more sustained bursts of traffic. Single-rate policing is implemented using a single token-bucket model, so that periods of relatively low traffic must occur between traffic bursts to allow the token bucket to refill. Two-rate policing is implemented using a dual token-bucket model, which allows bursts of traffic for longer periods.

Single-Rate Three-Color Policers

The single-rate three-color type of policer is defined in RFC 2697, *A Single Rate Three Color Marker*. You use this type of policer to rate-limit a traffic flow to a single rate and three traffic categories (green, yellow, and red). A single-rate three-color policer defines a *committed* bandwidth limit and burst-size limit plus an *excess* burst-size limit. Traffic that conforms to the committed traffic limits is categorized as green (conforming). Traffic that conforms to the bandwidth limit while allowing bursts of traffic as controlled by the excess burst-size limit is categorized as yellow. All other traffic is categorized as red.

A single-rate three-color policer is most useful when a service is structured according to packet length, not peak arrival rate.

Two-Rate Three-Color Policers

The two-rate three-color type of policer is defined in RFC 2698, *A Two Rate Three Color Marker*. You use this type of policer to rate-limit a traffic flow to two rates and three traffic categories (green, yellow, and red). A two-rate three-color policer defines a *committed* bandwidth limit and burst-size limit plus a *peak* bandwidth limit and burst-size limit. Traffic that conforms to the committed traffic limits is categorized as green (conforming). Traffic that exceeds the committed traffic limits but remains below the peak traffic limits is categorized as yellow. Traffic that exceeds the peak traffic limits is categorized as red.

A two-rate three-color policer is most useful when a service is structured according to arrival rates and not necessarily packet length.

Hierarchical Policers

You can use a hierarchical policer to rate-limit ingress Layer 2 traffic at a physical or logical interface and apply different policing actions based on whether the packets are classified for expedited forwarding (EF) or for a lower priority output queue. This feature is supported on SONET interfaces hosted on M40e, M120, and M320 edge routers with incoming Flexible PIC Concentrators (FPCs) as SFPC and outgoing FPCs as FFPC, and on T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs.

Two-Color and Three-Color Policer Options

Both two-color and three-color policers can be configured with the following options:

- Logical Interface (Aggregate) Policers on page 9
- Physical Interface Policers on page 9
- Policers Applied to Layer 2 Traffic on page 10
- Multifield Classification on page 10

Logical Interface (Aggregate) Policers

A logical interface policer—also called an aggregate policer—is a two-color or three-color policer that you can apply to multiple protocol families on the same logical interface without creating multiple instances of the policer. You apply a logical interface policer directly to a logical interface configuration (and not by referencing the policer in a stateless firewall filter and then applying the filter to the logical interface).

- You can apply the policer at the interface logical unit level to rate-limit all traffic types, regardless of the protocol family.
- You can also apply the policer at the logical interface protocol family level, to rate-limit traffic for a specific protocol family.

You can apply a logical interface policer to unicast traffic only. For information about configuring a stateless firewall filter for flooded traffic, see “Applying Filters to Forwarding Tables” in the “Traffic Sampling, Forwarding, and Monitoring” section of the *Junos OS Routing Policy Configuration Guide*.

Physical Interface Policers

A physical interface policer is a two-color or three-color policer that applies to all logical interfaces and protocol families configured on a physical interface, even if the logical interfaces belong to different routing instances. You apply a physical interface policer to a logical interface at the protocol level through a physical interface filter only, but rate limiting is performed aggregately for all logical interfaces and protocol families configured on the underlying physical interface.

This feature enables you to use a single policer instance to perform aggregate policing for different protocol families and different logical interfaces on the same physical interface.

Policers Applied to Layer 2 Traffic

In addition to hierarchical policing, you can also apply single-rate two-color policers and three-color policers (both single-rate and two-rate) to Layer 2 input or output traffic. You must configure the two-color or three-color policer as a logical interface policer and reference the policer in the interface configuration at the logical unit level, and not at the protocol level. You cannot apply a two-color or three-color policer to Layer 2 traffic as a stateless firewall filter action.

Multifield Classification

Like behavior aggregate (BA) classification, which is sometimes referred to as class-of-service (CoS) value traffic classification, multifield classification is a method of classifying incoming traffic by associating each packet with a forwarding class, a packet loss priority level, or both. The CoS scheduling configuration assigns packets to output queues based on forwarding class. The CoS random early detection (RED) process uses the drop probability configuration, output queue fullness percentage, and packet loss priority to drop packets as needed to control congestion at the output stage.

BA classification and multifield classification use different fields of a packet to perform traffic classification. BA classification is based on a *CoS value* in the IP packet header. Multifield classification can be based on *multiple fields* in the IP packet header, including CoS values. Multifield classification is used instead of BA classification when you need to classify packets based on information in the packet other than the CoS values only. Multifield classification is configured using a stateless firewall filter term that matches on any packet header fields and associates matched packets with a forwarding class, a loss priority, or both. The forwarding class or loss priority can be set by a firewall filter action or by a policer referenced as a firewall filter action.

Related Documentation

- Traffic Policing Overview on page 3
- Order of Policer and Firewall Filter Operations on page 10
- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Hierarchical Policer Configuration Overview on page 22
- Two-Color Policing at Layer 2 Overview on page 156
- Three-Color Policing at Layer 2 Overview on page 158

Order of Policer and Firewall Filter Operations

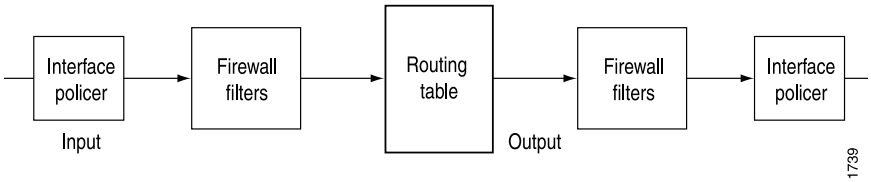
You can apply a both a traffic policer and a stateless firewall filter (with or without policing actions) to a single logical interface at the same time. In this case, the order of precedence of operations is such that policers applied directly to the logical interface are evaluated before input filters but after output filters.

- If an input firewall filter is configured on the same logical interface as a policer, the policer is executed first.

- If an output firewall filter is configured on the same logical interface as a policer, the firewall filter is executed first.

Figure 2 on page 11 illustrates the order of policer and firewall filter processing at the same interface.

Figure 2: Incoming and Outgoing Policers and Firewall Filters



Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Hierarchical Policer Configuration Overview on page 22

CHAPTER 2

Introduction to Policer Configuration

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Hierarchical Policer Configuration Overview on page 22
- Guidelines for Applying Traffic Policers on page 24

Statement Hierarchy for Configuring Policers

```
firewall {
    family (any | bridge | ccc | inet | inet6 | mpls | vpls) {
        filter filter-name {
            ... protocol-family-specific-firewall-filter-configuration ...
            prefix-action name {
                count;
                destination-prefix-length prefix-length;
                policer policer-name;
                source-prefix-length prefix-length;
                subnet-prefix-length prefix-length;
            }
        }
    }
    filter filter-name {
        accounting-profile [ profile-names ];
        interface-specific;
        physical-interface-filter;
        term term-name {
            filter filter-name;
            from {
                ... ipv4-firewall-filter-match-conditions ...
            }
            then {
                ... ipv4-firewall-filter-terminating-actions ...
                ... ipv4-firewall-filter-nonterminating-actions ...
                next term;
            }
        }
    }
    hierarchical-policer policer-name {
        aggregate {
```

```
    if-exceeding {
      bandwidth-limit-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
      forwarding-class class-name;
      loss-priority (high | low | medium-high | medium-low);
    }
  }
  premium {
    if-exceeding {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
    }
  }
}
interface-set interface-set-name {
  interface-name;
}
load-balance-group group-name {
  next-hop-group  [ group-names ];
}
policer policer-name {
  filter-specific;
  if-exceeding {
    (bandwidth-limit bps | bandwidth-percent percentage);
    burst-size-limit bytes;
  }
  logical-bandwidth-policer;
  logical-interface-policer;
  physical-interface-policer;
  then {
    discard;
    forwarding-class class-name;
    loss-priority (high | low | medium-high | medium-low);
  }
}
three-color-policer policer-name {
  action {
    loss-priority high then discard;
  }
  logical-interface-policer;
  physical-interface-policer;
  single-rate {
    (color-aware | color-blind);
    committed-burst-size bytes;
    committed-information-rate bps;
    excess-burst-size bytes;
  }
  two-rate {
    (color-aware | color-blind);
    committed-burst-size bytes;
```

```
            committed-information-rate bps;
            peak-burst-size bytes;
            peak-information-rate bps;
        }
    }
}
```

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Hierarchical Policer Configuration Overview on page 22
- Guidelines for Applying Traffic Policers on page 24

Two-Color Policer Configuration Overview

Table 1 on page 15 describes the hierarchy levels at which you can configure and apply single-rate two-color policers to Layer 3 traffic. For information about applying single-rate two-color policers to Layer 2 traffic, see "Two-Color Policing at Layer 2 Overview" on page 156.

Table 1: Two-Color Policer Configuration and Application Overview

Policer Configuration	Layer 3 Application	Key Points
Single-Rate Two-Color Policer *Defines traffic rate limiting that you can apply to Layer 3 protocol-specific traffic at a logical interface. Can be applied as an interface policer or as a firewall filter policer.*		

Basic policer configuration:
 	
[edit firewall]
policer *policer-name* {
  if-exceeding {
  bandwidth-limit *bps*;
  burst-size-limit *bytes*;
  }
  then {
  discard;
  forwarding-class *class-name*;
  loss-priority *supported-value*;
  }
}
	Method A—Apply as an interface policer at the protocol family level:
	
	[edit interfaces]
	interface-name {
	  unit *unit-number* {
	  family *family-name* {
	  policer {
	  input *policer-name*;
	  output *policer-name*;
	  }
	  }
	  }
	}
	
	Method B—Apply as a firewall filter policer at the protocol family level:
	
	[edit firewall]
	family *family-name* {
	  filter *filter-name* {
	  interface-specific; # (*)
	  from {
	  ... *match-conditions* ...
	  }
	  then {
		Policer configuration:
		
		• Use **bandwidth-limit** *bps* to specify an absolute value.
		
		Firewall filter configuration (*)
		
		• If applying to multiple interfaces, include the **interface-specific** statement to create unique policers and counters for each interface.
		
		Interface policer verification:
		
		• Use the **show interfaces (detail | extensive)** operational mode command.
		• Use the **show policer** operational mode command.
		
		Firewall filter policer verification:
		
		• Use the **show interfaces (detail | extensive)** operational mode command.

Table 1: Two-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points

	policer *policer-name*;
	}
	}
	}
	
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	family *family-name* {
	filter {
	input *filter-name*;
	output *filter-name*;
	}
	... *protocol-configuration* ...
	}
	}
	}
		• Use the **show firewall filter *filter-name*** operational mode command.

Table 1: Two-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points
Bandwidth Policer *Defines traffic rate limiting that you can apply to Layer 3 protocol-specific traffic at a logical interface, but the bandwidth limit is specified as a percentage value. Bandwidth can be based on physical interface line rate (the default) or the logical interface shaping rate. Can be applied as an interface policer or as a firewall filter policer where the filter is either interface-specific or a physical interface filter.*		

Bandwidth policer configuration:
[edit firewall]
policer *policer-name* {
logical-bandwidth-policer;
if-exceeding {
bandwidth-percent (1..100);
burst-size-limit *bytes*;
}
then {
discard;
forwarding-class *class-name*;
loss-priority *supported-value*;
}
}
	Method A—Apply as an interface policer at the protocol family level:
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	family *family-name* {
	policer {
	input *policer-name*;
	output *policer-name*;
	}
	}
	}
	}
	Method B—Apply as a firewall filter policer at the protocol family level:
	[edit firewall]
	family *family-name* {
	filter *filter-name* {
	interface-specific;
	from {
	... *match-conditions* ...
	}
	then {
	policer *policer-name*;
	}
	}
	}
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	family *family-name* {
	filter {
	input *filter-name*;
	output *filter-name*;
	}
	... *protocol-configuration* ...
	}
	}
	}
		Policer configuration:
		• Use the **bandwidth-percent *percentage*** statement instead of the **bandwidth-limit *bps*** statement.
		By default, bandwidth policing rate-limits traffic based on a percentage of the physical interface media rate.
		• To rate-limit traffic based on a percentage of the logical interface configured shaping rate, also include the **logical-bandwidth-policer** statement.
		Firewall filter configuration:
		• Percentage bandwidth policers can only be referenced by filters configured with the **interface-specific** statement.
		Interface policer verification:
		• Use the **show interfaces (detail | extensive)** operational mode command.
		• Use the **show policer** operational mode command.
		Firewall filter policer verification:
		• Use the **show interfaces (detail | extensive)** operational mode command.
		• Use the **show firewall filter *filter-name*** operational mode command.

Table 1: Two-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points
Logical Interface (Aggregate) Policer *Defines traffic rate limiting that you can apply to multiple protocol families on the same logical interface without creating multiple instances of the policer. Can be applied directly to a logical interface configuration only.*		

Logical interface policer configuration:
 	
[edit firewall]
policer *policer-name* {
logical-interface-policer;
if-exceeding {
bandwidth-limit *bps*;
burst-size-limit *bytes*;
}
then {
discard;
forwarding-class *class-name*;
loss-priority *supported-value*;
}
}
	Apply as an interface policer only:
	
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	policer { # All protocols
	input *policer-name*;
	output *policer-name*;
	}
	family *family-name* {
	policer { # One protocol
	input *policer-name*;
	output *policer-name*;
	}
	}
	}
	}
		Policer configuration:
		
		• Include the **logical-interface-policer** statement.
		
		Two options for interface policer application:
		
		• To rate-limit all traffic types, regardless of the protocol family, apply the logical interface policer at the logical unit level.
		• To rate-limit traffic of a specific protocol family, apply the logical interface policer at the protocol family level.
		
		Interface policer verification:
		
		• Use the **show interfaces (detail | extensive)** operational mode command.
		• Use the **show policer** operational mode command.

Table 1: Two-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points
Physical Interface Policer Defines traffic rate limiting that applies to all logical interfaces and protocol families configured on a physical interface, even if the interfaces belong to different routing instances. Can be applied as a firewall filter policer referenced from a physical interface filter only.		

Physical interface policer configuration:
 	
[edit firewall]
policer *policer-name* {
physical-interface-policer;
if-exceeding {
bandwidth-limit *bps*;
burst-size-limit *bytes*;
}
then {
discard;
forwarding-class *class-name*;
loss-priority *supported-value*;
}
}
	Apply as a firewall filter policer referenced from a physical interface filter that you apply at the protocol family level:
	
	[edit firewall]
	family *family-name* {
	filter *filter-name* {
	physical-interface-filter;
	from {
	... *match-conditions* ...
	}
	then {
	policer *policer-name*;
	}
	}
	}
	
	[edit interfaces]
	interface-name {
	unit *number* {
	family *family-name* {
	filter {
	input *filter-name*;
	output *filter-name*;
	}
	... *protocol-configuration* ...
	}
	}
	}
		Policer configuration:
		• Include the **physical-interface-policer** statement.
		Firewall filter configuration:
		• Include the **physical-interface-filter** statement.
		Application:
		• Apply the filter to the input or output of a logical interface at the protocol family level.
		Firewall filter policer verification:
		• Use the **show interfaces (detail | extensive)** operational mode command.
		• Use the **show firewall filter *filter-name*** operational mode command.

Related Documentation

- Basic Single-Rate Two-Color Policers on page 39
- Bandwidth Policers on page 55
- Filter-Specific Counters and Policers on page 64
- Prefix-Specific Counting and Policing Actions on page 71
- Multifield Classification on page 87
- Policer Overhead to Account for Rate Shaping in the Traffic Manager on page 102
- Two-Color and Three-Color Physical Interface Policers on page 139

Three-Color Policer Configuration Overview

Table 2 on page 20 describes the hierarchy levels at which you can configure and apply single-rate tricolor-marking (single-rate TCM) policers and two-rate tricolor-marking

(two-rate TCM) policers to Layer 3 traffic. For information about applying three-color policers to Layer 2 traffic, see "Three-Color Policing at Layer 2 Overview" on page 158.

Table 2: Three-Color Policer Configuration and Application Overview

Policer Configuration	Layer 3 Application	Key Points
Single-Rate Three-Color Policer Defines traffic rate limiting that you can apply to Layer 3 protocol-specific traffic at a logical interface. Can be applied as a firewall filter policer only. Provides moderate allowances for short periods of traffic that exceed the committed burst size.		

Basic single-rate TCM policer configuration:
`[edit firewall]`
`three-color-policer policer-name {`
`  single-rate {`
`  (color-aware | color-blind);`
`  committed-information-rate bps;`
`  committed-burst-size bytes;`
`  excess-burst-size bytes;`
`  }`
`  action {`
`  loss-priority high then discard;`
`  }`
`}`
	Reference the policer from a firewall filter, and apply the filter to a protocol family on a logical interface:
	`[edit firewall]`
	`family family-name {`
	`  filter filter-name {`
	`  term term-name {`
	`  from {`
	`  ... match-conditions ...`
	`  }`
	`  then {`
	`  three-color-policer {`
	`  single-rate policer-name;`
	`  }`
	`  }`
	`  }`
	`  }`
	`}`
	Apply the filter to a logical interface at the protocol family level:
	`[edit interfaces]`
	`interface-name {`
	`  unit unit-number {`
	`  family family-name {`
	`  filter {`
	`  input filter-name;`
	`  output filter-name;`
	`  }`
	`  }`
	`  }`
	`}`
		Policer configuration:
		• Include the **single-rate (color-aware | color-blind)** statement.
		Firewall filter configuration:
		• Include the **three-color-policer single-rate** *policer-name* action.
		Applying the firewall filter to the logical interface:
		• Include the **filter (input | output)** *filter-name* statement.

Table 2: Three-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points
Single-Rate Three-Color Physical Interface Policer Defines traffic rate limiting that applies to all logical interfaces and protocol families configured on a physical interface, even if the interfaces belong to different routing instances. Can be applied as a firewall filter policer only.		

Physical interface single-rate TCM policer:
 	
[edit firewall]
three-color-policer *policer-name* {
physical-interface-policer;
single-rate {
(color-aware | color-blind);
committed-information-rate *bps*;
committed-burst-size *bytes*;
excess-burst-size *bytes*;
}
action {
loss-priority high then discard;
}
}
	Reference the policer from a physical interface filter only, and apply the filter to a protocol family on a logical interface:
	
	[edit firewall]
	family *family-name* {
	filter *filter-name* {
	physical-interface-filter
	term *term-name* {
	from {
	... *match-conditions* ...
	}
	then {
	three-color-policer {
	single-rate *policer-name*;
	}
	}
	}
	}
	}
	
	[edit interfaces]
	interface-name {
	unit *number* {
	family *family-name* {
	filter {
	input *filter-name*;
	output *filter-name*;
	}
	}
	}
	}
		Policer configuration:
		• Include the **physical-interface-policer** statement.
		Firewall filter configuration:
		• Include the **physical-interface-filter** statement.
		Application:
		• Include the **filter (input | output)** ***filter-name*** statement.
		Verification
		• To verify, use the **show firewall filter** ***filter-name*** operational mode command.

Table 2: Three-Color Policer Configuration and Application Overview *(continued)*

Policer Configuration	Layer 3 Application	Key Points
Basic Two-Rate Three-Color Policer Defines traffic rate limiting that you can apply to Layer 3 protocol-specific traffic at a logical interface. Can be applied as a firewall filter policer only. Provides moderate allowances for sustained periods of traffic that exceed the committed bandwidth limit or burst size.		

Basic two-rate TCM policer configuration:
 	
[edit firewall]
three-color-policer *policer-name* {
two-rate {
(color-aware | color-blind);
committed-information-rate *bps*;
committed-burst-size *bytes*;
peak-information-rate *bps*;
peak-burst-size *bytes*;
}
action {
loss-priority high then discard;
}
}
	Reference the policer from a firewall filter, and apply the filter to a protocol family on a logical interface:
	
	[edit firewall]
	family *family-name* {
	filter *filter-name* {
	term *term-name* {
	from {
	... *match-conditions* ...
	}
	then {
	three-color-policer {
	two-rate *policer-name*;
	}
	}
	}
	}
	}
	
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	family *family-name* {
	filter {
	input *filter-name*;
	output *filter-name*;
	}
	}
	}
	}
		Policer configuration:
		• Include the **two-rate (color-aware | color-blind)** statement.
		
		Firewall filter configuration:
		• Include the **three-color-policer two-rate *policer-name*** action.
		
		Applying the firewall filter to the logical interface:
		• Include the **filter (input | output) *filter-name*** statement.

Related Documentation

- Three-Color Policer Configuration Guidelines on page 111
- Basic Single-Rate Three-Color Policers on page 113
- Basic Two-Rate Three-Color Policers on page 119
- Two-Color and Three-Color Logical Interface Policers on page 127
- Two-Color and Three-Color Physical Interface Policers on page 139

Hierarchical Policer Configuration Overview

Table 3 on page 23 describes the hierarchy levels at which you can configure and apply hierarchical policers.

Table 3: Hierarchical Policer Configuration and Application Summary

Policer Configuration	Layer 2 Application	Key Points
Hierarchical Policer Hierarchically rate-limits Layer 2 ingress traffic for all protocol families. Cannot be applied to egress traffic, Layer 3 traffic, or at a specific protocol level of the interface hierarchy. Supported on the following interfaces: • SONET interfaces hosted on M40e, M120, and M320 edge routers with incoming FPCs as SFPC and outgoing FPCs as FFPC. • SONET interfaces hosted on T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs. • Ethernet interfaces on Gigabit Ethernet Intelligent Queuing 2 (IQ2) and Ethernet Enhanced IQ2 (IQ2E) PICs. • Interfaces on DPCs in MX Series routers.		

Aggregate and premium policing components of a hierarchical policer:
 	
[edit firewall]
hierarchical-policer *policer-name* {
aggregate {
if-exceeding {
bandwidth-limit *bps*;
burst-size-limit *bytes*;
}
then {
discard;
forwarding-class *class-name*;
loss-priority *supported-value*;
}
}
premium {
if-exceeding {
bandwidth-limit *bps*;
burst-size-limit *bytes*;
}
then {
discard;
}
}
}
	Option A—Apply directly to Layer 2 input traffic on a physical interface:
	
	[edit interfaces]
	interface-name {
	layer2-policer {
	input-hierarchical-policer *policer-name*;
	}
	}
		Hierarchically rate-limit Layer 2 ingress traffic for all protocol families and logical interfaces configured on a physical interface.
		
		Include the **layer2-policer** configuration statement at the **[edit interfaces *interface-name*]** hierarchy level.
		
		NOTE: If you apply a hierarchical policer at a physical interface, you cannot also apply a hierarchical policer to any of the member logical interfaces.

	Option B—Apply directly to Layer 2 input traffic on a logical interface.
	
	[edit interfaces]
	interface-name {
	unit *unit-number* {
	layer2-policer {
	input-hierarchical-policer *policer-name*;
	}
	}
	}
		Hierarchically rate-limit Layer 2 ingress traffic for all protocol families configured on a specific logical interface.
		
		Include the **layer2-policer** configuration statement at the **[edit interfaces *interface-name* unit *unit-number*]** hierarchy level.
		
		NOTE: You must configure at least one protocol family for the logical interface.

Related Documentation

- Hierarchical Policers on page 149

Guidelines for Applying Traffic Policers

The following general guidelines pertain to applying traffic policers:

- Only one type of policer can be applied to the input or output of the same physical or logical interface. For example, you are not allowed to apply a policer and a hierarchical policer in the same direction at the same logical interface.
- Chaining of policers—that is, applying policers to both a port and the logical interfaces of that port—is not allowed.
- A maximum of 64 policers is supported per physical or logical interface, provided no behavior aggregate (BA) classification—traffic classification based on CoS values in the packet headers—is applied to the logical interface.
- The policer should be independent of BA classification. Without BA classification, all traffic on an interface is treated either as expedited forwarding (EF) or non-EF, based on the configuration. With BA classification, a physical or logical interface can support up to 64 policers. The interface might be a physical interface or logical interface.
- With BA classification, the miscellaneous traffic (the traffic *not* matching any of the BA classification DSCP/EXP bits) is policed as non-EF traffic. No separate policers are installed for this traffic.
- Policers can be applied to unicast packets only. For information about configuring a filter for flooded traffic, see "Applying Filters to Forwarding Tables" in the "Traffic Sampling, Forwarding, and Monitoring" section of the *Junos OS Routing Policy Configuration Guide*.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Hierarchical Policer Configuration Overview on page 22

CHAPTER 3

Policer Rate Limits and Actions

- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Dual Token Bucket Algorithms on page 30

Policer Bandwidth and Burst-Size Limits

Table 4 on page 25 lists each of the Junos OS policer types supported. For each policer type, the table summarizes the bandwidth limits and burst-size limits used to rate-limit traffic.

Table 4: Policer Bandwidth Limits and Burst-Size Limits

Policer Type	Bandwidth Limits	Burst-Size Limits
Single-Rate Two-Color Policer		
Defines a single rate limit: a bandwidth limit and an allowed burst size for conforming traffic. For a single-rate two-color policer only, you can specify the bandwidth limit as a percentage value from 1 through 100 instead of as an absolute number of bits per second. The effective bandwidth limit is calculated as a percentage of either the physical interface media rate or the logical interface configured shaping rate.	**bandwidth-limit** *bps*; M, MX, and T Series routers: 8000..50000000000 **bandwidth-percent** 1..100 percent	**burst-size-limit** *bytes*; M, MX, and T Series routers: 1500..10000000000
Single-Rate Three-Color Policer		
Defines a single rate limit: a bandwidth limit and an allowed burst size for conforming traffic. Also defines a second, larger burst size. This second burst size is used to differentiate between two categories of nonconforming traffic (yellow or red).	**committed-information-rate** *bps*; M, MX, and T Series routers: 1500..100000000000	**committed-burst-size** *bytes*; M, MX, and T Series routers: 1500..100000000000 **excess-burst-size** *bytes*; M, MX, and T Series routers: 1500..100000000000

Table 4: Policer Bandwidth Limits and Burst-Size Limits *(continued)*

Policer Type	Bandwidth Limits	Burst-Size Limits
Two-Rate Three-Color Policer		
Defines a committed rate limit: a bandwidth limit and an allowed burst size for conforming traffic. Also defines a peak rate limit: a second, larger burst size and a second, higher bandwidth limit. These additional rate-limit components are used to differentiate between two categories of nonconforming traffic (yellow or red).	**committed-information-rate *bps*;** M, MX, and T Series routers: 1500..100000000000	**committed-burst-size *bytes*;** M, MX, and T Series routers: 1500..100000000000
	peak-information-rate *bps*; M, MX, and T Series routers: 1500..100000000000	**peak-burst-size *bytes*;** M, MX, and T Series routers: 1500..100000000000
Hierarchical Policer		
Defines two policers, each with a bandwidth limit and an allowed burst size for conforming traffic. Different policing actions are applied based on whether the packets are classified for expedited forwarding (EF) or for a lower priority. Rate-limits ingress Layer 2 traffic at a SONET physical or logical interface hosted on supported routing platforms only.	**bandwidth-limit *bps*;** M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs: 32000..50000000000	**burst-size-limit *bytes*;** M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs: 1500..2147450880

Related Documentation

- Policer Color-Marking and Actions on page 26
- Calculation of Policer Burst-Size Limit on page 33

Policer Color-Marking and Actions

Table 5 on page 26 lists each of the Junos OS policer types supported. For each policer type, the table summarizes the color-marking criteria used to categorize a traffic flow and, for each color, the actions taken on packets in that type of traffic flow.

Table 5: Implicit and Configurable Policer Actions Based on Color Marking

Policer Rate Limits and Color Marking	Implicit Action	Configurable Actions
Single-Rate Two-Color Policer • Bandwidth limit • Burst size		

Table 5: Implicit and Configurable Policer Actions Based on Color Marking *(continued)*

Policer Rate Limits and Color Marking	Implicit Action	Configurable Actions
Green Conforms to rate and burst size limits	Set PLP to **low**	–
Red Exceeds rate and burst size limits	–	• Discard the packet. • Assign to a forwarding class. • Set PLP to **low** or **high**. On some platforms, you can also set the PLP to **medium-low** or **medium-high**.
Single-Rate Three-Color Policer • Committed information rate (CIR) • Committed burst size (CBS) • Excess burst size (EBS)		
Green Conforms to the CIR and CBS	Set PLP to **low**	–
Yellow Exceeds the CIR and CBS but conforms to the EBS	Set PLP to **medium-high**	–
Red Exceeds the EBS	Set PLP to **high**	• Discard the packet.
Two-Rate Three-Color Policer • Committed information rate (CIR) • Committed burst size (CBS) • Peak information rate (PIR) • Peak burst size (PBS)		
Green Conforms to the CIR and CBS	Set PLP to **low**	–
Yellow Exceeds the CIR and CBS, but conforms to the PIR	Set PLP to **medium-high**	–
Red Exceeds the PIR and PBS	Set PLP to **high**	• Discard the packet.
Hierarchical Policer		
Aggregate policer • Bandwidth limit • Burst size		

Table 5: Implicit and Configurable Policer Actions Based on Color Marking *(continued)*

Policer Rate Limits and Color Marking	Implicit Action	Configurable Actions
Green Conforms to rate limits	Set PLP to **low**	–
Red Exceeds rate limits	–	• Discard the packet. • Assign to a forwarding class. • Set PLP to **low** or **high**. On some platforms, you can also set the PLP to **medium-low** or **medium-high**.
Premium policer • Bandwidth limit • Burst size		
Green Conforms to rate limits	Set PLP to **low**	–
Red Exceeds rate limits	–	• Discard the packet.

Related Documentation

- Policer Bandwidth and Burst-Size Limits on page 25
- Calculation of Policer Burst-Size Limit on page 33

Single Token Bucket Algorithm

This topic covers the following information:

- Token Bucket Concepts on page 28
- Single Token Bucket Algorithm on page 29
- Conformance Measurement for Two-Color Marking on page 29

Token Bucket Concepts

When you apply traffic policing to the input or output traffic at an interface, the rate limits and actions specified in the policer configuration are used to enforce a limit on the average throughput rate at the interface while also allowing bursts of traffic up to a maximum number of bytes based on the overall traffic load. Junos OS policers measure traffic-flow conformance to a policing rate limit by using a *token bucket algorithm*:

- The *bucket* represents a rate-limiting function of the policer on the interface input or output traffic.
- Each *token* in the bucket represents a “credit” for some number of *bits*, and tokens in the bucket are “cashed in” for the ability to receive or transmit traffic that conforms to a rate limit configured for the policer.

- The *token arrival rate* is the fixed *bits-per-second* rate at which tokens are added to the token bucket, but only up to the specified depth of the bucket.
- The *token bucket depth* defines the capacity of the bucket in *bytes*.

An algorithm based on a single token bucket allows burst of traffic for short periods, whereas an algorithm based dual token buckets allows more sustained bursts of traffic.

Single Token Bucket Algorithm

A single-rate two-color policer limits traffic throughput at an interface based on how the traffic conforms to rate-limit values specified in the policer configuration. Similarly, a hierarchical policer limits traffic throughput at an interface based on how aggregate and premium traffic subflows conform to aggregate and premium rate-limit values specified in the policer configuration. For both two-color policer types, packets in a conforming traffic flow are categorized as *green*, and packets in a non-conforming traffic flow are categorized as *red*.

The single token bucket algorithm measures traffic-flow conformance to a two-color policer rate limit as follows:

- The token arrival rate represents the single *bandwidth limit* configured for the policer. You can specify the bandwidth limit as an absolute number of bits per second by including the **bandwidth-limit *bps*** statement. Alternatively, for single-rate two-color policers only, you can use the **bandwidth-percent *percentage*** statement to specify the bandwidth limit as a percentage of either the physical interface port speed or the configured logical interface shaping rate.
- The token bucket depth represents the single *burst size* configured for the policer. You specify the burst size by including the **burst-size-limit *bytes*** statement.
- If the bucket is filled to capacity, arriving tokens “overflow” the bucket and are lost.

When the bucket contains insufficient tokens for receiving or transmitting the traffic at the interface, packets might be dropped or else re-marked with a lower forwarding class, a higher packet loss priority (PLP) level, or both.

Conformance Measurement for Two-Color Marking

In two-color-marking policing, a traffic flow whose average arrival or departure rate does not exceed the token arrival rate (bandwidth limit) is considered *conforming traffic*. Packets in a conforming traffic flow (categorized as green traffic) are implicitly marked with a packet loss priority (PLP) level of **low** and then passed through the interface.

For a traffic flow whose average arrival or departure rate exceeds the token arrival rate, conformance to a two-color policer rate limit depends on the tokens in the bucket. If sufficient tokens remain in the bucket, the flow is considered conforming traffic. If the bucket does not contain sufficient tokens, the flow is considered *non-conforming traffic*. Packets in a non-conforming traffic flow (categorized as red traffic) are handled according to policing actions. Depending on the configuration of the two-color policer, packets might be implicitly discarded; or the packets might be re-marked with a specified forwarding class, a specified PLP, or both, and then passed through the interface.

NOTE: The number of tokens remaining in the bucket at any given time is a function of the token bucket depth and the overall traffic load.

The token bucket is initially filled to capacity, and so the policer allows an initial traffic burst (back-to-back traffic at average rates that exceed the token arrival rate) up to the size of the token bucket depth.

During periods of relatively low traffic (traffic that arrives at or departs from the interface at average rates below the token arrival rate), unused tokens accumulate in the bucket, but only up to the configured token bucket depth.

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Hierarchical Policer Configuration Overview on page 22
- Policer Color-Marking and Actions on page 26
- **bandwidth-limit (Hierarchical Policer) on page 169**
- **bandwidth-limit (Policer) on page 170**
- **bandwidth-percent on page 172**
- **burst-size-limit (Hierarchical Policer) on page 174**
- **burst-size-limit (Policer) on page 175**

Dual Token Bucket Algorithms

This topic covers the following information:

- Token Bucket Concepts on page 30
- Guaranteed Bandwidth for Three-Color Marking on page 31
- Nonconformance Measurement for Single-Rate Three-Color Marking on page 31
- Nonconformance Measurement for Two-Rate Three-Color Marking on page 31

Token Bucket Concepts

When you apply traffic policing to the input or output traffic at an interface, the rate limits and actions specified in the policer configuration are used to enforce a limit on the average throughput rate at the interface while also allowing bursts of traffic up to a maximum number of bytes based on the overall traffic load. Junos OS policers measure traffic-flow conformance to a policing rate limit by using a *token bucket algorithm*:

- The *bucket* represents a rate-limiting function of the policer on the interface input or output traffic.
- Each *token* in the bucket represents a “credit” for some number of *bits*, and tokens in the bucket are “cashed in” for the ability to receive or transmit traffic that conforms to a rate limit configured for the policer.

- The *token arrival rate* is the fixed *bits-per-second* rate at which tokens are added to the token bucket, but only up to the specified depth of the bucket.
- The *token bucket depth* defines the capacity of the bucket in *bytes*.

An algorithm based on a single token bucket allows burst of traffic for short periods, whereas an algorithm based dual token buckets allows more sustained bursts of traffic.

Guaranteed Bandwidth for Three-Color Marking

A committed information rate (CIR) defines the guaranteed bandwidth for traffic arriving at or departing from the interface under normal line conditions. A flow of traffic at an average rate that conforms to the CIR is categorized green, and packets in a green flow are implicitly marked with **low** packet loss priority (PLP) and then passed through the interface. During periods of relatively low traffic (traffic that arrives at or departs from the interface at average rates below the CIR), any unused bandwidth capacity accumulates in the first token bucket, but only up to a configured number of bytes. If any unused bandwidth capacity overflows the first bucket, the excess accumulates in a second token bucket.

The committed burst size (CBS) defines the maximum number of bytes for which unused amounts of the guaranteed bandwidth can be accumulated in the first token bucket. A burst of traffic at an average rate that exceeds the CIR is also categorized as green provided that sufficient unused bandwidth capacity is available in the first token bucket.

Nonconformance Measurement for Single-Rate Three-Color Marking

Single-rate three-color policer configurations specify a second burst size—the excess burst size (EBS)—that defines the maximum number of bytes for which the second token bucket can accumulate unused bandwidth that overflows from the first bucket.

A traffic flow is categorized yellow if its average rate exceeds the CIR and the available bandwidth capacity accumulated in the first bucket if sufficient unused bandwidth capacity is available in the second token bucket. Packets in a yellow flow are implicitly marked with **medium-high** PLP and then passed through the interface.

A traffic flow is categorized red its average rate exceeds the CIR and the available bandwidth capacity accumulated in the second bucket. Packets in a red flow are implicitly marked with **high** PLP and then either passed through the interface or optionally discarded.

Nonconformance Measurement for Two-Rate Three-Color Marking

Two-rate three-color policer configurations include a second rate limit—the peak-information-rate (PIR)—that you set to the expected average data rate for traffic arriving at or departing from the interface under peak conditions.

Two-rate three-color policer configurations also include a second burst size—the peak burst size (PBS)—that defines the maximum number of bytes for which the second token bucket can accumulate unused peak bandwidth capacity. During periods of relatively little peak traffic (traffic that arrives at or departs from the interface at average rates that exceed the PIR), any unused peak bandwidth capacity accumulates in the second token bucket, but only up to the maximum number of bytes specified by the PBS.

A traffic flow is categorized yellow if it exceeds the CIR and the available committed bandwidth capacity accumulated in the first token bucket but conforms to the PIR. Packets in a yellow flow are implicitly marked with **medium-high** PLP and then passed through the interface.

A traffic flow is categorized red if it exceeds the PIR and the available peak bandwidth capacity accumulated in the second token bucket. Packets in a red flow are implicitly marked with **high** PLP and then either passed through the interface or optionally discarded.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Color-Marking and Actions on page 26
- committed-burst-size on page 179
- committed-information-rate on page 181
- excess-burst-size on page 183
- peak-burst-size on page 197
- peak-information-rate on page 199

CHAPTER 4

Best Practices for Policer Configuration

- Calculation of Policer Burst-Size Limit on page 33

Calculation of Policer Burst-Size Limit

This topic covers the following information:

- Guidelines for Choosing a Burst-Size Limit on page 33
- Burst-Size Limit Based on the Line Rate of the Interface on page 34
- Burst-Size Limit Based on the MTU of Traffic on the Interface on page 35

Guidelines for Choosing a Burst-Size Limit

A policer burst-size limit controls the number of bytes of traffic that can pass through a policed interface unrestricted when a burst of traffic pushes the average transmit or receive rate above the configured bandwidth limit. The actual number of bytes of bursty traffic allowed to pass through a policed interface can vary from zero to the configured burst-size limit, depending on the overall traffic load.

Junos OS implements two-color policers using a *single token bucket* algorithm and implements three-color policers using a *dual token bucket* algorithm. In both of these models, the bits-per-second rate configured as a bandwidth limit is conceptualized the *token arrival rate* for a token bucket, and the number of bytes configured as a policer burst-size limit is conceptualized as the *bucket depth* for the corresponding bucket. The number of tokens remaining in the bucket at any given time is a function of the token bucket depth and the overall traffic load. The token bucket is initially filled to capacity, and so the policer allows an initial traffic burst (back-to-back traffic at average rates that exceed the token arrival rate) up to the size of the token bucket depth. During periods of relatively low traffic (traffic that arrives at or departs from the interface at average rates below the token arrival rate), unused tokens accumulate in the bucket, but only up to the configured token bucket depth.

NOTE: If you set the burst-size limit too low, too many packets will be subjected to rate-limiting. If you set the burst-size limit too high, too few packets will be rate-limited.

The following general guidelines apply to choosing a policer burst-size limit:

- A burst-size limit should not be set lower than 10 times the maximum transmission unit (MTU) of the traffic on the interface to be policed.
- The amount of time to allow a burst of traffic at the full line rate of a policed interface should not be lower than 5 milliseconds.
- The minimum and maximum values you can specify for a policer burst-size limit depends on the policer type (two-color, three-color, or hierarchical). For more information, see "Policer Bandwidth and Burst-Size Limits" on page 25.

BEST PRACTICE: **The preferred method for choosing a burst-size limit is based on the line rate of the interface on which you apply the policer and the amount of time you want to allow a burst of traffic at the full line rate.**

In cases where the line rate of the target interface is unknown, you can choose a burst-size limit based on the MTU of the traffic on the target interface.

Burst-Size Limit Based on the Line Rate of the Interface

To calculate the burst-size limit based on the line rate of the interface:

- Multiply the interface line rate (in bits per second) by the amount of time (in seconds) to allow a burst of traffic at the full line rate, and then divide by 8 bits to convert from bits to bytes.

  burst-size limit in bytes = interface media rate x allowable time for bursty traffic / 8 bits

We recommend that you use a value of 5 ms (0.005 seconds) as the starting point for the allowable amount of time for a burst of traffic.

Table 6 on page 34 shows example calculations of burst-size limits for various physical interface types.

Table 6: Example Calculations of Policer Burst-Size Limit

Target Interface		Allowed Burst Period	Calculation of Policer Burst-Size Limit Based on a Target Interface Line Rate and an Allowed Burst Period
Type	Line Rate		
DS3	45 Mbps	5 ms	45,000,000 bps x 0.005 seconds x 1 byte / 8 bits = 28,125 bytes
Fast Ethernet	100 Mbps	5 ms	100,000,000 bps x 0.005 seconds x 1 byte / 8 bits = 62,500 bytes
Gigabit Ethernet	1000 Mbps	5 ms	1,000,000,000 bps x 0.005 seconds x 1 byte / 8 bits = 625,000 bytes

Table 6: Example Calculations of Policer Burst-Size Limit *(continued)*

Target Interface		Allowed Burst Period	Calculation of Policer Burst-Size Limit Based on a Target Interface Line Rate and an Allowed Burst Period
Type	Line Rate		
10-Gigabit Ethernet	10,000 Mbps	5 ms	10,000,000,000 bpsm x 0.005 seconds x 1 byte / 8 bits = 6,250,000 bytes

Burst-Size Limit Based on the MTU of Traffic on the Interface

To calculate the burst-size limit based on the MTU of traffic on the interface:

- Multiply the interface traffic MTU by a factor of 10 or greater. At the minimum, the burst size should be at least one interface MTU.

  burst-size limit in bytes = interface traffic MTU x 10

For example, suppose that you are configuring a policer for an interface that carries traffic with an MTU of 4700 bytes. The recommended burst-size limit is 47,000 bytes or greater.

Related Documentation

- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Dual Token Bucket Algorithms on page 30

PART 2

Configuration

- Single-Rate Two-Color Policers on page 39
- Three-Color Policers on page 111
- Logical and Physical Interface Policers on page 127
- Layer 2 Policers on page 149
- Policer Configuration Statements on page 167

CHAPTER 5

Single-Rate Two-Color Policers

- Basic Single-Rate Two-Color Policers on page 39
- Bandwidth Policers on page 55
- Filter-Specific Counters and Policers on page 64
- Prefix-Specific Counting and Policing Actions on page 71
- Multifield Classification on page 87
- Policer Overhead to Account for Rate Shaping in the Traffic Manager on page 102

Basic Single-Rate Two-Color Policers

- Single-Rate Two-Color Policer Overview on page 39
- Example: Configuring a Single-Rate Two-Color Policer on page 40
- Example: Configuring Interface and Firewall Filter Policers at the Same Interface on page 46

Single-Rate Two-Color Policer Overview

Single-rate two color policing enforces a configured rate of traffic flow for a particular service level by applying implicit or configured actions to traffic that does not conform to the limits. When you apply a single-rate two-color policer to the input or output traffic at an interface, the policer meters the traffic flow to the rate limit defined by the following components:

- Bandwidth limit—The average number of bits per second permitted for packets received or transmitted at the interface. You can specify the bandwidth limit as an absolute number of bits per second or as a percentage value from 1 through 100. If a percentage value is specified, the effective bandwidth limit is calculated as a percentage of either the physical interface media rate or the logical interface configured shaping rate.
- Burst-size limit—The maximum size permitted for bursts of data.

For a traffic flow that conforms to the configured limits (categorized as green traffic), packets are implicitly marked with a packet loss priority (PLP) level of **low** and are allowed to pass through the interface unrestricted.

For a traffic flow that exceeds the configured limits (categorized as red traffic), packets are handled according to the traffic-policing actions configured for the policer. The action

might be to discard the packet, or the action might be to re-mark the packet with a specified forwarding class, a specified PLP, or both, and then transmit the packet.

To rate-limit Layer 3 traffic, you can apply a two-color policer in the following ways:

- Directly to a logical interface, at a specific protocol level.
- As the action of a standard stateless firewall filter that is applied to a logical interface, at a specific protocol level.

To rate-limit Layer 2 traffic, you can apply a two-color policer as a *logical interface policer* only. You cannot apply a two-color policer to Layer 2 traffic through a firewall filter.

Example: Configuring a Single-Rate Two-Color Policer

This example shows how to configure a single-rate two-color policer that you apply to a logical interface as a firewall filter action.

- Requirements on page 40
- Overview on page 40
- Configuration on page 40
- Verification on page 45

Requirements

No special configuration beyond device initialization is required before configuring this example.

To set the maximum burst size of the policer, you should know the line rate of the interface (preferred) or else the maximum transmission unit (MTU) of the traffic on the target interface.

Overview

In this example, you configure a single-rate two-color policer and then use an IPv4 firewall filter to apply the policer to all traffic except for BGP messages. You apply the firewall filter to the input and output of the same logical interface.

Topology

Assume that you know the traffic flow needs to be rate-limited to an average bandwidth of 9 Mbps. Also assume that you do not know the line rate of the target interface, but you do know that the MTU of traffic on the interface is 4700 bytes. As described in "Calculation of Policer Burst-Size Limit" on page 33, you can estimate a starting value of 10 times the MTU.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interface and Monitoring the Traffic Rate Without Policing on page 41
- Configuring the Basic Single-Rate Two-Color Policer on page 42
- Referencing the Policer from a Term in a Stateless Firewall Filter on page 43
- Applying the Firewall Filter to the Input and Output of the Logical Interface on page 44

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces so-1/3/0 unit 0 family inet address 10.39.1.1/16
set firewall policer p-9m-47k-discard if-exceeding bandwidth-limit 9m
set firewall policer p-9m-47k-discard if-exceeding burst-size-limit 47k
set firewall policer p-9m-47k-discard then discard
set firewall family inet filter rate-limit-in term t1 from protocol tcp
set firewall family inet filter rate-limit-in term t1 from port bgp
set firewall family inet filter rate-limit-in term t1 then accept
set firewall family inet filter rate-limit-in term t2 then policer p-9m-47k-discard
set firewall family inet filter rate-limit-in term t2 then accept
set interfaces so-1/3/0 unit 0 family inet filter input rate-limit-in
set interfaces so-1/3/0 unit 0 family inet filter output rate-limit-in
```

Configuring the Logical Interface and Monitoring the Traffic Rate Without Policing

Step-by-Step Procedure

To configure the logical interface and monitor the traffic rate:

1. Configure IPv4 on the logical interface.

   ```
   [edit]
   user@host# edit interfaces so-1/3/0 unit 0 family inet address 10.39.1.1/16
   ```

2. Commit the configuration.

   ```
   [edit]
   user@host# commit
   ```

3. Monitor the traffic flow at the interface (press 'q' to terminate monitoring).

   ```
   [edit]
   user@host# run monitor interface so-1/3/0.0
   ```

   The traffic statistics report the input and output rates before applying interface rate limiting.

Results

Confirm the configuration of the logical interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-3/3/0 {
  unit 0 {
    family inet {
      address 10.39.1.1/16
```

```
    }
  }
}
```

Configuring the Basic Single-Rate Two-Color Policer

Step-by-Step Procedure

To configure the basic single-rate two-color policer:

1. Enable configuration of a single-rate two-color policer.

   ```
   [edit]
   user@host# edit firewall policer p-9m-47k-discard
   ```

   NOTE:

   This example illustrates a basic two-color policer, which does not require any of the following statements:

   - filter-specific—You can include this statement so that, when this policer is applied as a firewall filter policer, a single instance of the policer is used by all terms within the same firewall filter.
   - logical-bandwidth-policer—Include this statement only if the policer bandwidth limit is specified as a percentage value (using the bandwidth-percent *percent* statement) and you want the bandwidth limit to be based on the configured shaping rate for the target logical interface.
   - logical-interface-policer—Include this statement only if you apply the policer directly to a physical or logical interface to rate-limit traffic for any configured protocol family based on the physical interface media rate.
   - physical-interface-policer—Include this statement if you apply the policer to packets filtered by a standard stateless firewall filter term and you want the policer to meter the aggregate traffic (all protocol families and logical interfaces configured on the underlying physical interface).

2. Configure the policer to rate-limit to an average bandwidth of 9 Mbps and a burst size of 47 KB.

   ```
   [edit firewall policer p-9m-47k-discard]
   user@host# set if-exceeding bandwidth-limit 9m
   user@host# set if-exceeding burst-size-limit 47k
   ```

   For information about configuring the burst size, see "Calculation of Policer Burst-Size Limit" on page 33.

   When the traffic flow conforms to these limits, the flow is categorized as green. For a single-rate two-color policer, packets in a green flow are implicitly set to a **low** packet loss priority (PLP) level.

3. Configure the policer to discard packets in a red traffic flow.

```
[edit firewall policer p-9m-47k-discard]
user@host# set then discard
```

Instead of discarding the traffic that exceeds the traffic limits, you can set the PLP level, the forwarding class assignment, or both.

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer p-9m-47k-discard {
  if-exceeding {
    bandwidth-limit 9m;
    burst-size-limit 47k;
  }
  then discard;
}
```

Referencing the Policer from a Term in a Stateless Firewall Filter

Step-by-Step Procedure To reference the policer from a term in a stateless firewall filter:

1. Enable configuration of the stateless firewall filter.

```
[edit]
user@host# edit firewall family inet filter rate-limit-in
```

2. Configure the first term to accept all BGP traffic.

BGP messages are transported over TCP port 179.

```
[edit firewall family inet filter rate-limit-in]
user@host# set term t1 from protocol tcp
user@host# set term t1 from port bgp
user@host# set term t1 then accept
```

The BGP traffic is not rate-limited to avoid having the BGP session time out because the packet is discarded by the policer.

3. Configure the second term to rate-limit all other traffic using the policer.

```
[edit firewall family inet filter rate-limit-in]
user@host# set term t2 then policer p-9m-47k-discard
user@host# set term t2 then accept
```

Results Confirm the configuration of the firewall filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
  filter rate-limit-in {
```

```
    term t1 {
      from {
        protocol tcp;
        port bgp;
      }
      then accept;
    }
    term t2 {
      then {
        policer p-9m-47k-discard;
        accept;
      }
    }
  }
}
policer p-9m-47k-discard {
  if-exceeding {
    bandwidth-limit 9m;
    burst-size-limit 47k;
  }
  then discard;
}
```

Applying the Firewall Filter to the Input and Output of the Logical Interface

Step-by-Step Procedure

To apply the stateless firewall filter to the input and output of the logical interface:

1. Enable configuration of IPv4 on the logical interface.

```
[edit]
user@host# edit interfaces so-1/3/0 unit 0 family inet
```

2. Apply the stateless firewall filter.

```
[edit interfaces so-1/3/0 unit 0 family inet]
user@host# set filter input rate-limit-in
user@host# set filter output rate-limit-in
```

Results

Confirm the configuration of the logical interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-3/3/0 {
  unit 0 {
    family inet {
      filter {
        input rate-limit-in;
        output rate-limit-in;
      }
      address 10.39.1.1/16;
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Monitoring and Adjusting Policing of the Logical Interface on page 45
- Displaying the Number of Packets Processed by the Policer at the Logical Interface on page 45

Monitoring and Adjusting Policing of the Logical Interface

Purpose Ensure that the traffic limits configured in the policer are throttling the input and output rate as you intended.

Action To ensure that the configured traffic limits are throttling the traffic rate as intended:

1. Monitor the traffic flow at the interface (press 'q' to terminate monitoring).

   ```
   [edit]
   user@host# run monitor interface so-1/3/0.0
   ```

   The traffic statistics report the input and output rate after applying interface rate limiting.

2. Adjust the burst-size limit if necessary.

   If the policer appears to be throttling the input and output rate more than you intended, increase the burst size (possibly doubling it) and then check again.

Displaying the Number of Packets Processed by the Policer at the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show firewall** operational mode command for the filter you applied to the logical interface:

```
[edit]
user@host# run show firewall filter rate-limit-in
Filter: rate-limit-in
Policers:
Name                                                Packets
p-9m-47k-discard-t2                                   32863
```

The command output displays the name of policer (**p-9m-47k-discard**), the name of the filter term (**t2**) under which the policer action is specified, and the number of packets that matched the filter term. This is only the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.

Example: Configuring Interface and Firewall Filter Policers at the Same Interface

This example shows how to configure three single-rate two-color policers and apply the policers to the IPv4 input traffic at the same single-tag virtual LAN (VLAN) logical interface.

- Requirements on page 46
- Overview on page 46
- Configuration on page 47
- Verification on page 53

Requirements

No special configuration beyond device initialization is required before configuring this example.

Overview

In this example, you configure three single-rate two-color policers and apply the policers to the IPv4 input traffic at the same single-tag VLAN logical interface. Two policers are applied to the interface through a firewall filter, and one policer is applied directly to the interface.

You configure one policer, named **p-all-1m-5k-discard**, to rate-limit traffic to 1 Mbps with a burst size of 5000 bytes. You apply this policer directly to IPv4 input traffic at the logical interface. When you apply a policer directly to protocol-specific traffic at a logical interface, the policer is said to be applied as an *interface policer*.

You configure the other two policers to allow burst sizes of 500 KB, and you apply these policers to IPv4 input traffic at the logical interface by using an IPv4 standard stateless firewall filter. When you apply a policer to protocol-specific traffic at a logical interface through a firewall filter action, the policer is said to be applied as a *firewall-filter policer*.

- You configure the policer named **p-icmp-500k-500k-discard** to rate-limit traffic to 500 Kbps with a burst size of 500 K bytes by discarding packets that do not conform to these limits. You configure one of the firewall filter terms to apply this policer to Internet Control Message Protocol (ICMP) packets.
- You configure the policer named **p-ftp-10p-500k-discard** to rate-limit traffic to a 10 percent bandwidth with a burst size of 500 KB by discarding packets that do not conform to these limits. You configure another firewall-filter term to apply this policer to File Transfer Protocol (FTP) packets.

A policer that you configure with a bandwidth limit expressed as a percentage value (rather than as an absolute bandwidth value) is called a *bandwidth policer*. Only single-rate two-color policers can be configured with a percentage bandwidth specification. By default, a bandwidth policer rate-limits traffic to the specified percentage of the line rate of the physical interface underlying the target logical interface.

Topology

You configure the target logical interface as a single-tag VLAN logical interface on a Fast Ethernet interface operating at 100 Mbps. This means that the policer you configure with the 10-percent bandwidth-limit (the policer that you apply to FTP packets) rate-limits the FTP traffic on this interface to 10 Mbps.

NOTE: In this example, you do not configure the bandwidth policer as a *logical-bandwidth policer*. Therefore, the percentage is based on the physical media rate rather than on the configured shaping rate of the logical interface.

The firewall filter that you configure to reference two of the policers must be configured as an *interface-specific filter*. Because the policer that is used to rate-limit FTP packets specifies the bandwidth limit as a percentage value, the firewall filter that references this policer must be configured as an interface-specific filter. Thus, if this firewall filter were to be applied to multiple interfaces instead of just the Fast Ethernet interface in this example, unique policers and counters would be created for each interface to which the filter is applied.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Single-Tag VLAN Logical Interface on page 48
- Configuring the Three Policers on page 49
- Configuring the IPv4 Firewall Filter on page 51
- Applying the Interface Policer and Firewall Filter Policers to the Logical Interface on page 52

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces fe-0/1/1 vlan-tagging
set interfaces fe-0/1/1 unit 0 vlan-id 100
set interfaces fe-0/1/1 unit 0 family inet address 10.20.15.1/24
set interfaces fe-0/1/1 unit 1 vlan-id 101
set interfaces fe-0/1/1 unit 1 family inet address 10.20.240.1/24
set firewall policer p-all-1m-5k-discard if-exceeding bandwidth-limit 1m
set firewall policer p-all-1m-5k-discard if-exceeding burst-size-limit 5k
set firewall policer p-all-1m-5k-discard then discard
set firewall policer p-ftp-10p-500k-discard if-exceeding bandwidth-percent 10
set firewall policer p-ftp-10p-500k-discard if-exceeding burst-size-limit 500k
set firewall policer p-ftp-10p-500k-discard then discard
set firewall policer p-icmp-500k-500k-discard if-exceeding bandwidth-limit 500k
set firewall policer p-icmp-500k-500k-discard if-exceeding burst-size-limit 500k
set firewall policer p-icmp-500k-500k-discard then discard
```

```
set firewall family inet filter filter-ipv4-with-limits interface-specific
set firewall family inet filter filter-ipv4-with-limits term t-ftp from protocol tcp
set firewall family inet filter filter-ipv4-with-limits term t-ftp from port ftp
set firewall family inet filter filter-ipv4-with-limits term t-ftp from port ftp-data
set firewall family inet filter filter-ipv4-with-limits term t-ftp then policer
  p-ftp-10p-500k-discard
set firewall family inet filter filter-ipv4-with-limits term t-icmp from protocol icmp
set firewall family inet filter filter-ipv4-with-limits term t-icmp then policer
  p-icmp-500k-500k-discard
set firewall family inet filter filter-ipv4-with-limits term catch-all then accept
set interfaces fe-0/1/1 unit 1 family inet filter input filter-ipv4-with-limits
set interfaces fe-0/1/1 unit 1 family inet policer input p-all-1m-5k-discard
```

Configuring the Single-Tag VLAN Logical Interface

Step-by-Step Procedure

To configure the single-tag VLAN logical interface:

1. Enable configuration of the Fast Ethernet interface.

   ```
   [edit]
   user@host# edit interfaces fe-0/1/1
   ```

2. Enable single-tag VLAN framing.

   ```
   [edit interfaces fe-0/1/1]
   user@host# set vlan-tagging
   ```

3. Bind VLAN IDs to the logical interfaces.

   ```
   [edit interfaces fe-0/1/1]
   user@host# set unit 0 vlan-id 100
   user@host# set unit 1 vlan-id 101
   ```

4. Configure IPv4 on the single-tag VLAN logical interfaces.

   ```
   [edit interfaces fe-0/1/1]
   user@host# set unit 0 family inet address 10.20.15.1/24
   user@host# set unit 1 family inet address 10.20.240.1/24
   ```

Results

Confirm the configuration of the VLAN by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
fe-0/1/1 {
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      address 10.20.15.1/24;
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 10.20.240.1/24;
```

```
    }
  }
}
```

Configuring the Three Policers

Step-by-Step Procedure

To configure the three policers:

1. Enable configuration of a two-color policer that discards packets that do not conform to a bandwidth of 1 Mbps and a burst size of 5000 bytes.

   NOTE: You apply this policer directly to all IPv4 input traffic at the single-tag VLAN logical interface, so the packets will not be filtered before being subjected to rate limiting.

   ```
   [edit]
   user@host# edit firewall policer p-all-1m-5k-discard
   ```

2. Configure the first policer.

   ```
   [edit firewall policer p-all-1m-5k-discard]
   user@host# set if-exceeding bandwidth-limit 1m
   user@host# set if-exceeding burst-size-limit 5k
   user@host# set then discard
   ```

3. Enable configuration of a two-color policer that discards packets that do not conform to a bandwidth specified as “10 percent” and a burst size of 500,000 bytes.

   You apply this policer only to the FTP traffic at the single-tag VLAN logical interface.

   You apply this policer as the action of an IPv4 firewall filter term that matches FTP packets from TCP.

   ```
   [edit firewall policer p-all-1m-5k-discard]
   user@host# up

   [edit]
   user@host# edit firewall policer p-ftp-10p-500k-discard
   ```

4. Configure policing limits and actions.

   ```
   [edit firewall policer p-ftp-10p-500k-discard]
   user@host# set if-exceeding bandwidth-percent 10
   user@host# set if-exceeding burst-size-limit 500k
   user@host# set then discard
   ```

   Because the bandwidth limit is specified as a percentage, the firewall filter that references this policer must be configured as an interface-specific filter.

NOTE: If you wanted this policer to rate-limit to 10 percent of the logical interface configured shaping rate (rather than to 10 percent of the physical interface media rate), you would need to include the logical-bandwidth-policer statement at the **[edit firewall policer p-all-1m-5k-discard]** hierarchy level. This type of policer is called a *logical-bandwidth policer*.

5. Enable configuration of the IPv4 firewall filter policer for ICMP packets.

```
[edit firewall policer p-ftp-10p-500k-discard]
user@host# up

[edit]
user@host# edit firewall policer p-icmp-500k-500k-discard
```

6. Configure policing limits and actions.

```
[edit firewall policer p-icmp-500k-500k-discard]
user@host# set if-exceeding bandwidth-limit 500k
user@host# set if-exceeding burst-size-limit 500k
user@host# set then discard
```

Results Confirm the configuration of the policers by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer p-all-1m-5k-discard {
    if-exceeding {
        bandwidth-limit 1m;
        burst-size-limit 5k;
    }
    then discard;
}
policer p-ftp-10p-500k-discard {
    if-exceeding {
        bandwidth-percent 10;
        burst-size-limit 500k;
    }
    then discard;
}
policer p-icmp-500k-500k-discard {
    if-exceeding {
        bandwidth-limit 500k;
        burst-size-limit 500k;
    }
    then discard;
}
```

Configuring the IPv4 Firewall Filter

Step-by-Step Procedure

To configure the IPv4 firewall filter:

1. Enable configuration of the IPv4 firewall filter.

   ```
   [edit]
   user@host# edit firewall family inet filter filter-ipv4-with-limits
   ```

2. Configure the firewall filter as interface-specific.

   ```
   [edit firewall family inet filter filter-ipv4-with-limits]
   user@host# set interface-specific
   ```

   The firewall filter must be interface-specific because one of the policers referenced is configured with a bandwidth limit expressed as a percentage value.

3. Enable configuration of a filter term to rate-limit FTP packets.

   ```
   [edit firewall family inet filter filter-ipv4-with-limits]
   user@host# edit term t-ftp

   [edit firewall family inet filter filter-ipv4-with-limits term t-ftp]
   user@host# set from protocol tcp
   user@host# set from port [ ftp ftp-data ]
   ```

   FTP messages are sent over TCP port 20 (**ftp**) and received over TCP port 21 (**ftp-data**).

4. Configure the filter term to match FTP packets.

   ```
   [edit firewall family inet filter filter-ipv4-with-limits term t-ftp]
   user@host# set then policer p-ftp-10p-500k-discard
   ```

5. Enable configuration of a filter term to rate-limit ICMP packets.

   ```
   [edit firewall family inet filter filter-ipv4-with-limits term t-ftp]
   user@host# up

   [edit firewall family inet filter filter-ipv4-with-limits]
   user@host# edit term t-icmp
   ```

6. Configure the filter term for ICMP packets

   ```
   [edit firewall family inet filter filter-ipv4-with-limits term t-icmp]
   user@host# set from protocol icmp
   user@host# set then policer p-icmp-500k-500k-discard
   ```

7. Configure a filter term to accept all other packets without policing.

   ```
   [edit firewall family inet filter filter-ipv4-with-limits term t-icmp]
   user@host# up

   [edit firewall family inet filter filter-ipv4-with-limits]
   user@host# set term catch-all then accept
   ```

Results Confirm the configuration of the firewall filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
    filter filter-ipv4-with-limits {
        interface-specific;
        term t-ftp {
            from {
                protocol tcp;
                port [ ftp ftp-data ];
            }
            then policer p-ftp-10p-500k-discard;
        }
        term t-icmp {
            from {
                protocol icmp;
            }
            then policer p-icmp-500k-500k-discard;
        }
        term catch-all {
            then accept;
        }
    }
}
policer p-all-1m-5k-discard {
    if-exceeding {
        bandwidth-limit 1m;
        burst-size-limit 5k;
    }
    then discard;
}
policer p-ftp-10p-500k-discard {
    if-exceeding {
        bandwidth-percent 10;
        burst-size-limit 500k;
    }
    then discard;
}
policer p-icmp-500k-500k-discard {
    if-exceeding {
        bandwidth-limit 500k;
        burst-size-limit 500k;
    }
    then discard;
}
```

Applying the Interface Policer and Firewall Filter Policers to the Logical Interface

Step-by-Step Procedure To apply the three policers to the VLAN:

1. Enable configuration of IPv4 on the logical interface.

   ```
   [edit]
   ```



```
user@host# edit interfaces fe-0/1/1 unit 1 family inet
```

2. Apply the firewall filter policers to the interface.

```
[edit interfaces fe-0/1/1 unit 1 family inet]
user@host# set filter input filter-ipv4-with-limits
```

3. Apply the interface policer to the interface.

```
[edit interfaces fe-0/1/1 unit 1 family inet]
user@host# set policer input p-all-1m-5k-discard
```

Input packets at **fe-0/1/1.0** are evaluated against the interface policer before they are evaluated against the firewall filter policers. For more information, see "Order of Policer and Firewall Filter Operations" on page 10.

Results Confirm the configuration of the interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
fe-0/1/1 {
    vlan-tagging;
    unit 0 {
        vlan-id 100;
        family inet {
            address 10.20.15.1/24;
        }
    }
    unit 1 {
        vlan-id 101;
        family inet {
            filter {
                input filter-ipv4-with-limits;
            }
            policer {
                input p-all-1m-5k-discard;
            }
            address 10.20.240.1/24;
        }
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Policers Applied Directly to the Logical Interface on page 54
- Displaying Statistics for the Policer Applied Directly to the Logical Interface on page 54
- Displaying the Policers and Firewall Filters Applied to an Interface on page 54
- Displaying Statistics for the Firewall Filter Policers on page 55

Displaying Policers Applied Directly to the Logical Interface

Purpose Verify that the interface policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces policers** operational mode command for logical interface **fe-0/1/1.1**. The command output section for the **Proto** column and **Input Policer** column shows that the policer **p-all-1m-5k-discard** is evaluated when packets are received on the logical interface.

```
user@host> show interfaces policers fe-0/1/1.1
Interface       Admin Link Proto Input Policer         Output Policer
fe-0/1/1.1      up    up
                           inet  p-all-1m-5k-discard-fe-0/1/1.1-inet-i
```

In this example, the interface policer is applied to logical interface traffic in the input direction only.

Displaying Statistics for the Policer Applied Directly to the Logical Interface

Purpose Verify the number of packets evaluated by the interface policer.

Action Use the show policer operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction.

```
user@host> show policer p-all-1m-5k-discard-fe-0/1/1.1-inet-i
Policers:
Name                                                Packets
p-all-1m-5k-discard-fe-0/1/1.1-inet-i                     5
```

Displaying the Policers and Firewall Filters Applied to an Interface

Purpose Verify that the firewall filter **filter-ipv4-with-limits** is applied to the IPv4 input traffic at logical interface **fe-0/1/1.1**.

Action Use the **show interfaces statistics** operational mode command for logical interface **fe-0/1/1.1**, and include the **detail** option. Under the **Protocol inet** section of the command output section, the **Input Filters** and **Policer** lines display the names of filter and policer applied to the logical interface in the input direction.

```
user@host> show interfaces statistics fe-0/1/1.1 detail
  Logical interface fe-0/1/1.1 (Index 83) (SNMP ifIndex 545) (Generation 153)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                  46
     Input  packets:                   0
     Output packets:                   1
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                  46
     Input  packets:                   0
     Output packets:                   1
    Transit statistics:
```

```
  Input  bytes  :                    0                    0 bps
  Output bytes  :                    0                    0 bps
  Input  packets:                    0                    0 pps
  Output packets:                    0                    0 pps
Protocol inet, MTU: 1500, Generation: 176, Route table: 0
  Flags: Sendbcast-pkt-to-re
  Input Filters: filter-ipv4-with-limits-fe-0/1/1.1-i
  Policer: Input: p-all-1m-5k-discard-fe-0/1/1.1-inet-i
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.20.130/24, Local: 10.20.130.1, Broadcast: 10.20.130.255,

    Generation: 169
```

In this example, the two firewall filter policers are applied to logical interface traffic in the input direction only.

Displaying Statistics for the Firewall Filter Policers

Purpose Verify the number of packets evaluated by the firewall filter policers.

Action Use the **show firewall** operational mode command for the filter you applied to the logical interface.

```
[edit]
user@host> show firewall filter filter-ipv4-with-limits-fe-0/1/1.1-i

Filter: filter-ipv4-with-limits-fe-0/1/1.1-i
Policers:
Name                                                Packets
p-ftp-10p-500k-discard-t-ftp-fe-0/1/1.1-i                 0
p-icmp-500k-500k-discard-t-icmp-fe-0/1/1.1-i              0
```

The command output displays the names of the policers (**p-ftp-10p-500k-discard** and **p-icmp-500k-500k-discard**), combined with the names of the filter terms (**t-ftp** and **t-icmp**, respectively) under which the policer action is specified. The policer-specific output lines display the number of packets that matched the filter term. This is only the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.

Related Documentation

- Order of Policer and Firewall Filter Operations on page 10
- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24
- Calculation of Policer Burst-Size Limit on page 33

Bandwidth Policers

- Bandwidth Policer Overview on page 56
- Example: Configuring a Logical Bandwidth Policer on page 57

Bandwidth Policer Overview

For a single-rate two-color policer only, you can specify the bandwidth limit as a percentage value from 1 through 100 instead of as an absolute number of bits per second. This type of two-color policer, called a *bandwidth policer*, rate-limits traffic to a bandwidth limit that is calculated as a percentage of either the physical interface media rate or the logical interface configured shaping rate.

Guidelines for Configuring a Bandwidth Policer

The following guidelines apply to configuring a bandwidth policer:

- To specify a percentage bandwidth limit, you include the bandwidth-percent ***percentage*** statement in place of the bandwidth-limit ***bps*** statement.
- By default, a bandwidth policer calculates the percentage bandwidth limit based on the physical interface port speed. To configure a bandwidth policer to calculate the percentage bandwidth limit based on the configured logical interface shaping rate instead, include the logical-bandwidth-policer statement at the **[edit firewall policer *policer-name*]** hierarchy level. This type of bandwidth policer is called a *logical bandwidth policer*.

  You can configure a logical interface shaping rate by including the **shaping-rate *bps*** statement at the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number*]** hierarchy level. A logical interface shaping rate causes the specified amount of bandwidth to be allocated to the logical interface.

  NOTE: If you configure a logical-bandwidth policer and then apply the policer to a logical interface that is not configured with a shaping rate, then the policer rate-limits traffic on that logical interface to calculate the percentage bandwidth limit based on the physical interface port speed, even if you include the logical-bandwidth-policer statement in the bandwidth policer configuration.

- If you reference a bandwidth policer from a stateless firewall filter term, you must include the **interface-specific** statement in the firewall filter configuration.

Guidelines for Applying a Bandwidth Policer

The following guidelines pertain to applying a bandwidth policer to traffic:

- You can use a bandwidth policer to rate-limit protocol-specific traffic (not **family any**) at the input or output of a logical interface.
- You can apply a bandwidth policer directly to protocol-specific input or output traffic at a logical interface.

- To send only selected packets to a bandwidth policer, you can reference the bandwidth policer from a stateless firewall filter term and then apply the filter to logical interface traffic for a specific protocol family.
  - To reference a *logical bandwidth policer* from a firewall filter, you must include the **interface-specific** statement in the firewall filter configuration.
  - You cannot use a bandwidth policer for forwarding-table filters.
- You cannot apply a bandwidth policer to an aggregate interface, a tunnel interface, or a software interface.

Example: Configuring a Logical Bandwidth Policer

This example shows how to configure a logical bandwidth policer.

- Requirements on page 57
- Overview on page 57
- Configuration on page 58
- Verification on page 62

Requirements

Before you begin, make sure that you have two logical units available on a Gigabit Ethernet interface.

Overview

In this example, you configure a single-rate two-color policer that specifies the bandwidth limit as a percentage value rather than as an absolute number of bits per second. This type of policer is called a *bandwidth policer*. By default, a bandwidth policer enforces a bandwidth limit based on the line rate of the underlying physical interface. As an option, you can configure a bandwidth policer to enforce a bandwidth limit based on the configured shaping rate of the logical interface. To configure this type of bandwidth policer, called a *logical bandwidth policer*, you include the logical-bandwidth-policer statement in the policer configuration.

To configure a logical interface shaping rate, include the **shaping-rate *bps*** statement at the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number*]** hierarchy level. This class-of-service (CoS) configuration statement causes the specified amount of bandwidth to be allocated to the logical interface.

NOTE: If you configure a policer bandwidth limit as a percentage but a shaping rate is not configured for the target logical interface, the policer bandwidth limit is calculated as a percentage of the physical interface media rate, even if you enable the logical-bandwidth policing feature.

To apply a logical bandwidth policer to a logical interface, you can apply the policer directly to the logical interface at the protocol family level or (if you only need to rate-limit

filtered packets) you can reference the policer from a stateless firewall filter configured to operate in *interface-specific* mode.

Topology

In this example, you configure two logical interfaces on a single Gigabit Ethernet interface and configure a shaping rate on each logical interface. On logical interface **ge-1/3/0.0**, you allocate 4 Mbps of bandwidth. On logical interface **ge-1/3/0.1**, you allocate 2 Mbps of bandwidth.

You also configure a logical bandwidth policer with a bandwidth limit of 50 percent and a maximum burst size of 125,000 bytes, and then you apply the policer to input and output traffic at the logical units configured on **ge-1/3/0.0**. For logical interface **ge-1/3/0.0**, the policer rate-limits to a bandwidth limit of 2 Mbps (50 percent of the 4 Mbps shaping rate configured for the logical interface). For logical interface **ge-1/3/0.1**, the policer rate-limits traffic to a bandwidth limit of 1 Mbps (50 percent of the 2 Mbps shaping rate configured for the logical interface).

If no shaping rate is configured for a target logical interface, the policer rate-limits to a bandwidth limit calculated as 50 percent of the physical interface media rate. For example, if you apply a 50 percent bandwidth policer to input or output traffic at a Gigabit Ethernet logical interface without rate shaping, the policer applies a bandwidth limit of 500 Mbps (50 percent of 1000 Mbps).

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on page 59
- Configuring Traffic Rate-Shaping by Specifying the Amount of Bandwidth to be Allocated to the Logical Interface on page 60
- Configuring the Logical Bandwidth Policer on page 60
- Applying the Logical Bandwidth Policers to the Logical Interfaces on page 61

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/3/0 per-unit-scheduler
set interfaces ge-1/3/0 vlan-tagging
set interfaces ge-1/3/0 unit 0 vlan-id 100
set interfaces ge-1/3/0 unit 0 family inet address 172.1.1.1/30
set interfaces ge-1/3/0 unit 1 vlan-id 200
set interfaces ge-1/3/0 unit 1 family inet address 172.2.1.1/30
set class-of-service interfaces ge-1/3/0 unit 0 shaping-rate 4m
set class-of-service interfaces ge-1/3/0 unit 1 shaping-rate 2m
set firewall policer LB-policer logical-bandwidth-policer
set firewall policer LB-policer if-exceeding bandwidth-percent 50
set firewall policer LB-policer if-exceeding burst-size-limit 125k
```

```
set firewall policer LB-policer then discard
set interfaces ge-1/3/0 unit 0 family inet policer input LB-policer
set interfaces ge-1/3/0 unit 0 family inet policer output LB-policer
set interfaces ge-1/3/0 unit 1 family inet policer input LB-policer
set interfaces ge-1/3/0 unit 1 family inet policer output LB-policer
```

Configuring the Logical Interfaces

Step-by-Step Procedure

To configure the logical interfaces:

1. Enable configuration of the physical interface.

```
[edit]
user@host# edit interfaces ge-1/3/0

[edit interfaces ge-1/3/0]
user@host# set per-unit-scheduler
user@host# set vlan-tagging
```

2. Configure the first logical interface.

```
[edit interfaces ge-1/3/0]
user@host# set unit 0 vlan-id 100
user@host# set unit 0 family inet address 172.1.1.1/30
```

3. Configure the second logical interface.

```
[edit interfaces ge-1/3/0]
user@host# set unit 1 vlan-id 200
user@host# set unit 1 family inet address 172.2.1.1/30
```

Results

Confirm the configuration of the interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/0 {
    per-unit-scheduler;
    vlan-tagging;
    unit 0 {
        vlan-id 100;
        family inet {
            address 172.1.1.1/30;
        }
    }
    unit 1 {
        vlan-id 200;
        family inet {
            address 172.2.1.1/30;
        }
    }
}
```

Configuring Traffic Rate-Shaping by Specifying the Amount of Bandwidth to be Allocated to the Logical Interface

Step-by-Step Procedure

To configure rate shaping by specifying the bandwidth to be allocated to the logical interface:

1. Enable CoS configuration on the physical interface.

```
[edit]
user@host# edit class-of-service interfaces ge-1/3/0
```

2. Configure rate shaping for the logical interfaces.

```
[edit]
user@host# set unit 0 shaping-rate 4m
user@host# set unit 1 shaping-rate 2m
```

These statements allocate 4 Mbps of bandwidth to logical unit **ge-1/3/0.0** and 2 Mbps of bandwidth to logical unit **ge-1/3/0.1**.

Results

Confirm the configuration of the rate shaping by entering the **show class-of-service** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show class-of-service
interfaces {
  ge-1/3/0 {
    unit 0 {
      shaping-rate 4m;
    }
    unit 1 {
      shaping-rate 2m;
    }
  }
}
```

Configuring the Logical Bandwidth Policer

Step-by-Step Procedure

To configure the logical bandwidth policer:

1. Enable configuration of a single-rate two-color policer.

```
[edit]
user@host# edit firewall policer LB-policer
```

2. Configure the policer as a logical-bandwidth policer.

```
[edit firewall policer LB-policer]
user@host# set logical-bandwidth-policer
```

This applies the rate-limiting to logical interfaces.

3. Configure the policer traffic limits and actions.

```
[edit firewall policer LB-policer]
user@host# set if-exceeding bandwidth-percent 50
user@host# set if-exceeding burst-size-limit 125k
```

```
user@host# set then discard
```

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer LB-policer {
  logical-bandwidth-policer;
  if-exceeding {
    bandwidth-percent 50;
    burst-size-limit 125k;
  }
  then discard;
}
```

Applying the Logical Bandwidth Policers to the Logical Interfaces

Step-by-Step Procedure To configure the logical bandwidth policers to the logical interfaces:

1. Enable configuration of the interface.

   ```
   [edit]
   user@host# edit interfaces ge-1/3/0
   ```

2. Apply the logical bandwidth policer to the first logical interface.

   ```
   [edit interfaces ge-1/3/0]
   user@host# set unit 0 family inet policer input LB-policer
   user@host# set unit 0 family inet policer output LB-policer
   ```

3. Apply the policing to the second logical interface.

   ```
   [edit interfaces ge-1/3/0]
   user@host# set unit 1 family inet policer input LB-policer
   user@host# set unit 1 family inet policer output LB-policer
   ```

Results Confirm the configuration of the interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/0 {
  per-unit-scheduler;
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      policer {
        input LB-policer;
        output LB-policer;
      }
      address 172.1.1.1/30;
    }
```

```
    }
    unit 1 {
      vlan-id 200;
      family inet {
        policer {
          input LB-policer;
          output LB-policer;
        }
        address 172.2.1.1/30;
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 62
- Displaying Statistics for the Policer on page 63

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interfaces **ge-1/3/0.0** and **ge-1/3/0.1**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface, and the **Protocol inet** section contains a **Policer** field that lists the policer **LB-policer** as an input or output policer as follows:

- **Input: LB-policer-ge-1/3/0.0-inet-i**
- **Output: LB-policer-ge-1/3/0.0-inet-o**

In this example, the policer is applied to logical interface traffic in both the input and output directions.

```
user@host> show interfaces ge-1/3/0.0 detail
  Logical interface ge-1/3/0.0 (Index 80) (SNMP ifIndex 154) (Generation 150)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                  46
     Input  packets:                   0
     Output packets:                   1
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                  46
     Input  packets:                   0
     Output packets:                   1
    Transit statistics:
     Input  bytes  :                   0                  0 bps
     Output bytes  :                   0                  0 bps
```

```
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol inet, MTU: 1500, Generation: 174, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Policer: Input: LB-policer-ge-1/3/0.0-inet-i, Output:
LB-policer-ge-1/3/0.0-inet-o
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 172.1.1.0/30, Local: 172.1.1.1, Broadcast: 172.1.1.3,
Generation: 165

user@host> show interfaces ge-1/3/0.1 detail
  Logical interface ge-1/3/0.1 (Index 81) (SNMP ifIndex 543) (Generation 151)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.200 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :                   46
     Input  packets:                    0
     Output packets:                    1
    Local statistics:
     Input  bytes  :                    0
     Output bytes  :                   46
     Input  packets:                    0
     Output packets:                    1
    Transit statistics:
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol inet, MTU: 1500, Generation: 175, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Policer: Input: LB-policer-ge-1/3/0.1-inet-i, Output:
LB-policer-ge-1/3/0.1-inet-o
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 172.2.1.0/30, Local: 172.2.1.1, Broadcast: 172.2.1.3,
Generation: 167
```

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the show policer operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **LB-policer**, the input and output policer names are displayed as follows:

- **LB-policer-ge-1/3/0.0-inet-i**
- **LB-policer-ge-1/3/0.0-inet-o**
- **LB-policer-ge-1/3/0.1-inet-i**
- **LB-policer-ge-1/3/0.1-inet-o**

The **-inet-i** suffix denotes a policer applied to logical interface input traffic, while the **-inet-o** suffix denotes a policer applied to logical interface output traffic. In this example, the policer is applied to both input and output traffic on logical interface **ge-1/3/0.0** and logical interface **ge-1/3/0.1**.

```
user@host> show policer
Policers:
Name                                                Packets
__default_arp_policer__                                   0
LB-policer-ge-1/3/0.0-inet-i                              0
LB-policer-ge-1/3/0.0-inet-o                              0
LB-policer-ge-1/3/0.1-inet-i                              0
LB-policer-ge-1/3/0.1-inet-o                              0
```

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24
- **bandwidth-percent on page 172**
- "interface-specific" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- **logical-bandwidth-policer on page 192**
- shaping-rate (Applying to an Interface) in the *Junos OS Class of Service Configuration Guide*

Filter-Specific Counters and Policers

- Filter-Specific Policer Overview on page 64
- Example: Configuring a Stateless Firewall Filter to Protect Against TCP and ICMP Floods on page 65

Filter-Specific Policer Overview

By default, a policer operates in *term-specific* mode so that, for a given firewall filter, the Junos OS creates a separate policer instance for every filter term that references the policer. As an option, you can configure a policer to operate in *filter-specific* mode so that a single policer instance is used by all terms (within the same firewall filter) that reference the policer.

For an IPv4 firewall filter with multiple terms that reference the same policer, configuring the policer to operate in filter-specific mode enables you to count and monitor the activity of the policer at the firewall filter level.

NOTE: **Term-specific mode and filter-specific mode also apply to prefix-specific policer sets.**

To enable a single-rate two-color policer to operate in filter-specific mode, you can include the **filter-specific** statement at the following hierarchy levels:

- **[edit firewall policer *policer-name*]**
- **[edit logical-systems *logical-system-name* firewall policer *policer-name*]**

You can reference filter-specific policers from IPv4 (**family inet**) firewall filters only.

Example: Configuring a Stateless Firewall Filter to Protect Against TCP and ICMP Floods

This example shows how to create a stateless firewall filter that protects against TCP and ICMP denial-of-service attacks.

- Requirements on page 65
- Overview on page 65
- Configuration on page 66
- Verification on page 69

Requirements

No special configuration beyond device initialization is required before configuring stateless firewall filters.

Overview

In this example, you create a stateless firewall filter called **protect-RE** that polices TCP and ICMP packets. This example includes the following policers:

- **tcp-connection-policer**—Limits the traffic rate of the TCP packets to 500,000 bps and the burst size to 15,000 bytes. Packets that exceed the traffic rate are discarded.
- **icmp-policer**—Limits the traffic rate of the ICMP packets to 1,000,000 bps and the burst size to 15,000 bytes. Packets that exceed the traffic rate are discarded.

When specifying limits, the bandwidth limit can be from 32,000 bps to 32,000,000,000 bps and the burst-size limit can be from 1,500 bytes through 100,000,000 bytes. Use the following abbreviations when specifying limits: k (1,000), m (1,000,000), and g (1,000,000,000).

Each policer is incorporated into the action of a filter term. This example includes the following terms:

- **tcp-connection-term**—Polices certain TCP packets with a source address of 192.168.122.0/24 or 10.2.1.0/24. These addresses are defined in the **trusted-addresses** prefix list.

  Policed packets include connection request packets (SYN and ACK flag bits equal **1** and **0**), connection release packets (FIN flag bit equals **1**), and connection reset packets (RST flag bit equals **1**).
- **icmp-term**—Polices echo request packets, echo response packets, unreachable packets, and time-exceeded packets. All of these ICMP packets are counted in the **icmp-counter** counter.

NOTE: You can move terms within the firewall filter by using the insert command. See insert in the *Junos OS CLI User Guide*.

If you want to include the terms created in this procedure in the **protect-RE** firewall filter configured in Example: Configuring a Stateless Firewall Filter to Accept Traffic from Trusted Sources, perform the configuration tasks in this example first. Then configure the terms as described in Example: Configuring a Stateless Firewall Filter to Accept Traffic from Trusted Sources. This approach ensures that the rate-limiting terms are included as the first two terms in the firewall filter.

NOTE: You can move terms within the firewall filter by using the insert command. See insert in the *Junos OS CLI User Guide*.

Configuration

CLI Quick Configuration

To quickly configure the stateless firewall filter, copy the following commands to a text file, remove any line breaks, and then paste the commands into the CLI.

```
[edit]
set firewall family inet filter protect-RE term tcp-connection-term from source-prefix-list
    trusted-addresses
set firewall family inet filter protect-RE term tcp-connection-term from protocol tcp
set firewall family inet filter protect-RE term tcp-connection-term from tcp-flags "(syn
    & !ack) | fin | rst"
set firewall family inet filter protect-RE term tcp-connection-term then policer
    tcp-connection-policer
set firewall family inet filter protect-RE term tcp-connection-term then accept
set firewall family inet filter protect-RE term icmp-term from protocol icmp
set firewall family inet filter protect-RE term icmp-term from icmp-type echo-request
set firewall family inet filter protect-RE term icmp-term from icmp-type echo-reply
set firewall family inet filter protect-RE term icmp-term from icmp-type unreachable
set firewall family inet filter protect-RE term icmp-term from icmp-type time-exceeded
set firewall family inet filter protect-RE term icmp-term then policer icmp-policer
set firewall family inet filter protect-RE term icmp-term then count icmp-counter
set firewall family inet filter protect-RE term icmp-term then accept
set firewall policer tcp-connection-policer filter-specific
set firewall policer tcp-connection-policer if-exceeding bandwidth-limit 1m
set firewall policer tcp-connection-policer if-exceeding burst-size-limit 15k
set firewall policer tcp-connection-policer then discard
set firewall policer icmp-policer filter-specific
set firewall policer icmp-policer if-exceeding bandwidth-limit 1m
set firewall policer icmp-policer if-exceeding burst-size-limit 15k
set firewall policer icmp-policer then discard
set policy-options prefix-list trusted-addresses 10.2.1.0/24
set policy-options prefix-list trusted-addresses 192.168.122.0/24
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure stateless firewall filter policers:

1. Define the first policer.

   ```
   [edit]
   ```



```
user@host# edit firewall policer tcp-connection-policer
```

2. Define the action for the policer.

```
[edit firewall policer tcp-connection-policer]
user@host# set then discard
```

3. Define the rate limits for the policer.

```
[edit firewall policer tcp-connection-policer]
user@host# set filter-specific
user@host# set if-exceeding burst-size-limit 15k bandwidth-limit 1m
```

4. Define the second policer.

```
[edit]
user@host# edit firewall policer icmp-policer
```

5. Define the action for the policer.

```
[edit firewall policer icmp-policer]
user@host# set then discard
```

6. Set the rate limits for the policer.

```
[edit firewall policer icmp-policer]
user@host# set filter-specific
user@host# set if-exceeding burst-size-limit 15k bandwidth-limit 1m
```

7. Define the prefix list.

```
[edit]
user@host# set policy-options prefix-list trusted-addresses 192.168.122.0/24
user@host# set policy-options prefix-list trusted-addresses 10.2.1.0/24
```

8. Create the stateless firewall filter.

```
[edit]
user@host# edit firewall family inet filter protect-RE
```

9. Define the first term for the filter.

```
[edit firewall family inet filter protect-RE]
user@host# edit term tcp-connection-term
```

10. Define the source address match condition for the term.

```
[edit firewall family inet filter protect-RE term tcp-connection-term]
user@host# set from source-prefix-list trusted-addresses
```

11. Define protocol match conditions for the term.

```
[edit firewall family inet filter protect-RE term tcp-connection-term]
user@host# set from protocol tcp tcp-flags "(syn & !ack) | fin | rst"
```

12. Define the actions for the term.

```
[edit firewall family inet filter protect-RE term tcp-connection-term]
user@host# set then policer tcp-connection-policer accept
```

13. Define the second term.

```
[edit]
user@host# edit firewall family inet filter protect-RE term icmp-term
```

14. Define the protocol for the term.

```
[edit firewall family inet filter protect-RE term icmp-term]
user@host# set from protocol icmp
```

15. Define the match conditions for the term.

```
[edit firewall family inet filter protect-RE term icmp-term]
user@host# set from icmp-type [echo-request echo-reply unreachable
  time-exceeded]
```

16. Define the action for the term.

```
[edit firewall family inet filter protect-RE term icmp-term]
user@host# set then policer icmp-policer count icmp-counter accept
```

Results Confirm your configuration by entering the **show firewall** command and the **show policy-options** command from configuration mode. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show firewall
family inet {
  filter protect-RE {
    term tcp-connection-term {
      from {
        source-prefix-list {
          trusted-addresses;
        }
        protocol tcp;
        tcp-flags "(syn & !ack) | fin | rst";
      }
      then {
        policer tcp-connection-policer;
        accept;
      }
    }
    term icmp-term {
      from {
        protocol icmp;
        icmp-type [ echo-request echo-reply unreachable time-exceeded ];
      }
      then {
        policer icmp-policer;
        count icmp-counter;
        accept;
      }
    }
  }
}
policer tcp-connection-policer {
  filter-specific;
  if-exceeding {
```



```
        bandwidth-limit 1m;
        burst-size-limit 15k;
    }
    then discard;
}
policer icmp-policer {
    filter-specific;
    if-exceeding {
        bandwidth-limit 1m;
        burst-size-limit 15k;
    }
    then discard;
}
```

```
user@host# show policy-options
prefix-list trusted-addresses {
    10.2.1.0/24;
    192.168.122.0/24;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Stateless Firewall Filter Configurations on page 69
- Verifying a TCP and ICMP Flood Firewall Filter on page 69
- Displaying Firewall Filter Statistics on page 70

Displaying Stateless Firewall Filter Configurations

Purpose Verify the configuration of the firewall filter.

Action From configuration mode, enter the **show firewall** command.

Meaning Verify that the output shows the intended configuration of the firewall filter. In addition, verify that the terms are listed in the order in which you want the packets to be tested. You can move terms within a firewall filter by using the **insert** CLI command.

Verifying a TCP and ICMP Flood Firewall Filter

Purpose Verify that the actions of the firewall filter terms are taken.

Action Send packets to the device that match the terms. In addition, verify that the filter actions are *not* taken for packets that do not match.

- Verify that the device can establish only TCP sessions with a host at an IP address that matches 192.168.122.0/24 or 10.2.1.0/24. For example, log in to the device with the **telnet *host-name*** command from another host with one of these address prefixes.
- Use the **ping *host-name*** command to verify that the device responds only to ICMP packets (such as ping requests) that do not exceed the policer traffic rates.

- Use the **ping *host-name* size *bytes*** command to exceed the policer traffic rates by sending ping requests with large data payloads.

Sample Output

```
user@host> telnet 192.168.249.71
Trying 192.168.249.71...
Connected to host.acme.net.
Escape character is '^]'.

host (ttyp0)

login: user
Password:

--- JUNOS 6.4-20040521.1 built 2004-05-21 09:38:12 UTC

user@host>

user@host> ping 192.168.249.71
PING host-ge-000.acme.net (192.168.249.71): 56 data bytes
64 bytes from 192.168.249.71: icmp_seq=0 ttl=253 time=11.946 ms
64 bytes from 192.168.249.71: icmp_seq=1 ttl=253 time=19.474 ms
64 bytes from 192.168.249.71: icmp_seq=2 ttl=253 time=14.639 ms
...

user@host> ping 192.168.249.71 size 20000
PING host-ge-000.acme.net (192.168.249.71): 20000 data bytes
^C
--- host-ge-000.acme.net ping statistics ---
12 packets transmitted, 0 packets received, 100% packet loss
```

Meaning Verify the following information:

- You can successfully log in to the device using Telnet.
- The device sends responses to the **ping host** command.
- The device does not send responses to the **ping host size 20000** command.

Displaying Firewall Filter Statistics

Purpose Verify that packets are being policed and counted.

Action From operational mode, enter the **show firewall filter *filter-name*** command.

Sample Output

```
user@host> show firewall filter protect-RE
Filter: protect-RE
Counters:
Name                                                Bytes              Packets
icmp-counter                                      1040000                 5600
Policers:
Name                                                Packets
```

```
tcp-connection-policer                          643254873
icmp-policer                                         7391
```

Meaning Verify the following information:

- Next to **Filter**, the name of the firewall filter is correct.
- Under **Counters**:
  - Under **Name**, the names of any counters configured in the firewall filter are correct.
  - Under **Bytes**, the number of bytes that match the filter term containing the **count *counter-name*** action are shown.
  - Under **Packets**, the number of packets that match the filter term containing the **count *counter-name*** action are shown.
- Under **Policers**:
  - Under **Name**, the names of any policers configured in the firewall filter are correct.
  - Under **Packets**, the number of packets that match the conditions specified for the policer are shown.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24
- Prefix-Specific Counting and Policing Actions on page 71

Prefix-Specific Counting and Policing Actions

- Prefix-Specific Counting and Policing Overview on page 71
- Filter-Specific Counter and Policer Set Overview on page 74
- Example: Configuring Prefix-Specific Counting and Policing on page 74
- Prefix-Specific Counting and Policing Configuration Scenarios on page 81

Prefix-Specific Counting and Policing Overview

This topic covers the following information:

- Separate Counting and Policing for Each IPv4 Address Range on page 71
- Prefix-Specific Action Configuration on page 72
- Counter and Policer Set Size and Indexing on page 73

Separate Counting and Policing for Each IPv4 Address Range

Prefix-specific counting and policing enables you to configure an IPv4 firewall filter term that matches on a source or destination address, applies a single-rate two-color policer as the term action, but associates the matched packet with a specific counter and policer instance based on the source or destination in the packet header. You can implicitly

create a separate counter or policer instance for a single address or for a group of addresses.

NOTE: J Series Services Routers do not support prefix-specific counting and policing.

Prefix-specific counting and policing uses a *prefix-specific action* configuration that specifies the name of the policer you want to apply, whether prefix-specific counting is to be enabled, and a source or destination address prefix range.

The prefix range specifies between 1 and 16 sequential set bits of an IPv4 address mask. The length of the prefix range determines the size of the counter and policer *set*, which consists of as few as 2 or as many as 65,536 counter and policer instances. The position of the bits of the prefix range determines the indexing of filter-matched packets into the set of instances.

NOTE: A prefix-specific action is specific to a source or destination *prefix range*, but it is not specific to a particular source or destination *address range*, and it is not specific to a particular interface.

To apply a prefix-specific action to the traffic at an interface, you configure a firewall filter term that matches on source or destination addresses, and then you apply the firewall filter to the interface. The flow of filtered traffic is rate-limited using prefix-specific counter and policer instances that are selected per packet based on the source or destination address in the header of the filtered packet.

Prefix-Specific Action Configuration

To configure a prefix-specific action, you specify the following information:

- Prefix-specific action name—Name that can be referenced as the action of an IPv4 standard firewall filter term that matches packets on source or destination addresses.
- Policer name—Name of a single-rate two-color policer for which you want to implicitly create prefix-specific instances.

  NOTE: For aggregated Ethernet interfaces, you can configure a prefix-specific action that references a logical interface policer (also called an aggregate policer). You can reference this type of prefix-specific action from an IPv4 standard firewall filter and then apply the filter at the aggregate level of the interface.

- Counting option—Option to include if you want to enable prefix-specific counters.
- Filter-specific option—Option to include if you want a single counter and policer set to be shared across all terms in the firewall filter. A prefix-specific action that operates in this way is said to operate in *filter-specific* mode. If you do not enable this option,

the prefix-specific action operates in *term-specific* mode, meaning that a separate counter and policer set is created for each filter term that references the prefix-specific action.

- Source address prefix length—Length of the address prefix, from 0 through 32, to be used with a packet matched on the source address.
- Destination address prefix length—Length of the address prefix, from 0 through 32, to be used with a packet matched on the destination address.
- Subnet prefix length—Length of the subnet prefix, from 0 through 32, to be used with a packet matched on either the source or destination address.

You must configure source and destination address prefix lengths to be from 1 to 16 bits longer than the subnet prefix length. If you configure source or destination address prefix lengths to be more than 16 bits beyond the configured subnet prefix length, an error occurs when you try to commit the configuration.

Counter and Policer Set Size and Indexing

The number of prefix-specific actions (counters or policers) implicitly created for a prefix-specific action is determined by the length of the address prefix and the length of the subnet prefix:

Size of Counter and Policer Set = 2^(*source-or-destination-prefix-length* - *subnet-prefix-length*)

Table 7 on page 73 shows examples of counter and policer set size and indexing.

Table 7: Examples of Counter and Policer Set Size and Indexing

Example Prefix Lengths Specified in the Prefix-Specific Action	Calculation of Counter or Policer Set Size	Indexing of Instances	
source-prefix-length = 32 *subnet-prefix-length* = 16	Size = 2^(32-16) = 2^16 = 65,536 instances NOTE: This calculation shows the largest counter or policer set size supported.	Instance 0:	*x.x*.0.0
		Instance 1:	*x.x*.0.1
		Instance 65535:	*x.x*.255.255
source-prefix-length = 32 *subnet-prefix-length* = 24	Size = 2^(32 - 24) = 2^8 = 256 instances	Instance 0:	*x.x.x*.0
		Instance 1:	*x.x.x*.1
		Instance 255:	*x.x.x*.255
source-prefix-length = 32 *subnet-prefix-length* = 25	Size = 2^(32 - 25) = 2^7 = 128 instances	Instance 0:	*x.x.x*.0
		Instance 1:	*x.x.x*.1
		Instance 127:	*x.x.x*.127

Table 7: Examples of Counter and Policer Set Size and Indexing *(continued)*

Example Prefix Lengths Specified in the Prefix-Specific Action	Calculation of Counter or Policer Set Size	Indexing of Instances	
source-prefix-length = 24 *subnet-prefix-length* = 20	Size = 2^(24 - 20) = 2^4 = 16 instances	Instance 0:	*x.x*.0.*x*
		Instance 1:	*x.x*.1.*x*
		Instance 15:	*x.x*.15.*x*

Filter-Specific Counter and Policer Set Overview

By default, a prefix-specific policer set operates in *term-specific* mode so that, for a given firewall filter, the Junos OS creates a separate counter and policer set for every filter term that references the prefix-specific action. As an option, you can configure a prefix-specific policer set to operate in *filter-specific* mode so that a single prefix-specific policer set is used by all terms (within the same firewall filter) that reference the policer.

For an IPv4 firewall filter with multiple terms that reference the same prefix-specific policer set, configuring the policer set to operate in filter-specific mode enables you to count and monitor the activity of the policer set at the firewall filter level.

NOTE: **Term-specific mode and filter-specific mode also apply to policers.** See "Filter-Specific Policer Overview" on page 64.

To enable a prefix-specific policer set to operate in filter-specific mode, you can include the filter-specific statement at following the hierarchy levels:

- **[edit firewall family inet prefix-action *prefix-action-name*]**
- **[edit logical-systems *logical-system-name* firewall family inet prefix-action *prefix-action-name*]**

You can reference filter-specific, prefix-specific policer sets from IPv4 (**family inet**) firewall filters only.

Example: Configuring Prefix-Specific Counting and Policing

This example shows how to configure prefix-specific counting and policing.

- Requirements on page 75
- Overview on page 75
- Configuration on page 76
- Verification on page 80

Requirements

No special configuration beyond device initialization is required before configuring this example.

Overview

In this example, you configure prefix-specific counting and policing based on the last octet of the source address field in packets matched by an IPv4 firewall filter.

The single-rate two-color policer named **1Mbps-policer** rate-limits traffic to a bandwidth of 1,000,000 bps and a burst-size limit of 63,000 bytes, discarding any packets in a traffic flow that exceeds the traffic limits.

Independent of the IPv4 addresses contained in any packets passed from a firewall filter, the prefix-specific action named **psa-1Mbps-per-source-24-32-256** specifies a set of 256 counters and policers, numbered from 0 through 255. For each packet, the last octet of the source address field is used to index into the associated prefix-specific counter and policer in the set:

- Packets with a source address ending with the octet 0x0000 00000 index the first counter and policer in the set.
- Packets with a source address ending with the octet 0x0000 0001 index the second counter and policer in the set.
- Packets with a source address ending with the octet 0x1111 1111 index the last counter and policer in the set.

The **limit-source-one-24** firewall filter contains a single term that matches all packets from the **/24** subnet of source address **10.10.10.0**, passing these packets to the prefix-specific action **psa-1Mbps-per-source-24-32-256**.

Topology

In this example, because the filter term matches the **/24** subnet of a single source address, each counting and policing instance in the prefix-specific set is used for only one source address.

- Packets with a source address **10.10.10.0** index the first counter and policer in the set.
- Packets with a source address **10.10.10.1** index the second counter and policer in the set.
- Packets with a source address **10.10.10.255** index the last counter and policer in the set.

This example shows the simplest case of prefix-specific actions, in which the filter term matches on one address with a prefix length that is the same as the prefix length specified in the prefix-specific action for indexing into the set of prefix-specific counters and policers.

For descriptions of other configurations for prefix-specific counting and policing, see "Prefix-Specific Counting and Policing Configuration Scenarios" on page 81.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring a Policer for Prefix-Specific Counting and Policing on page 76
- Configuring a Prefix-Specific Action Based on the Policer on page 77
- Configuring an IPv4 Filter That References the Prefix-Specific Action on page 78
- Applying the Firewall Filter to IPv4 Input Traffic at a Logical Interface on page 79

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set firewall policer 1Mbps-policer if-exceeding bandwidth-limit 1m
set firewall policer 1Mbps-policer if-exceeding burst-size-limit 63k
set firewall policer 1Mbps-policer then discard
set firewall family inet prefix-action psa-1Mbps-per-source-24-32-256 policer
  1Mbps-policer
set firewall family inet prefix-action psa-1Mbps-per-source-24-32-256 count
set firewall family inet prefix-action psa-1Mbps-per-source-24-32-256
  subnet-prefix-length 24
set firewall family inet prefix-action psa-1Mbps-per-source-24-32-256 source-prefix-length
  32
set firewall family inet filter limit-source-one-24 term one from source-address
  10.10.10.0/24
set firewall family inet filter limit-source-one-24 term one then prefix-action
  psa-1Mbps-per-source-24-32-256
set interfaces so-0/0/2 unit 0 family inet filter input limit-source-one-24
set interfaces so-0/0/2 unit 0 family inet address 10.39.1.1/16
```

Configuring a Policer for Prefix-Specific Counting and Policing

Step-by-Step Procedure

To configure a policer to be used for prefix-specific counting and policing:

1. Enable configuration of a single-rate two-color policer.

   ```
   [edit]
   user@host# edit firewall policer 1Mbps-policer
   ```

2. Define the traffic limit.

   ```
   [edit firewall policer 1Mbps-policer]
   user@host# set if-exceeding bandwidth-limit 1m
   user@host# set if-exceeding burst-size-limit 63k
   ```

   Packets in a traffic flow that conforms to this limit are passed with the PLP set to **low**.

3. Define the actions for nonconforming traffic.

   ```
   [edit firewall policer 1Mbps-policer]
   user@host# set then discard
   ```

Packets in a traffic flow that exceeds this limit are discarded. Other configurable actions for a single-rate two-color policer are to set the forwarding class and to set the PLP level.

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer 1Mbps-policer {
  if-exceeding {
    bandwidth-limit 1m;
    burst-size-limit 63k;
  }
  then discard;
}
```

Configuring a Prefix-Specific Action Based on the Policer

Step-by-Step Procedure To configure a prefix-specific action that references the policer and specifies a portion of a source address prefix:

1. Enable configuration of a prefix-specific action.

   ```
   [edit]
   user@host# edit firewall family inet prefix-action psa-1Mbps-per-source-24-32-256
   ```

   Prefix-specific counting and policing can be defined for IPv4 traffic only.

2. Reference the policer for which a prefix-specific set is to be created.

   ```
   [edit firewall family inet prefix-action psa-1Mbps-per-source-24-32-256]
   user@host# set policer 1Mbps-policer
   user@host# set count
   ```

   NOTE: For aggregated Ethernet interfaces, you can configure a prefix-specific action that references a logical interface policer (also called an aggregate policer). You can reference this type of prefix-specific action from an IPv4 standard firewall filter and then apply the filter at the aggregate level of the interface.

3. Specify the prefix range on which IPv4 addresses are to be indexed to the counter and policer set.

   ```
   [edit firewall family inet prefix-action psa-1Mbps-per-source-24-32-256]
   user@host# set source-prefix-length 32
   user@host# set subnet-prefix-length 24
   ```

Results Confirm the configuration of the prefix-specific action by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer 1Mbps-policer {
  if-exceeding {
    bandwidth-limit 1m;
    burst-size-limit 63k;
  }
  then discard;
}
family inet {
  prefix-action psa-1Mbps-per-source-24-32-256 {
    policer 1Mbps-policer;
    subnet-prefix-length 24;
    source-prefix-length 32;
  }
}
```

Configuring an IPv4 Filter That References the Prefix-Specific Action

Step-by-Step Procedure To configure an IPv4 standard firewall filter that references the prefix-specific action:

1. Enable configuration of the IPv4 standard firewall filter.

   ```
   [edit]
   user@host# edit firewall family inet filter limit-source-one-24
   ```

   Prefix-specific counting and policing can be defined for IPv4 traffic only.

2. Configure the filter term to match on the packet source address or destination address.

   ```
   [edit firewall family inet filter limit-source-one-24]
   user@host# set term one from source-address 10.10.10.0/24
   ```

3. Configure the filter term to reference the prefix-specific action.

   ```
   [edit firewall family inet filter limit-source-one-24]
   user@host# set term one then prefix-action psa-1Mbps-per-source-24-32-256
   ```

   You could also use the **next term** action to configure all Hypertext Transfer Protocol (HTTP) traffic to each host to transmit at 500 Kbps and have the total HTTP traffic limited to 1 Mbps.

Results Confirm the configuration of the prefix-specific action by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer 1Mbps-policer {
  if-exceeding {
    bandwidth-limit 1m;
    burst-size-limit 63k;
```



```
    }
    then discard;
  }
  family inet {
    prefix-action psa-1Mbps-per-source-24-32-256 {
      policer 1Mbps-policer;
      subnet-prefix-length 24;
      source-prefix-length 32;
    }
    filter limit-source-one-24 {
      term one {
        from {
          source-address {
            10.10.10.0/24;
          }
        }
        then prefix-action psa-1Mbps-per-source-24-32-256;
      }
    }
  }
```

Applying the Firewall Filter to IPv4 Input Traffic at a Logical Interface

Step-by-Step Procedure

To apply the firewall filter to IPv4 input traffic at a logical interface:

1. Enable configuration of IPv4 on the logical interface.

   ```
   [edit]
   user@host# edit interfaces so-0/0/2 unit 0 family inet
   ```

2. Configure an IP address.

   ```
   [edit interfaces so-0/0/2 unit 0 family inet]
   user@host# set address 10.39.1.1/16
   ```

3. Apply the IPv4 standard stateless firewall filter.

   ```
   [edit interfaces so-0/0/2 unit 0 family inet]
   user@host# set filter input limit-source-one-24
   ```

Results

Confirm the configuration of the prefix-specific action by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-0/0/2 {
  unit 0 {
    family inet {
      filter {
        input limit-source-one-24;
      }
      address 10.39.1.1/16;
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying the Firewall Filters Applied to an Interface on page 80
- Displaying Prefix-Specific Actions Statistics for the Firewall Filter on page 80

Displaying the Firewall Filters Applied to an Interface

Purpose Verify that the firewall filter **limit-source-one-24** is applied to the IPv4 input traffic at logical interface **so-0/0/2.0**.

Action Use the **show interfaces statistics** operational mode command for logical interface **so-0/0/2.0**, and include the **detail** option. In the command output section for **Protocol inet**, the **Input Filters** field displays **limit-source-one-24**, indicating that the filter is applied to IPv4 traffic in the input direction:

```
user@host> show interfaces statistics so-0/0/2.0 detail
  Logical interface so-0/0/2.0 (Index 79) (SNMP ifIndex 510) (Generation 149)
    Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 4470, Generation: 173, Route table: 0
      Flags: Sendbcast-pkt-to-re, Protocol-Down
      Input Filters: limit-source-one-24
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.39/16, Local: 10.39.1.1, Broadcast: 10.39.255.255,
Generation: 163
```

Displaying Prefix-Specific Actions Statistics for the Firewall Filter

Purpose Verify the number of packets evaluated by the policer.

Action Use the show firewall prefix-action-stats **filter** ***filter-name*** **prefix-action** ***name*** operational mode command to display statistics about a prefix-specific action configured on a firewall filter.

As an option, you can use the **from** ***set-index*** **to** ***set-index*** command option to specify the starting and ending counter or policer to be displayed. A policer set is indexed from 0 through 65535.

The command output displays the specified filter name followed by a listing of the number of bytes and packets processed by each policer in the policer set.

For a term-specific policer, each policer in the set is identified as follows:

prefix-specific-action-name-term-name-set-index

For a filter-specific policer, each policer is identified in the command output as follows:

prefix-specific-action-name-set-index

Because the example prefix-specific action **psa-1Mbps-per-source-24-32-256** is referenced by only one term of the example filter **limit-source-one-24**, the example policer **1Mbps-policer** is configured as term-specific. In the **show firewall prefix-action-stats**

command output, the policer statistics are displayed as **psa-1Mbps-per-source-24-32-256-one-0**, **psa-1Mbps-per-source-24-32-256-one-1**, and so on through **psa-1Mbps-per-source-24-32-256-one-255**.

```
user@host> show firewall prefix-action-stats filter limit-source-one-24 prefix-action
psa-1Mbps-per-source-24-32-256 from 0 to 9
Filter: limit-source-one-24
Counters:
Name                                                Bytes   Packets
psa-1Mbps-per-source-24-32-256-one-0                    0         0
psa-1Mbps-per-source-24-32-256-one-1                    0         0
psa-1Mbps-per-source-24-32-256-one-2                    0         0
psa-1Mbps-per-source-24-32-256-one-3                    0         0
psa-1Mbps-per-source-24-32-256-one-4                    0         0
psa-1Mbps-per-source-24-32-256-one-5                    0         0
psa-1Mbps-per-source-24-32-256-one-6                    0         0
psa-1Mbps-per-source-24-32-256-one-7                    0         0
psa-1Mbps-per-source-24-32-256-one-8                    0         0
psa-1Mbps-per-source-24-32-256-one-9                    0         0
```

Prefix-Specific Counting and Policing Configuration Scenarios

This topic covers the following information:

- Prefix Length of the Action and Prefix Length of Addresses in Filtered Packets on page 81
- Scenario 1: Firewall Filter Term Matches on Multiple Addresses on page 82
- Scenario 2: Subnet Prefix Is Longer Than the Prefix in the Filter Match Condition on page 84
- Scenario 3: Subnet Prefix Is Shorter Than the Prefix in the Firewall Filter Match Condition on page 85

Prefix Length of the Action and Prefix Length of Addresses in Filtered Packets

Table 8 on page 81 describes the relationship between the prefix length specified in the prefix-specific action and the prefix length of the addresses matched by the firewall filter term that references the prefix-specific action.

Table 8: Summary of Prefix-Specific Action Scenarios

Counter and Policer Set	Packet-Filtering Criteria	Indexing of Instances	
Prefix-specific action scenario: "Example: Configuring Prefix-Specific Counting and Policing" on page 74			
source-prefix-length = 32 *subnet-prefix-length* = 24 Set size: 2^8 = 256 Instance numbers: 0 - 255	*source-address* = 10.10.10.0/24	Instance 0	10.10.10.0
		Instance 1:	10.10.10.1
		...	...
		Instance 255:	10.10.10.255

Table 8: Summary of Prefix-Specific Action Scenarios *(continued)*

Counter and Policer Set	Packet-Filtering Criteria	Indexing of Instances	
Prefix-specific action scenario: "Scenario 1: Firewall Filter Term Matches on Multiple Addresses" on page 82			
source-prefix-length = 32 *subnet-prefix-length* = 24 Set size: 2^8 = 256 Instance numbers: 0 - 255	*source-address* = 10.10.10.0/24 *source-address* = 10.11.0.0/16	Instance 0	10.10.10.0, 10.11.*x*.0
		Instance 1:	10.10.10.1, 10.11.*x*.1
		...	...
		Instance 255:	10.10.10.255, 10.11.*x*.255
	For addresses in the /16 subnet, *x* ranges from 0 through 255.		
Prefix-specific action scenario: "Scenario 2: Subnet Prefix Is Longer Than the Prefix in the Filter Match Condition" on page 84			
source-prefix-length = 32 *subnet-prefix-length* = 25 Set size: 2^7 = 128 Instance numbers: 0 - 127	*source-address* = 10.10.10.0/24	Instance 0	10.10.10.0, 10.10.10.128
		Instance 1:	10.10.10.1, 10.10.10.120
		...	...
		Instance 127:	10.10.10.255, 10.10.10.127
Prefix-specific action scenario: "Scenario 3: Subnet Prefix Is Shorter Than the Prefix in the Firewall Filter Match Condition" on page 85			
source-prefix-length = 32 *subnet-prefix-length* = 24 Set size: 2^8 = 256 Instance numbers: 0 - 255	*source-address* = 10.10.10.0/25 NOTE: Only packets with source addresses ranging from **10.10.10.0** through **10.10.10.127** are passed to the prefix-specific action.	Instance 0	10.10.10.0
		Instance 1:	10.10.10.1
		...	...
		Instance 127:	10.10.10.127
		Instances 128 – 255: unused	

Scenario 1: Firewall Filter Term Matches on Multiple Addresses

The complete example, "Example: Configuring Prefix-Specific Counting and Policing" on page 74, shows the simplest case of prefix-specific actions, in which a single-term firewall

filter matches on one address with a prefix length that is the same as the subnet prefix length specified in the prefix-specific action. Unlike the example, this scenario describes a configuration in which a single-term firewall filter matches on two IPv4 source addresses. In addition, the additional condition matches on a source address with a prefix length that is different from the subnet prefix length defined in the prefix-specific action. In this case, the additional condition matches on the **/16** subnet of the source address **10.11.0.0**.

NOTE: **Unlike packets that match the source address 10.10.10.0/24, packets that match the source address 10.11.0.0/16 are in a many-to-one correspondence with the instances in the counter and policer set.**

The filter-matched packets that are passed to the prefix-specific action index into the counter and policer set in such a way that the counting and policing instances are shared by packets that contain source addresses across the **10.10.10.0/24** and **10.11.0.0/16** subnets as follows:

- The first counter and policer in the set are indexed by packets with source addresses **10.10.10.0** and **10.11.*x*.0**, where *x* ranges from **0** through **255**.
- The second counter and policer in the set are indexed by packets with source addresses **10.10.10.1** and **10.11.*x*.1**, where *x* ranges from **0** through **255**.
- The 256th (last) counter and policer in the set are indexed by packets with source addresses **10.10.10.255** and **10.11.*x*.255**, where *x* ranges from **0** through **255**.

The following configuration shows the statements for configuring the single-rate two-color policer, the prefix-specific action that references the policer, and the IPv4 standard stateless firewall filter that references the prefix-specific action:

```
[edit]
firewall {
   policer 1Mbps-policer {
      if-exceeding {
         bandwidth-limit 1m;
         burst-size-limit 63k;
      }
      then discard;
   }
   family inet {
      prefix-action psa-1Mbps-per-source-24-32-256 {
         policer 1Mbps-policer;
         subnet-prefix-length 24;
         source-prefix-length 32;
      }
      filter limit-source-two-24-16 {
         term one {
            from {
               source-address {
                  10.10.10.0/24;
                  10.11.0.0/16;
               }
            }
```

```
            then prefix-action psa-1Mbps-per-source-24-32-256;
          }
        }
      }
    }
    interfaces {
      so-0/0/2 {
        unit 0 {
          family inet {
            filter {
              input limit-source-two-24-16;
            }
            address 10.39.1.1/16;
          }
        }
      }
    }
```

Scenario 2: Subnet Prefix Is Longer Than the Prefix in the Filter Match Condition

The complete example, "Example: Configuring Prefix-Specific Counting and Policing" on page 74, shows the simplest case of prefix-specific actions, in which the single-term firewall filter matches on one address with a prefix length that is the same as the subnet prefix length specified in the prefix-specific action. Unlike the example, this scenario describes a configuration in which the prefix-specific action defines a subnet prefix length that is longer than the prefix of the source address matched by the firewall filter. In this case, the prefix-specific action defines a subnet-prefix value of **25**, while the firewall filter matches on a source address in the **/24** subnet.

NOTE: The firewall filter passes the prefix-specific action packets with source addresses that range from 10.10.10.0 through 10.10.10.255, while the prefix-specific action specifies a set of only 128 counters and policers, numbered from 0 through 127.

The filter-matched packets that are passed to the prefix-specific action index into the counter and policer set in such a way that the counting and policing instances are shared by packets that contain either of two source addresses within the **10.10.10.0/24** subnet:

- The first counter and policer in the set are indexed by packets with source addresses **10.10.10.0** and **10.10.10.128**.
- The second counter and policer in the set are indexed by packets with source addresses **10.10.10.1** and **10.10.10.129**.
- The 128th (last) counter and policer in the set are indexed by packets with source addresses **10.10.10.127** and **10.10.10.255**.

The following configuration shows the statements for configuring the single-rate two-color policer, the prefix-specific action that references the policer, and the IPv4 standard stateless firewall filter that references the prefix-specific action:

```
[edit]
```

```
firewall {
   policer 1Mbps-policer {
      if-exceeding {
         bandwidth-limit 1m;
         burst-size-limit 63k;
      }
      then discard;
   }
   family inet {
      prefix-action psa-1Mbps-per-source-25-32-128 {
         policer 1Mbps-policer;
         subnet-prefix-length 25;
         source-prefix-length 32;
      }
      filter limit-source-one-24 {
         term one {
            from {
               source-address {
                  10.10.10.0/24;
               }
            }
            then prefix-action psa-1Mbps-per-source-25-32-128;
         }
      }
   }
}
interfaces {
   so-0/0/2 {
      unit 0 {
         family inet {
            filter {
               input limit-source-one-24;
            }
            address 10.39.1.1/16;
         }
      }
   }
}
```

Scenario 3: Subnet Prefix Is Shorter Than the Prefix in the Firewall Filter Match Condition

The complete example, "Example: Configuring Prefix-Specific Counting and Policing" on page 74, shows the simplest case of prefix-specific actions, in which the single-term firewall filter matches on one address with a prefix length that is the same as the subnet prefix length specified in the prefix-specific action. Unlike the example, this scenario describes a configuration in which the prefix-specific action defines a subnet prefix length that is shorter than the prefix of the source address matched by the firewall filter. In this case, the filter term matches on the **/25** subnet of the source address **10.10.10.0**.

NOTE: The firewall filter passes the prefix-specific action only packets with source addresses that range from 10.10.10.0 through 10.10.10.127, while the prefix-specific action specifies a set of 256 counters and policers, numbered from 0 through 255.

The matched packets that are passed to the prefix-specific action index into the lower half of the counter and policer set only:

- The first counter and policer in the set are indexed by packets with source address **10.10.10.0**.
- The second counter and policer in the set are indexed by packets with source address **10.10.10.1** and **10.10.10.129**.
- The 128th counter and policer in the set are indexed by packets with source address **10.10.10.127**.
- The upper half of the set (instances numbered from 128 through 255) are not indexed by packets passed to the prefix-specific action from this particular firewall filter.

The following configuration shows the statements for configuring the single-rate two-color policer, the prefix-specific action that references the policer, and the IPv4 standard stateless firewall filter that references the prefix-specific action:

```
[edit]
firewall {
   policer 1Mbps-policer {
      if-exceeding {
         bandwidth-limit 1m;
         burst-size-limit 63k;
      }
      then discard;
   }
   family inet {
      prefix-action psa-1Mbps-per-source-24-32-256 {
         policer 1Mbps-policer;
         subnet-prefix-length 24;
         source-prefix-length 32;
      }
      filter limit-source-one-25 {
         term one {
            from {
               source-address {
                  10.10.10.0/25;
               }
            }
            then prefix-action psa-1Mbps-per-source-24-32-256;
         }
      }
   }
}
interfaces {
   so-0/0/2 {
```

```
        unit 0 {
          family inet {
            filter {
              input limit-source-one-25;
            }
            address 10.39.1.1/16;
          }
        }
      }
    }
```

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24

Multifield Classification

- Multifield Classification Overview on page 87
- Multifield Classification Requirements and Restrictions on page 89
- Multifield Classification Limitations on M Series Routers on page 90
- Example: Configuring Multifield Classification on page 92
- Example: Configuring and Applying a Firewall Filter for a Multifield Classifier on page 98

Multifield Classification Overview

This topic covers the following information:

- Forwarding Classes and PLP Levels on page 87
- Multifield Classification and BA Classification on page 88
- Multifield Classification Used In Conjunction with Policers on page 88

Forwarding Classes and PLP Levels

You can configure the Junos OS class of service (CoS) features to classify incoming traffic by associating each packet with a forwarding class, a packet loss priority (PLP) level, or both:

- Based on the associated forwarding class, each packet is assigned to an output queue, and the router services the output queues according to the associated scheduling you configure.
- Based on the associated PLP, each packet carries a lower or higher likelihood of being dropped if congestion occurs. The CoS random early detection (RED) process uses the drop probability configuration, output queue fullness percentage, and packet PLP to drop packet as needed to control congestion at the output stage.

Multifield Classification and BA Classification

The Junos OS supports two general types of packet classification: behavior aggregate (BA) classification and multifield classification:

- BA classification, or CoS value traffic classification, refers to a method of packet classification that uses a CoS configuration to set the forwarding class or PLP of a packet based on the *CoS value* in the IP packet header. The CoS value examined for BA classification purposes can be the Differentiated Services code point (DSCP) value, DSCP IPv6 value, IP precedence value, MPLS EXP bits, and IEEE 802.1p value. The default classifier is based on the IP precedence value.
- Multifield classification refers to a method of packet classification that uses a standard stateless firewall filter configuration to set the forwarding class or PLP for each packet entering or exiting the interface based on *multiple fields* in the IP packet header, including the DSCP value (for IPv4 only), the IP precedence value, the MPLS EXP bits, and the IEEE 802.1p bits. Multifield classification commonly matches on IP address fields, the IP protocol type field, or the port number in the UDP or TCP pseudoheader field. Multifield classification is used instead of BA classification when you need to classify packets based on information in the packet information other than the CoS values only.

  With multifield classification, a firewall filter term can specify the packet classification actions for matching packets though the use of the **forwarding-class *class-name*** or **loss-priority (high | medium-high | medium-low | low)** nonterminating actions in the term's **then** clause. For more information about these actions, see .

NOTE: **BA classification of a packet can be overridden by the stateless firewall filter actions forwarding-class and loss-priority.**

Multifield Classification Used In Conjunction with Policers

To configure multifield classification in conjunction with rate limiting, a firewall filter term can specify the packet classification actions for matching packets through the use of a **policer** nonterminating action that references a single-rate two-color policer.

When multifield classification is configured to perform classification through a policer, the filter-matched packets in the traffic flow are rate-limited to the policer-specified traffic limits. Packets in a conforming flow of filter-matched packets are implicitly set to a **low** PLP. Packets in a nonconforming traffic flow can be discarded, or the packets can be set to a specified forwarding class, set to a specified PLP level, or both, depending on the type of policer and how the policer is configured to handle nonconforming traffic.

NOTE: Before you apply a firewall filter that performs multifield classification and also a policer to the same logical interface and for the same traffic direction, make sure that you consider the order of policer and firewall filter operations.

As an example, consider the following scenario:

- You configure a firewall filter that performs multifield classification (acts on matched packets by setting the forwarding class, the PLP, or both) based on the packet's existing forwarding class or PLP. You apply the firewall filter at the input of a logical interface.
- You also configure a single-rate two-color policer that acts on a red traffic flow by re-marking (setting the forwarding class, the PLP, or both) rather than discarding those packets. You apply the policer as an interface policer at the input of the same logical interface to which you apply the firewall filter.

Because of the order of policer and firewall operations, the input policer is executed before the input firewall filter. This means that the multifield classification specified by the firewall filter is performed on input packets that have already been re-marked once by policing actions. Consequently, any input packet that matches the conditions specified in a firewall filter term is then subject to a second re-marking according to the **forwarding-class** or **loss-priority** nonterminating actions also specified in that term.

Multifield Classification Requirements and Restrictions

This topic covers the following information:

- Supported Platforms on page 89
- CoS Tricolor Marking Requirement on page 90
- Restrictions on page 90

Supported Platforms

The **loss-priority** firewall filter action is supported on the following routing platforms only:

- M7i and M10i routers with the Enhanced CFEB (CFEB-E)
- M120 and M320 routers
- MX Series routers
- T Series routers with Enhanced II Flexible PIC Concentrators (FPCs)

CoS Tricolor Marking Requirement

The **loss-priority** firewall filter action has platform-specific requirements dependencies on the CoS tricolor marking feature, as defined in RFC 2698:

- On an M320 router, you cannot commit a configuration that includes the **loss-priority** firewall filter action unless you enable the CoS tricolor marking feature.
- On all routing platforms that support the **loss-priority** firewall filter action, you cannot set the **loss-priority** firewall filter action to **medium-low** or **medium-high** unless you enable the CoS tricolor marking feature. .

To enable the CoS tricolor marking feature, include the **tri-color** statement at the **[edit class-of-service]** hierarchy level.

Restrictions

You cannot configure the **loss-priority** and **three-color-policer** nonterminating actions for the same firewall filter term. These two nonterminating actions are mutually exclusive.

Multifield Classification Limitations on M Series Routers

This topic covers the following information:

- Problem: Output-Filter Matching on Input-Filter Classification on page 90
- Workaround: Configure All Actions in the Ingress Filter on page 91

Problem: Output-Filter Matching on Input-Filter Classification

On M Series routers (except M120 routers), you cannot classify packets with an output filter match based on the ingress classification that is set with an input filter applied to the same IPv4 logical interface.

For example, in the following configuration, the filter called **ingress** assigns all incoming IPv4 packets to the **expedited-forwarding** class. The filter called **egress** counts all packets that were assigned to the **expedited-forwarding** class in the **ingress** filter. This configuration does not work on most M Series routers. It works on all other routing platforms, including M120 routers, MX Series routers, and T Series routers.

```
[edit]
user@host # show firewall
family inet {
   filter ingress {
      term 1 {
         then {
            forwarding-class expedited-forwarding;
            accept;
         }
      }
      term 2 {
         then accept;
      }
   }
   filter egress {
```

```
    term 1 {
      from {
        forwarding-class expedited-forwarding;
      }
      then count ef;
    }
    term 2 {
      then accept;
    }
  }
}

[edit]
user@host# show interfaces
ge-1/2/0 {
  unit 0 {
    family inet {
      filter {
        input ingress;
        output egress;
      }
    }
  }
}
```

Workaround: Configure All Actions in the Ingress Filter

As a workaround, you can configure all of the actions in the ingress filter.

```
user@host # show firewall
family inet {
  filter ingress {
    term 1 {
      then {
        forwarding-class expedited-forwarding;
        accept;
        count ef;
      }
    }
    term 2 {
      then accept;
    }
  }
}

[edit]
user@host# show interfaces
ge-1/2/0 {
  unit 0 {
    family inet {
      filter {
        input ingress;
      }
    }
  }
}
```

Example: Configuring Multifield Classification

This example shows how to configure multifield classification of IPv4 traffic by using firewall filter actions and two firewall filter policers.

- Requirements on page 92
- Overview on page 93
- Configuration on page 94
- Verification on page 98

Requirements

Before you begin, make sure that your environment supports the features shown in this example:

1. The **loss-priority** firewall filter action must be supported on the router and configurable to all four values.

   a. To be able to set a **loss-priority** firewall filter action, configure this example on logical interface **ge-1/2/0.0** on one of the following routing platforms:

      - MX Series router
      - M120 or M320 router
      - M7i or M10i router with the Enhanced CFEB (CFEB-E)
      - T Series router with Enhanced II Flexible PIC Concentrator (FPC)

   b. To be able to set a **loss-priority** firewall filter action to **medium-low** or **medium-high**, make sure that the CoS tricolor marking feature is enabled. To enable the CoS tricolor marking feature, include the **tri-color** statement at the **[edit class-of-service]** hierarchy level.

2. The **expedited-forwarding** and **assured-forwarding** forwarding classes must be scheduled on the underlying physical interface **ge-1/2/0**.

   a. Make sure that the following forwarding classes are assigned to output queues:

      - **expedited-forwarding**
      - **assured-forwarding**

      Forwarding-class assignments are configured at the **[edit class-of-service forwarding-classes queue *queue-number*]** hierarchy level.

      NOTE: You cannot commit a configuration that assigns the same forwarding class to two different queues.

b. Make sure that the output queues to which the forwarding classes are assigned are associated with schedulers. A scheduler defines the amount of interface bandwidth assigned to the queue, the size of the memory buffer allocated for storing packets, the priority of the queue, and the random early detection (RED) drop profiles associated with the queue.

   - You configure output queue schedulers at the **[edit class-of-service schedulers]** hierarchy level.
   - You associate output queue schedulers with forwarding classes by means of a scheduler map that you configure at the **[edit class-of-service scheduler-maps *map-name*]** hierarchy level.

c. Make sure that output-queue scheduling is applied to the physical interface **ge-1/2/0**.

   You apply a scheduler map to a physical interface at the **[edit class-of-service interfaces ge-1/2/0 scheduler-map *map-name*]** hierarchy level.

Overview

In this example, you apply multifield classification to the input IPv4 traffic at a logical interface by using stateless firewall filter actions and two firewall filter policers that are referenced from the firewall filter. Based on the source address field, packets are either set to the **low** loss priority or else policed. Neither of the policers discards nonconforming traffic. Packets in nonconforming flows are marked for a specific forwarding class (**expedited-forwarding** or **assured-forwarding**), set to a specific loss priority, and then transmitted.

NOTE: Single-rate two-color policers always transmit packets in a conforming traffic flow after implicitly setting a low loss priority.

Topology

In this example, you apply multifield classification to the IPv4 traffic on logical interface **ge-1/2/0.0**. The classification rules are specified in the IPv4 stateless firewall filter **mfc-filter** and two single-rate two-color policers, **ef-policer** and **af-policer**.

The IPv4 standard stateless firewall filter **mfc-filter** defines three filter terms:

- **isp1-customers**—The first filter term matches packets with the source address 10.1.1.0/24 or 10.1.2.0/24. Matched packets are assigned to the **expedited-forwarding** forwarding class and set to the **low** loss priority.
- **isp2-customers**—The second filter term matches packets with the source address 10.1.3.0/24 or 10.1.4.0/24. Matched packets are passed to **ef-policer**, a policer that rate-limits traffic to a bandwidth limit of 300 Kbps with a burst-size limit of 50 KB. This policer specifies that packets in a nonconforming flow are marked for the **expedited-forwarding** forwarding class and set to the **high** loss priority.

- **other-customers**—The third and final filter term passes all other packets to **af-policer**, a policer that rate-limits traffic to a bandwidth limit of 300 Kbps and a burst-size limit of 50 KB (the same traffic limits as defined by **ef-policer**). This policer specifies that packets in a nonconforming flow are marked for the **assured-forwarding** forwarding class and set to the **medium-high** loss priority.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring Policers to Rate-Limit Expedited-Forwarding and Assured-Forwarding Traffic on page 94
- Configuring a Multifield Classification Filter That Also Applies Policing on page 95
- Applying Multifield Classification Filtering and Policing to the Logical Interface on page 97

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set firewall policer ef-policer if-exceeding bandwidth-limit 300k
set firewall policer ef-policer if-exceeding burst-size-limit 50k
set firewall policer ef-policer then loss-priority high
set firewall policer ef-policer then forwarding-class expedited-forwarding
set firewall policer af-policer if-exceeding bandwidth-limit 300k
set firewall policer af-policer if-exceeding burst-size-limit 50k
set firewall policer af-policer then loss-priority high
set firewall policer af-policer then forwarding-class assured-forwarding
set firewall family inet filter mfc-filter term isp1-customers from source-address 10.1.1.0/24
set firewall family inet filter mfc-filter term isp1-customers from source-address 10.1.2.0/24
set firewall family inet filter mfc-filter term isp1-customers then loss-priority low
set firewall family inet filter mfc-filter term isp1-customers then forwarding-class
  expedited-forwarding
set firewall family inet filter mfc-filter term isp2-customers from source-address
  10.1.3.0/24
set firewall family inet filter mfc-filter term isp2-customers from source-address
  10.1.4.0/24
set firewall family inet filter mfc-filter term isp2-customers then policer ef-policer
set firewall family inet filter mfc-filter term other-customers then policer af-policer
set interfaces ge-1/2/0 unit 0 family inet address 192.168.1.1/24
set interfaces ge-1/2/0 unit 0 family inet filter input mfc-filter
```

Configuring Policers to Rate-Limit Expedited-Forwarding and Assured-Forwarding Traffic

Step-by-Step Procedure

To configure policers to rate-limit expedited-forwarding and assured-forwarding traffic:

1. Define traffic limits for expedited-forwarding traffic.

```
[edit]
user@host# edit firewall policer ef-policer
```

```
[edit firewall policer ef-policer]
user@host# set if-exceeding bandwidth-limit 300k
user@host# set if-exceeding burst-size-limit 50k
user@host# set then loss-priority high
user@host# set then forwarding-class expedited-forwarding
```

2. Configure a policer for assured-forwarding traffic.

```
[edit firewall policer ef-policer]
user@host# up

[edit firewall]
user@host# edit policer af-policer

[edit firewall policer af-policer]
user@host# set if-exceeding bandwidth-limit 300k
user@host# set if-exceeding burst-size-limit 50k
user@host# set then loss-priority high
user@host# set then forwarding-class assured-forwarding
```

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer af-policer {
  if-exceeding {
    bandwidth-limit 300k;
    burst-size-limit 50k;
  }
  then {
    loss-priority high;
    forwarding-class assured-forwarding;
  }
}
policer ef-policer {
  if-exceeding {
    bandwidth-limit 300k;
    burst-size-limit 50k;
  }
  then {
    loss-priority high;
    forwarding-class expedited-forwarding;
  }
}
```

Configuring a Multifield Classification Filter That Also Applies Policing

Step-by-Step Procedure To configure a multifield classification filter that additionally applies policing:

1. Enable configuration of a firewall filter term for IPv4 traffic.

```
[edit]
user@host# edit firewall family inet filter mfc-filter
```

2. Configure the first term to match on source addresses and then classify the matched packets.

```
[edit firewall family inet filter mfc-filter]
user@host# set term isp1-customers from source-address 10.1.1.0/24
user@host# set term isp1-customers from source-address 10.1.2.0/24
user@host# set term isp1-customers then loss-priority low
user@host# set term isp1-customers then forwarding-class expedited-forwarding
```

3. Configure the second term to match on different source addresses and then police the matched packets.

```
[edit firewall family inet filter mfc-filter]
user@host# set term isp2-customers from source-address 10.1.3.0/24
user@host# set term isp2-customers from source-address 10.1.4.0/24
user@host# set term isp2-customers then policer ef-policer
```

4. Configure the third term to police all other packets to a different set of traffic limits and actions.

```
[edit firewall family inet filter mfc-filter]
user@host# set term other-customers then policer af-policer
```

Results Confirm the configuration of the filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
    filter mfc-filter {
        term isp1-customers {
            from {
                source-address 10.1.1.0/24;
                source-address 10.1.2.0/24;
            }
            then {
                loss-priority low;
                forwarding-class expedited-forwarding;
            }
        }
        term isp2-customers {
            from {
                source-address 10.1.3.0/24;
                source-address 10.1.4.0/24;
            }
            then {
                policer ef-policer;
            }
        }
        term other-customers {
            then {
                policer af-policer;
            }
        }
    }
}
```

```
policer af-policer {
  if-exceeding {
    bandwidth-limit 300k;
    burst-size-limit 50k;
  }
  then discard;
}
policer ef-policer {
  if-exceeding {
    bandwidth-limit 200k;
    burst-size-limit 50k;
  }
  then {
    loss-priority high;
    forwarding-class expedited-forwarding;
  }
}
```

Applying Multifield Classification Filtering and Policing to the Logical Interface

Step-by-Step Procedure

To apply multifield classification filtering and policing to the logical interface:

1. Enable configuration of IPv4 on the logical interface.

   ```
   [edit]
   user@host# edit interfaces ge-1/2/0 unit 0 family inet
   ```

2. Configure an IP address for the logical interface.

   ```
   [edit interfaces ge-1/2/0 unit 0 family inet ]
   user@host# set address 192.168.1.1/24
   ```

3. Apply the firewall filter to the logical interface input.

   ```
   [edit interfaces ge-1/2/0 unit 0 family inet ]
   user@host# set filter input mfc-filter
   ```

NOTE: Because the policer is executed before the filter, if an input policer is also configured on the logical interface, it cannot use the forwarding class and PLP of a multifield classifier associated with the interface.

Results

Confirm the configuration of the interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/2/0 {
  unit 0 {
    family inet {
      filter {
        input mfc-filter;
      }
      address 192.168.1.1/24;
```

```
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Displaying the Number of Packets Processed by the Policer at the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show firewall** operational mode command for the filter you applied to the logical interface.

```
user@host> show firewall filter rate-limit-in
Filter: rate-limit-in
Policers:
Name                                                Packets
ef-policer-isp2-customers                             32863
af-policer-other-customers                             3870
```

The command output lists the policers applied by the firewall filter **rate-limit-in**, and the number of packets that matched the filter term.

NOTE: **The packet count includes the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.**

The policer name is displayed concatenated with the name of the firewall filter term in which the policer is referenced as an action.

Example: Configuring and Applying a Firewall Filter for a Multifield Classifier

This example shows how to configure a firewall filter to classify traffic using a multifield classifier. The classifier detects packets of interest to CoS as they arrive on an interface.

- Requirements on page 98
- Overview on page 99
- Configuration on page 99
- Verification on page 102

Requirements

Before you begin, review how to create and configure a firewall. See Guidelines for Configuring Standard Firewall Filters.

Overview

One common way to detect packets of CoS interest is by source or destination address. The destination address is used in this example, but many other matching criteria for packet detection are available to firewall filters.

In this example, you configure the firewall filter mf-classifier. You create and name the assured forwarding traffic class, set the match condition, and specify the destination address as 192.168.44.55. You create the forwarding class for assured forwarding DiffServ traffic as af-class and set the loss priority to low.

Then you create and name the expedited forwarding traffic class, set the match condition, for the expedited forwarding traffic class, and specify the destination address as 192.168.66.77. You then create the forwarding class for expedited forwarding DiffServ traffic as ef-class and set the policer to ef-policer. Then you create and name the network-control traffic class and set the match condition.

You then create and name the forwarding class for the network control traffic class as nc-class. You create and name the forwarding class for the best-effort traffic class as be-class. Finally, you apply the multifield classifier firewall filter as an input filter on each customer-facing or host-facing that needs the filter. In this example, the interface is ge-0/0/0.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set firewall filter mf-classifier interface-specific
set firewall filter mf-classifier term assured-forwarding from destination-address
  192.168.44.55
set firewall filter mf-classifier term assured-forwarding then forwarding-class af-class
set firewall filter mf-classifier term assured-forwarding then loss-priority low
set firewall filter mf-classifier term expedited-forwarding from destination-address
  192.168.66.77
set firewall filter mf-classifier term expedited-forwarding then forwarding-class ef-class
set firewall filter mf-classifier term expedited-forwarding then policer ef-policer
set firewall filter mf-classifier term network-control from precedence net-control
set firewall filter mf-classifier term network-control then forwarding-class nc-class
set firewall filter mf-classifier term best-effort then forwarding-class be-class
set interfaces ge-0/0/0 unit 0 family inet filter input mf-classifier
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see "Using the CLI Editor in Configuration Mode" on page 217 in the *Junos OS CLI User Guide*.

To configure a firewall filter for a multifield classifier for a device:

1. Create and name the multifield classifier filter.

   [edit]

```
user@host# edit firewall filter mf-classifier
user@host# set interface-specific
```

2. Create and name the term for the assured forwarding traffic class.

```
[edit firewall filter mf-classifier]
user@host# edit term assured-forwarding
```

3. Specify the destination address for assured forwarding traffic.

```
[edit firewall filter mf-classifier term assured-forwarding]
user@host# set from destination-address 192.168.44.55
```

4. Create the forwarding class and set the loss priority for the assured forwarding traffic class.

```
[edit firewall filter mf-classifier term assured-forwarding]
user@host# set then forwarding-class af-class
user@host# set then loss-priority low
```

5. Create and name the term for the expedited forwarding traffic class.

```
[edit]
user@host# edit firewall filter mf-classifier
user@host# edit term expedited-forwarding
```

6. Specify the destination address for the expedited forwarding traffic.

```
[edit firewall filter mf-classifier term expedited-forwarding]
user@host# set from destination-address 192.168.66.77
```

7. Create the forwarding class and apply the policer for the expedited forwarding traffic class.

```
[edit firewall filter mf-classifier term expedited-forwarding]
user@host# set then forwarding-class ef-class
user@host# set then policer ef-policer
```

8. Create and name the term for the network control traffic class.

```
[edit]
user@host# edit firewall filter mf-classifier
user@host# edit term network-control
```

9. Create the match condition for the network control traffic class.

```
[edit firewall filter mf-classifier term network-control]
user@host# set from precedence net-control
```

10. Create and name the forwarding class for the network control traffic class.

```
[edit firewall filter mf-classifier term network-control]
user@host# set then forwarding-class nc-class
```

11. Create and name the term for the best-effort traffic class.

```
[edit]
user@host# edit firewall filter mf-classifier
user@host# edit term best-effort
```

12. Create and name the forwarding class for the best-effort traffic class.

```
[edit firewall filter mf-classifier term best-effort]
user@host# set then forwarding-class be-class
```


NOTE: Because this is the last term in the filter, it has no match condition.

13. Apply the multifield classifier firewall filter as an input filter.

```
[edit]
user@host# set interfaces ge-0/0/0 unit 0 family inet filter input mf-classifier
```

Results From configuration mode, confirm your configuration by entering the **show firewall filter mf-classifier** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show firewall filter mf-classifier
  interface-specific;
  term assured-forwarding {
  from {
    destination-address {
    192.168.44.55/32;
  }
  }
  then {
    loss-priority low;
    forwarding-class af-class;
  }
  }
  term expedited-forwarding {
    from {
    destination-address {
    192.168.66.77/32;
  }
  }
  then {
    policer ef-policer;
    forwarding-class ef-class;
  }
  }
  term network-control {
    from {
  precedence net-control;
  }
  then forwarding-class nc-class;
    }
    term best-effort {
  then forwarding-class be-class;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying a Firewall Filter for a Multifield Classifier Configuration on page 102

Verifying a Firewall Filter for a Multifield Classifier Configuration

Purpose Verify that a firewall filter for a multifield classifier is configured properly on a device.

Action From configuration mode, enter the **show firewall filter mf-classifier** command.

Related Documentation

- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Order of Policer and Firewall Filter Operations on page 10
- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24
- "Junos CoS Components" in the *Junos OS Class of Service Configuration Guide*
- "BA Classifier Overview" in the *Junos OS Class of Service Configuration Guide*
- "Overview of Forwarding Classes" in the *Junos OS Class of Service Configuration Guide*
- "Default Forwarding Classes" in the *Junos OS Class of Service Configuration Guide*
- "RED Drop Profiles Overview" in the *Junos OS Class of Service Configuration Guide*
- **tri-color** statement in the *Junos OS Class of Service Configuration Guide*

Policer Overhead to Account for Rate Shaping in the Traffic Manager

- Policer Overhead to Account for Rate Shaping Overview on page 102
- Example: Configuring Policer Overhead to Account for Rate Shaping on page 103

Policer Overhead to Account for Rate Shaping Overview

If you configure ingress or egress traffic-shaping overhead values for an interface, the traffic manager cannot apply these values to any rate-limiting also applied to the interface. To enable the router to account for the additional Ethernet frame length when policing actions are being determined, you must configure the ingress or egress overhead values for policers separately.

NOTE: When a policer overhead value is changed, the PIC or DPC goes offline and then comes back online.

For Gigabit Ethernet Intelligent Queuing 2 (IQ2) and Enhanced IQ2 (IQ2E) PICs or interfaces on Dense Port Concentrators (DPCs) in MX Series routers, you can control the rate of traffic that passes through all interfaces on the PIC or DPC by configuring a *policer overhead*. You can configure a policer ingress overhead and a policer egress overhead, each with values from 0 through 255 bytes. The policer overhead values are added to the length of the final Ethernet frame when determining ingress and egress policer actions.

Example: Configuring Policer Overhead to Account for Rate Shaping

This example shows how to configure overhead values for policers when rate-shaping overhead is configured.

- Requirements on page 103
- Overview on page 103
- Configuration on page 104
- Verification on page 110

Requirements

Before you begin, make sure that interface for which you are applying ingress or egress policer overhead is hosted on one of the following:

- Gigabit Ethernet IQ2 PIC
- IQ2E PIC
- DPCs in MX Series routers

Overview

This example shows how to configure policer overhead values for all physical interfaces on a supported PIC or MPC so that the rate shaping value configured on a logical interface is accounted for in any policing on that logical interface.

Topology

The router hosts a Gigabit Ethernet IQ2 PIC, installed in PIC location 3 of the Flexible PIC Concentrator (FPC) in slot number 1. The physical interface on port 1 on that PIC is configured to receive traffic on logical interface 0 and send it back out on logical interface 1. Class-of-service scheduling includes 100 Mbps of traffic rate-shaping overhead for the output traffic. A policer egress overhead of 100 bytes is configured on the entire PIC so that, for any policers applied to the output traffic, 100 bytes are added to the final Ethernet frame length when determining ingress and egress policer actions.

NOTE:

Traffic rate-shaping and corresponding policer overhead are configured separately:

- You configure rate shaping at the **[edit class-of-service interfaces *interface-name* unit *unit-number*]** hierarchy level.
- You configure policer overhead at the **[edit chassis fpc *slot-number* pic *pic-number*]** hierarchy level.

When a policer overhead value is changed, the PIC or DPC goes offline and then comes back online.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on page 105
- Configuring Traffic Rate-Shaping on the Logical Interface That Carries Output Traffic on page 106
- Configuring Policer Overhead on the PIC or MPC That Hosts the Rate-Shaped Logical Interface on page 108
- Applying a Policer to the Logical Interface That Carries Input Traffic on page 108

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/3/1 per-unit-scheduler
set interfaces ge-1/3/1 vlan-tagging
set interfaces ge-1/3/1 unit 0 vlan-id 100
set interfaces ge-1/3/1 unit 0 family inet address 10.10.10.1/30
set interfaces ge-1/3/1 unit 1 vlan-id 101
set interfaces ge-1/3/1 unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
set class-of-service schedulers be transmit-rate percent 5
set class-of-service schedulers ef transmit-rate percent 30
set class-of-service schedulers af transmit-rate percent 30
set class-of-service schedulers nc transmit-rate percent 35
set class-of-service scheduler-maps my-map forwarding-class best-effort scheduler be
set class-of-service scheduler-maps my-map forwarding-class expedited-forwarding
  scheduler ef
set class-of-service scheduler-maps my-map forwarding-class network-control scheduler
  nc
set class-of-service scheduler-maps my-map forwarding-class assured-forwarding
  scheduler af
set class-of-service interfaces ge-1/3/1 unit 1 scheduler-map my-map
set class-of-service interfaces ge-1/3/1 unit 1 shaping-rate 100m
```

```
set firewall policer 500Kbps logical-interface-policer
set firewall policer 500Kbps if-exceeding bandwidth-limit 500k
set firewall policer 500Kbps if-exceeding burst-size-limit 625k
set firewall policer 500Kbps then discard
set chassis fpc 1 pic 3 ingress-policer-overhead 100
set chassis fpc 1 pic 3 egress-policer-overhead 100
set interfaces ge-1/3/1 unit 0 family inet policer input 500Kbps
```

Configuring the Logical Interfaces

Step-by-Step Procedure

To configure the logical interfaces:

1. Enable configuration of the interface

   ```
   [edit]
   user@host# edit interfaces ge-1/3/1
   ```

2. Enable multiple queues for each logical interface (so that you can associate an output scheduler with each logical interface).

   ```
   [edit interfaces ge-1/3/1]
   user@host# set per-unit scheduler
   user@host# set vlan-tagging
   ```

   NOTE: For Gigabit Ethernet IQ2 PICs only, use the **shared-scheduler** statement to enable shared schedulers and shapers on a physical interface.

3. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 0 vlan-id 100
   user@host# set unit 0 family inet address 10.10.10.1/30
   ```

4. Configure logical interface **ge-1/3/1.1**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 1 vlan-id 101
   user@host# set unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
     00:00:11:22:33:44
   ```

Results

Confirm the configuration of the interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
   per-unit-scheduler;
   vlan-tagging;
   unit 0 {
      vlan-id 100;
      family inet {
         address 10.10.10.1/30;
```

```
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 20.20.20.1/30 {
        arp 20.20.20.2 mac 00:00:11:22:33:44;
      }
    }
  }
}
```

Configuring Traffic Rate-Shaping on the Logical Interface That Carries Output Traffic

Step-by-Step Procedure

To configure traffic rate-shaping on the logical interface that carries output traffic:

1. Enable configuration of class-of-service features.

   ```
   [edit]
   user@host# edit class-of-service
   ```

2. Configure packet scheduling on logical interface **ge-1/3/1.0**.

   a. Configure schedulers that specify the percentage of transmission capacity.

      ```
      [edit class-of-service]
      user@host# edit schedulers

      [edit class-of-service schedulers]
      user@host# set be transmit-rate percent 5
      user@host# set ef transmit-rate percent 30
      user@host# set af transmit-rate percent 30
      user@host# set nc transmit-rate percent 35
      ```

      A percentage of zero drops all packets in the queue. When the **rate-limit** option is specified, the transmission rate is limited to the rate-controlled amount. In contrast with the **exact** option, a scheduler with the **rate-limit** option shares unused bandwidth above the rate-controlled amount.

   b. Configure a scheduler map to associate each scheduler with a forwarding class.

      ```
      [edit class-of-service]
      user@host# edit scheduler-maps my-map

      [edit class-of-service scheduler-maps my-map]
      user@host# set forwarding-class best-effort scheduler be
      user@host# set forwarding-class expedited-forwarding scheduler ef
      user@host# set forwarding-class network-control scheduler nc
      user@host# set forwarding-class assured-forwarding scheduler af
      ```

   c. Associate the scheduler map with logical interface **ge-1/3/1.0**.

      ```
      [edit class-of-service]
      user@host# edit interfaces ge-1/3/1 unit 1

      [edit class-of-service interfaces ge-1/3/1 unit 1]
      user@host# set scheduler-map my-map
      ```

3. Configure 100 Mbps of traffic rate-shaping overhead on logical interface **ge-1/3/1.1**.

```
[edit class-of-service interfaces ge-1/3/1 unit 1]
user@host# set shaping-rate 100
```

Alternatively, you can configure a shaping rate for a logical interface and oversubscribe the physical interface by including the **shaping-rate** statement at the **[edit class-of-service traffic-control-profiles]** hierarchy level. With this configuration approach, you can independently control the delay-buffer rate.

Results Confirm the configuration of the class-of-service features (including the 100 Mbp of shaping of the egress traffic) by entering the **show class-of-service** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show class-of-service
interfaces {
  ge-1/3/1 {
    unit 1 {
      scheduler-map my-map;
      shaping-rate 100m;
    }
  }
}
scheduler-maps {
  my-map {
    forwarding-class best-effort scheduler be;
    forwarding-class expedited-forwarding scheduler ef;
    forwarding-class network-control scheduler nc;
    forwarding-class assured-forwarding scheduler af;
  }
}
schedulers {
  be {
    transmit-rate percent 5;
  }
  ef {
    transmit-rate percent 30;
  }
  af {
    transmit-rate percent 30;
  }
  nc {
    transmit-rate percent 35;
  }
}
```

Configuring Policer Overhead on the PIC or MPC That Hosts the Rate-Shaped Logical Interface

Step-by-Step Procedure

To configure policer overhead on the PIC or MPC that hosts the rate-shaped logical interface:

1. Enable configuration of the supported PIC or MPC.

```
[edit]
user@host# set chassis fpc 1 pic 3
```

2. Configure 100 bytes of policer overhead on the supported PIC or MPC.

```
[edit]
user@host# set ingress-policer-overhead 100
user@host# set egress-policer-overhead 100
```

NOTE: These values are added to the length of the final Ethernet frame when determining ingress and egress policer actions for all physical interfaces on the PIC or MPC.

You can specify policer overhead with values from 0 through 255 bytes.

Results

Confirm the configuration of the policer overhead on the physical interface to account for rate-shaping by entering the **show chassis** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show chassis
chassis {
  fpc 1 {
    pic 3 {
      egress-policer-overhead 100;
      ingress-policer-overhead 100;
    }
  }
}
```

Applying a Policer to the Logical Interface That Carries Input Traffic

Step-by-Step Procedure

To apply a policer to the logical interface that carries input traffic:

1. Configure the logical interface (aggregate) policer.

```
[edit]
user@host# edit firewall policer 500Kbps

[edit firewall policer 500Kbps]
user@host# set logical-interface-policer
user@host# set if-exceeding bandwidth-limit 500k
user@host# set if-exceeding burst-size-limit 625k
user@host# set then discard
```

2. Apply the policer to Layer 3 input on the IPv4 logical interface.

```
[edit]
user@host# set interfaces ge-1/3/1 unit 0 family inet policer input 500Kbps
```

NOTE: The 100 Mbps policer overhead is added to the length of the final Ethernet frame when determining ingress and egress policer actions,

Results Confirm the configuration of the policer with rate-shaping overhead by entering the **show firewall** and **show interfaces** configuration mode commands. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer 500Kbps {
    logical-interface-policer;
    if-exceeding {
        bandwidth-limit 500k;
        burst-size-limit 625k;
    }
    then discard;
}
[edit]
user@host# show interfaces
ge-1/3/1 {
    per-unit-scheduler;
    vlan-tagging;
    unit 0 {
        vlan-id 100;
        layer2-policer {
            input-policer 500Kbps;
        }
        family inet {
            address 10.10.10.1/30;
        }
    }
    unit 0 {
        vlan-id 101;
        family inet {
            address 20.20.20.1/30 {
                arp 20.20.20.2 mac 00:00:11:22:33:44;
            }
        }
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 110
- Displaying Statistics for the Policer on page 110

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interface **ge-1/3/1.0**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface, and the **Protocol inet** section contains a **Policer** field that would list the policer **500Kbps** as an input or output policer as follows:

- **Input: 500Kbps-ge-1/3/1.0-log_int-i**
- **Output: 500Kbps-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to Input traffic only.

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the **show policer** operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **500Kbps**, the input and output policer names are displayed as follows:

- **500Kbps-ge-1/3/1.0-log_int-i**
- **500Kbps-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to input traffic only.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Guidelines for Applying Traffic Policers on page 24
- "Configuring a Policer Overhead" in the *Junos OS System Basics and Services Command Reference*

CHAPTER 6

Three-Color Policers

- Three-Color Policer Configuration Guidelines on page 111
- Basic Single-Rate Three-Color Policers on page 113
- Basic Two-Rate Three-Color Policers on page 119

Three-Color Policer Configuration Guidelines

- Platforms Supported for Three-Color Policers on page 111
- Color Modes for Three-Color Policers on page 111
- Naming Conventions for Three-Color Policers on page 112

Platforms Supported for Three-Color Policers

Three-color policers are supported on the following Juniper Networks routers:

- M120 Multiservice Edge Routers
- M320 Multiservice Edge Routers and T Series Core Routers with Enhanced II Flexible PIC Concentrators (FPCs)
- MX Series 3D Universal Edge Routers
- T640 Core Routers with Enhanced Scaling FPC4

On MX Series and M120 routers, you can apply three-color policers to aggregated interfaces.

The **discard** action for a tricolor marking policer for a firewall filter is supported on the M120 routers, M320 routers with Enhanced-III FPCs, M7i and M10i routers with the Enhanced CFEB (CFEB-E), and MX Series routers with Trio MPCs, so it is not necessary to include the **logical-interface-policer** statement for them.

Color Modes for Three-Color Policers

Three-color policers—both single-rate and two-rate three-color policer schemes—can operate in either of two modes:

- Color-Blind Mode on page 112
- Color-Aware Mode on page 112

Color-Blind Mode

In *color-blind* mode, the three-color policer assumes that all packets examined have not been previously marked or metered. If you configure a three-color policer to be color-blind instead of color-aware, the policer ignores preexisting color markings that might have been set for a packet by another traffic policer configured at a previous network node.

Color-Aware Mode

In *color-aware* mode, the three-color policer assumes that all packets examined have been previously marked or metered. In other words, the three-color policer takes into account any coloring markings that might have been set for a packet by another traffic policer configured at a previous network node. At the node where color-aware policing is configured, any preexisting color markings are used in determining the appropriate policing action for the packet.

In color-aware mode, the three-color policer can increase the packet loss priority (PLP) level of a packet, but never decrease it. For example, if a color-aware three-color policer meters a packet with a medium PLP marking, it can raise the PLP level to high, but cannot reduce the PLP level to low.

For two-rate, three-color policing, the Junos OS uses two token buckets to manage bandwidth based on the two rates of traffic. For example, two-rate policing might be configured on a node upstream in the network. The two-rate policer has marked a packet as yellow (loss priority medium-low). The color-aware policer takes this yellow marking into account when determining the appropriate policing action. In color-aware policing, the yellow packet would never receive the action associated with either the green packets or red packets. This way, tokens for violating packets are never taken from the metering token buckets at the color-aware policing node.

Naming Conventions for Three-Color Policers

Because policers can be numerous and must be applied correctly to work, a simple naming convention makes it easier to apply the policers properly.

We recommend that you name your policer using a convention that identifies the basic components of the policer:

- Three-color policer type—Where **srTCM** identifies a *single-rate* three-color policer and **trTCM** identifies a *two-rate* three-color policer.
- Three-color policer color mode—Where **ca** identifies a *color-aware* three-color policer and **cb** identifies a *color-blind three-color policer*.

NOTE:

TCM stands for tricolor marking.

Table 9 on page 113 describes a recommended naming convention for policers.

Table 9: Recommended Naming Convention for Policers

Three-Color Policer Type	Naming Convention	Example Names
Single-rate three-color, color-aware	**srTCM*number*-ca**	**srTCM1-ca**, **srTCM2-ca**, **srTCM3-ca**, ...
Single-rate three-color, color-blind	**srTCM*number*-cb**	**srTCM1-cb**, **srTCM2-cb**, **srTCM3-cb**, ...
Two-rate three-color, color-aware	**trTCM*number*-ca**	**trTCM1-ca**, **trTCM2-ca**, **trTCM3-ca**, ...
Two-rate three-color, color-blind	**trTCM*number*-cb**	**trTCM1-cb**, **trTCM2-cb**, **trTCM3-cb**, ...

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Three-Color Policer Configuration Overview on page 19
- Guidelines for Applying Traffic Policers on page 24

Basic Single-Rate Three-Color Policers

- Single-Rate Three-Color Policer Overview on page 113
- Example: Configuring a Single-Rate Three-Color Policer on page 114

Single-Rate Three-Color Policer Overview

A single-rate three-color policer defines a bandwidth limit and a maximum burst size for guaranteed traffic and a second burst size for peak traffic. A single-rate three-color policer is most useful when a service is structured according to packet length and not peak arrival rate.

Single-rate three-color policing meters a traffic stream based on the following configured traffic criteria:

- Committed information rate (CIR)—Bandwidth limit for guaranteed traffic.
- Committed burst size (CBS)—Maximum packet size permitted for bursts of data that exceed the CIR.
- Excess burst size (EBS)—Maximum packet size permitted for peak traffic.

Single-rate tricolor marking (single-rate TCM) classifies traffic as belonging to one of three color categories and performs congestion-control actions on the packets based on the color marking:

- Green—Traffic that conforms to *either* the bandwidth limit *or* the burst size for guaranteed traffic (CIR and CBS). For a green traffic flow, single-rate marks the packets with an implicit loss priority of **low** and transmits the packets.
- Yellow—Traffic that exceeds *both* the bandwidth limit *and* the burst size for guaranteed traffic (CIR or CBS) but not the burst size for peak traffic (EBS). For a yellow traffic flow, single-rate marks the packets with an implicit loss priority of **medium-high** and transmits the packets.
- Red—Traffic that exceeds the burst size for peak traffic (EBS), single-rate marks packets with an implicit loss priority of **high** and, optionally, discards the packets.

If congestion occurs downstream, the packets with higher loss priority are more likely to be discarded.

NOTE: For both single-rate and two-rate three-color policers, the only *configurable* action is to discard packets in a red traffic flow.

The **discard** action for a tricolor marking policer for a firewall filter is supported on the M120 routers, M320 routers with Enhanced-III FPCs, M7i and M10i routers with the Enhanced CFEB (CFEB-E), and MX Series routers with Trio MPCs, so it is not necessary to include the **logical-interface-policer** statement for them.

Example: Configuring a Single-Rate Three-Color Policer

This example shows how to configure a single-rate three-color policer.

- Requirements on page 114
- Overview on page 114
- Configuration on page 115
- Verification on page 118

Requirements

No special configuration beyond device initialization is required before configuring this example.

Overview

A single-rate three-color policer meters a traffic flow against a bandwidth limit and burst-size limit for guaranteed traffic, plus a second burst-size limit for excess traffic. Traffic that conforms to the limits for guaranteed traffic is categorized as green, and nonconforming traffic falls into one of two categories:

- Nonconforming traffic that does not exceed the burst size for excess traffic is categorized as yellow.

- Nonconforming traffic that exceeds the burst size for excess traffic is categorized as red.

Each category is associated with an action. For green traffic, packets are implicitly set with a loss-priority value of **low** and then transmitted. For yellow traffic, packets are implicitly set with a loss-priority value of **medium-high** and then transmitted. For red traffic, packets are implicitly set with a loss-priority value of **high** and then transmitted. If the policer configuration includes the optional action statement (**action loss-priority high then discard**), then packets in a red flow are discarded instead.

You can apply a three-color policer to Layer 3 traffic as a firewall filter policer only. You reference the policer from a stateless firewall filter term, and then you apply the filter to the input or output of a logical interface at the protocol level.

Topology

In this example, you apply a color-aware, single-rate three-color policer to the input IPv4 traffic at logical interface **ge-2/0/5.0**. The IPv4 firewall filter term that references the policer does not apply any packet-filtering. The filter is used only to apply the three-color policer to the interface.

You configure the policer to rate-limit traffic to a bandwidth limit of 40 Mbps and a burst-size limit of 100 KB for green traffic but also allow an excess burst-size limit of 200 KB for yellow traffic. Only nonconforming traffic that exceeds the peak burst-size limit is categorized as red. In this example, you configure the three-color policer action **loss-priority high then discard**, which overrides the implicit marking of red traffic to a **high** loss priority.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring a Single-Rate Three-Color Policer on page 116
- Configuring an IPv4 Stateless Firewall Filter That References the Policer on page 117
- Applying the Filter to the Logical Interface on page 117

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set firewall three-color-policer srTCM1-ca single-rate color-aware
set firewall three-color-policer srTCM1-ca single-rate committed-information-rate 40m
set firewall three-color-policer srTCM1-ca single-rate committed-burst-size 100k
set firewall three-color-policer srTCM1-ca single-rate excess-burst-size 200k
set firewall three-color-policer srTCM1-ca action loss-priority high then discard
set firewall family inet filter filter-srtcm1ca-all term 1 then three-color-policer single-rate
    srTCM1-ca
set class-of-service interfaces ge-2/0/5 unit 0 forwarding-class af
set interfaces ge-2/0/5 unit 0 family inet address 10.20.130.1/24
```

```
set interfaces ge-2/0/5 unit 0 family inet filter input filter-srtcm1ca-all
```

Configuring a Single-Rate Three-Color Policer

Step-by-Step Procedure

To configure a single-rate three-color policer:

1. Enable configuration of a three-color policer.

   ```
   [edit]
   user@host# edit firewall three-color-policer srTCM1-ca
   ```

2. Configure the color mode of the single-rate three-color policer.

   ```
   [edit firewall three-color-policer srTCM1-ca]
   user@host# set single-rate color-aware
   ```

3. Configure the single-rate guaranteed traffic limits.

   ```
   [edit firewall three-color-policer srTCM1-ca]
   user@host# set single-rate committed-information-rate 40m
   user@host# set single-rate committed-burst-size 100k
   ```

4. Configure the single-rate burst-size limit that is used to classify nonconforming traffic.

   ```
   [edit firewall three-color-policer srTCM1-ca]
   user@host# set single-rate excess-burst-size 200k
   ```

5. (Optional) Configure the action for nonconforming traffic.

   ```
   [edit firewall three-color-policer srTCM1-ca]
   user@host# set action loss-priority high then discard
   ```

   For three-color policers, the only configurable action is to discard packets in a red traffic flow. In this example, packets in a red traffic flow have been implicitly marked with a **high** packet loss priority (PLP) level because the traffic flow exceeded the rate-limiting defined by the single rate-limit (specified by the **committed-information-rate 40m** statement) and the larger burst-size limit (specified by the **excess-burst-size 200k** statement). Because the optional **action** statement is included, this example takes the more severe action of discarding packets in a red traffic flow.

Results

Confirm the configuration of the hierarchical policer by entering the **show firewall** configuration command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
three-color-policer srTCM1-ca {
    action {
        loss-priority high then discard;
    }
    single-rate {
        color-aware;
        committed-information-rate 40m;
        committed-burst-size 100k;
        excess-burst-size 200k;
    }
}
```

Configuring an IPv4 Stateless Firewall Filter That References the Policer

Step-by-Step Procedure

To configure a standard stateless firewall filter that references the policer:

1. Enable configuration of an IPv4 standard stateless firewall filter.

```
[edit]
user@host# edit firewall family inet filter filter-srtcm1ca-all
```

2. Specify the filter term that references the policer.

```
[edit firewall family inet filter filter-srtcm1ca-all]
user@host# set term 1 then three-color-policer single-rate srTCM1-ca
```

Note that the term does not specify any match conditions. The firewall filter passes all packets to the policer.

Results

Confirm the configuration of the firewall filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
  filter filter-srtcm1ca-all {
    term 1 {
      then {
        three-color-policer {
          single-rate srTCM1-ca;
        }
      }
    }
  }
}
three-color-policer srTCM1-ca {
  action {
    loss-priority high then discard;
  }
  single-rate {
    color-aware;
    committed-information-rate 40m;
    committed-burst-size 100k;
    excess-burst-size 200k;
  }
}
```

Applying the Filter to the Logical Interface

Step-by-Step Procedure

To apply the filter to the logical interface:

1. (MX Series routers only) (Optional) Reclassify all incoming packets on the logical interface **ge-2/0/5.0** to assured forwarding, regardless of any preexisting classification.

```
[edit]
user@host# set class-of-service interfaces ge-2/0/5 unit 0 forwarding-class af
```

The classifier name can be a configured classifier or one of the default classifiers.

2. Enable configuration of the logical interface.

```
[edit]
user@host# edit interfaces ge-2/0/5 unit 0 family inet
```

3. Configure an IP address.

```
[edit interfaces ge-2/0/5 unit 0 family inet]
user@host# set address 10.20.130.1/24
```

4. Reference the filter as an input filter.

```
[edit interfaces ge-2/0/5 unit 0 family inet]
user@host# set filter input filter-srtcm1ca-all
```

Results Confirm the configuration of the interface by entering the **show class-of-service** and **show interfaces** configuration mode commands. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show class-of-service
interfaces {
   ge-2/0/5 {
      unit 0 {
         forwarding-class af;
      }
   }
}
[edit]
user@host# show interfaces
ge-2/0/5 {
   unit 0 {
      family inet {
         filter {
            input filter-srtcm1ca-all;
            }
         address 10.20.130.1/24;
      }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Displaying the Firewall Filters Applied to the Logical Interface

Purpose Verify that the firewall filter is applied to IPv4 input traffic at the logical interface.

Action Use the **show interfaces** operational mode command for the logical interface **ge-2/0/5.0**, and specify **detail** mode. The **Protocol inet** section of the command output displays IPv4

information for the logical interface. Within that section, the **Input Filters** field displays the name of the firewall filter applied to IPv4 input traffic at the logical interface.

```
user@host> show interfaces ge-2/0/5.0 detail
  Logical interface ge-2/0/5.0 (Index 105) (SNMP ifIndex 556) (Generation 170)
    Flags: Device-Down SNMP-Traps 0x4004000 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                   0                    0 pps
     Output packets:                   0                    0 pps
    Protocol inet, MTU: 1500, Generation: 242, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Input Filters: filter-srtcm1ca-all
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.20.130/24, Local: 10.20.130.1, Broadcast: 10.20.130.255,

        Generation: 171
    Protocol multiservice, MTU: Unlimited, Generation: 243, Route table: 0
      Policer: Input: __default_arp_policer__
```

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Three-Color Policer Configuration Overview on page 19
- Three-Color Policer Configuration Guidelines on page 111

Basic Two-Rate Three-Color Policers

- Two-Rate Three-Color Policer Overview on page 119
- Example: Configuring a Two-Rate Three-Color Policer on page 120

Two-Rate Three-Color Policer Overview

A two-rate three-color policer defines two bandwidth limits (one for guaranteed traffic and one for peak traffic) and two burst sizes (one for each of the bandwidth limits). A two-rate three-color policer is most useful when a service is structured according to arrival rates and not necessarily packet length.

Two-rate three-color policing meters a traffic stream based on the following configured traffic criteria:

- Committed information rate (CIR)—Bandwidth limit for guaranteed traffic.
- Committed burst size (CBS)—Maximum packet size permitted for bursts of data that exceed the CIR.

- Peak information rate (PIR)—Bandwidth limit for peak traffic.
- Peak burst size (PBS)—Maximum packet size permitted for bursts of data that exceed the PIR.

Two-rate tricolor marking (two-rate TCM) classifies traffic as belonging to one of three color categories and performs congestion-control actions on the packets based on the color marking:

- Green—Traffic that conforms to the bandwidth limit and burst size for guaranteed traffic (CIR and CBS). For a green traffic flow, two-rate TCM marks the packets with an implicit loss priority of **low** and transmits the packets.
- Yellow—Traffic that exceeds the bandwidth limit or burst size for guaranteed traffic (CIR or CBS) but not the bandwidth limit and burst size for peak traffic (PIR and PBS). For a yellow traffic flow, two-rate TCM marks packets with an implicit loss priority of **medium-high** and transmits the packets.
- Red—Traffic that exceeds the bandwidth limit and burst size for peak traffic (PIR and PBS). For a red traffic flow, two-rate TCM marks packets with an implicit loss priority of **high** and, optionally, discards the packets.

If congestion occurs downstream, the packets with higher loss priority are more likely to be discarded.

NOTE: For both single-rate and two-rate three-color policers, the only *configurable* action is to discard packets in a red traffic flow.

For a tricolor marking policer referenced by a firewall filter term, the **discard** policing action is supported on the following routing platforms:

- M7i and M10i routers with the Enhanced CFEB (CFEB-E)
- M120 and M320 routers with Enhanced-III FPCs
- MX Series routers with Trio MPCs

To apply a tricolor marking policer on these routing platforms, it is not necessary to include the **logical-interface-policer** statement.

Example: Configuring a Two-Rate Three-Color Policer

This example shows how to configure a two-rate three-color policer.

- Requirements on page 121
- Overview on page 121
- Configuration on page 121
- Verification on page 124

Requirements

No special configuration beyond device initialization is required before configuring this example.

Overview

A two-rate three-color policer meters a traffic flow against a bandwidth limit and burst-size limit for guaranteed traffic, plus a bandwidth limit and burst-size limit for peak traffic. Traffic that conforms to the limits for guaranteed traffic is categorized as green, and nonconforming traffic falls into one of two categories:

- Nonconforming traffic that does not exceed peak traffic limits is categorized as yellow.
- Nonconforming traffic that exceeds peak traffic limits is categorized as red.

Each category is associated with an action. For green traffic, packets are implicitly set with a loss-priority value of **low** and then transmitted. For yellow traffic, packets are implicitly set with a loss-priority value of **medium-high** and then transmitted. For red traffic, packets are implicitly set with a loss-priority value of **high** and then transmitted. If the policer configuration includes the optional action statement (**action** loss-priority high then discard), then packets in a red flow are discarded instead.

You can apply a three-color policer to Layer 3 traffic as a firewall filter policer only. You reference the policer from a stateless firewall filter term, and then you apply the filter to the input or output of a logical interface at the protocol level.

Topology

In this example, you apply a color-aware, two-rate three-color policer to the input IPv4 traffic at logical interface **fe-0/1/1.0**. The IPv4 firewall filter term that references the policer does not apply any packet-filtering. The filter is used only to apply the three-color policer to the interface.

You configure the policer to rate-limit traffic to a bandwidth limit of 40 Mbps and a burst-size limit of 100 KB for green traffic, and you configure the policer to also allow a peak bandwidth limit of 60 Mbps and a peak burst-size limit of 200 KB for yellow traffic. Only nonconforming traffic that exceeds the peak traffic limits is categorized as red. In this example, you configure the three-color policer action **loss-priority high then discard**, which overrides the implicit marking of red traffic to a **high** loss priority.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring a Two-Rate Three-Color Policer on page 122
- Configuring an IPv4 Stateless Firewall Filter That References the Policer on page 123
- Applying the Filter to a Logical Interface at the Protocol Family Level on page 124

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set firewall three-color-policer trTCM1-ca two-rate color-aware
set firewall three-color-policer trTCM1-ca two-rate committed-information-rate 40m
set firewall three-color-policer trTCM1-ca two-rate committed-burst-size 100k
set firewall three-color-policer trTCM1-ca two-rate peak-information-rate 60m
set firewall three-color-policer trTCM1-ca two-rate peak-burst-size 200k
set firewall three-color-policer trTCM1-ca action loss-priority high then discard
set firewall family inet filter filter-trtcm1ca-all term 1 then three-color-policer two-rate
    trTCM1-ca
set interfaces ge-2/0/5 unit 0 family inet address 10.10.10.1/30
set interfaces ge-2/0/5 unit 0 family inet filter input filter-trtcm1ca-all
set class-of-service interfaces ge-2/0/5 forwarding-class af
```

Configuring a Two-Rate Three-Color Policer

Step-by-Step Procedure

To configure a two-rate three-color policer:

1. Enable configuration of a three-color policer.

   ```
   [edit]
   user@host# set firewall three-color-policer trTCM1-ca
   ```

2. Configure the color mode of the two-rate three-color policer.

   ```
   [edit firewall three-color-policer trTCM1-ca]
   user@host# set two-rate color-aware
   ```

3. Configure the two-rate guaranteed traffic limits.

   ```
   [edit firewall three-color-policer trTCM1-ca]
   user@host# set two-rate committed-information-rate 40m
   user@host# set two-rate committed-burst-size 100k
   ```

   Traffic that does not exceed both of these limits is categorized as green. Packets in a green flow are implicitly set to **low** loss priority and then transmitted.

4. Configure the two-rate peak traffic limits.

   ```
   [edit firewall three-color-policer trTCM1-ca]
   user@host# set two-rate peak-information-rate 60m
   user@host# set two-rate peak-burst-size 200k
   ```

   Nonconforming traffic that does not exceed both of these limits is categorized as yellow. Packets in a yellow flow are implicitly set to **medium-high** loss priority and then transmitted. Nonconforming traffic that exceeds both of these limits is categorized as red. Packets in a red flow are implicitly set to **high** loss priority.

5. (Optional) Configure the policer action for red traffic.

   ```
   [edit firewall three-color-policer trTCM1-ca]
   user@host# set action loss-priority high then discard
   ```

   For three-color policers, the only configurable action is to discard red packets. Red packets are packets that have been assigned high loss priority because they exceeded the peak information rate (PIR) and the peak burst size (PBS).

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
three-color-policer trTCM1-ca {
    action {
        loss-priority high then discard;
    }
    two-rate {
        color-aware;
        committed-information-rate 40m;
        committed-burst-size 100k;
        peak-information-rate 60m;
        peak-burst-size 200k;
    }
}
```

Configuring an IPv4 Stateless Firewall Filter That References the Policer

Step-by-Step Procedure To configure an IPv4 stateless firewall filter that references the policer:

1. Enable configuration of an IPv4 standard stateless firewall filter.

   ```
   [edit]
   user@host# set firewall family inet filter filter-trtcm1ca-all
   ```

2. Specify the filter term that references the policer.

   ```
   [edit firewall family inet filter filter-trtcm1ca-all]
   user@host# set term 1 then three-color-policer two-rate trTCM1-ca
   ```

   Note that the term does not specify any match conditions. The firewall filter passes all packets to the policer.

Results Confirm the configuration of the firewall filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
    filter filter-trtcm1ca-all {
        term 1 {
            then {
                three-color-policer {
                    two-rate trTCM1-ca;
                }
            }
        }
    }
}
three-color-policer trTCM1-ca {
    action {
        loss-priority high then discard;
    }
```

```
    two-rate {
      color-aware;
      committed-information-rate 40m;
      committed-burst-size 100k;
      peak-information-rate 60m;
      peak-burst-size 200k;
    }
  }
```

Applying the Filter to a Logical Interface at the Protocol Family Level

Step-by-Step Procedure

To apply the filter to the logical interface at the protocol family level:

1. Enable configuration of an IPv4 firewall filter.

   ```
   [edit]
   user@host# edit interfaces ge-2/0/5 unit 0 family inet
   ```

2. Apply the policer to the logical interface at the protocol family level.

   ```
   [edit interfaces ge-2/0/5 unit 0 family inet]
   user@host# set address 10.10.10.1/30
   user@host# set filter input filter-trtcm1ca-all
   ```

3. (MX Series routers only) (Optional) For input policers, you can configure a fixed classifier. A fixed classifier reclassifies all incoming packets, regardless of any preexisting classification.

   ```
   [edit]
   user@host# set class-of-service interfaces ge-2/0/5 forwarding-class af
   ```

   The classifier name can be a configured classifier or one of the default classifiers.

Results

Confirm the configuration of the interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-2/0/5 {
  unit 0 {
    family inet {
      address 10.10.10.1/30;
      filter {
        input filter-trtcm1ca-all;
      }
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying the Firewall Filters Applied to the Logical Interface on page 125

Displaying the Firewall Filters Applied to the Logical Interface

Purpose Verify that the firewall filter is applied to IPv4 input traffic at the logical interface.

Action Use the **show interfaces** operational mode command for the logical interface **ge-2/0/5.0**, and specify **detail** mode. The **Protocol inet** section of the command output displays IPv4 information for the logical interface. Within that section, the **Input Filters** field displays the name of IPv4 firewall filters associated with the logical interface.

```
user@host> show interfaces ge-2/0/5.0 detail
  Logical interface ge-2/0/5.0 (Index 105) (SNMP ifIndex 556) (Generation 170)
    Flags: Device-Down SNMP-Traps 0x4004000 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0                   0 bps
     Output bytes  :                   0                   0 bps
     Input  packets:                   0                   0 pps
     Output packets:                   0                   0 pps
    Protocol inet, MTU: 1500, Generation: 242, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Input Filters: filter-trtcm1ca-all
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.20.130/24, Local: 10.20.130.1, Broadcast: 10.20.130.255,

        Generation: 171
    Protocol multiservice, MTU: Unlimited, Generation: 243, Route table: 0
      Policer: Input: __default_arp_policer__
```

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Three-Color Policer Configuration Overview on page 19
- Three-Color Policer Configuration Guidelines on page 111

CHAPTER 7

Logical and Physical Interface Policers

- Two-Color and Three-Color Logical Interface Policers on page 127
- Two-Color and Three-Color Physical Interface Policers on page 139

Two-Color and Three-Color Logical Interface Policers

- Logical Interface (Aggregate) Policer Overview on page 127
- Example: Configuring a Two-Color Logical Interface (Aggregate) Policer on page 128
- Example: Configuring a Three-Color Logical Interface (Aggregate) Policer on page 133

Logical Interface (Aggregate) Policer Overview

A *logical interface policer*—also called an *aggregate policer*—is a two-color or three-color policer that defines traffic rate limiting that you can apply to input or output traffic for multiple protocol families on the same logical interface without creating multiple instances of the policer.

To configure a single-rate two-color logical interface policer, include the **logical-interface-policer** statement at one of the following hierarchy levels:

- **[edit firewall** policer ***policer-name*****]**
- **[edit logical-systems *logical-system-name* firewall** policer ***policer-name*****]**

To configure a single-rate or two-rate three-color logical interface policer, include the **logical-interface-policer** statement at one of the following hierarchy levels:

- **[edit firewall** three-color-policer ***name*****]**
- **[edit logical-systems *logical-system-name* firewall** three-color-policer ***name*****]**

NOTE: A three-color policer can be applied to Layer 2 traffic as a logical interface policer only. You cannot apply a three-color policer to Layer 2 traffic as a physical interface policer (through a firewall filter).

You apply a logical interface policer to Layer 3 traffic directly to the interface configuration at the logical unit level (to rate-limit all traffic types, regardless of the protocol family) or at the protocol family level (to rate-limit traffic of a specific protocol family). You

cannot reference a logical interface policer from a stateless firewall filter term and then apply the filter to a logical interface.

You can apply a logical interface policer to unicast traffic only. For information about configuring a stateless firewall filter for flooded traffic, see "Applying Filters to Forwarding Tables" in the "Traffic Sampling, Forwarding, and Monitoring" section of the *Junos OS Routing Policy Configuration Guide*.

To display a logical interface policer on a particular interface, issue the **show interfaces policers** operational mode command.

Example: Configuring a Two-Color Logical Interface (Aggregate) Policer

This example shows how to configure a single-rate two-color policer as a logical interface policer and apply it to incoming IPv4 traffic on a logical interface.

- Requirements on page 128
- Overview on page 128
- Configuration on page 128
- Verification on page 132

Requirements

Before you begin, make sure that the logical interface to which you apply the two-color logical interface policer is hosted on a Gigabit Ethernet interface (**ge-**) or a 10-Gigabit Ethernet interface (**xe-**).

Overview

In this example, you configure the single-rate two-color policer **policer_IFL** as a logical interface policer and apply it to incoming IPv4 traffic at logical interface **ge-1/3/1.0**.

Topology

If the input IPv4 traffic on the physical interface **ge-1/3/1** exceeds the bandwidth limit equal to 90 percent of the media rate with a 300 KB burst-size limit, then the logical interface policer **policer_IFL** rate-limits the input IPv4 traffic on the logical interface **ge-1/3/1.0**. Configure the policer to mark nonconforming traffic by setting packet loss priority (PLP) levels to **high** and classifying packets as **best-effort**.

As the incoming IPv4 traffic rate on the physical interface slows and conforms to the configured limits, Junos OS stops marking the incoming IPv4 packets at the logical interface.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on page 129
- Configuring the Single-Rate Two-Color Policer as a Logical Interface Policer on page 130
- Applying the Logical Interface Policer to Input IPv4 Traffic at a Logical Interface on page 131

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/3/1 vlan-tagging
set interfaces ge-1/3/1 unit 0 vlan-id 100
set interfaces ge-1/3/1 unit 0 family inet address 10.10.10.1/30
set interfaces ge-1/3/1 unit 1 vlan-id 101
set interfaces ge-1/3/1 unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
set firewall policer policer_IFL logical-interface-policer
set firewall policer policer_IFL if-exceeding bandwidth-percent 90
set firewall policer policer_IFL if-exceeding burst-size-limit 300k
set firewall policer policer_IFL then loss-priority high
set firewall policer policer_IFL then forwarding-class best-effort
set interfaces ge-1/3/1 unit 0 family inet policer input policer_IFL
```

Configuring the Logical Interfaces

Step-by-Step Procedure

To configure the logical interfaces:

1. Enable configuration of the interface.

   ```
   [edit]
   user@host# edit interfaces ge-1/3/1
   ```

2. Configure single tagging.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set vlan-tagging
   ```

3. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 0 vlan-id 100
   user@host# set unit 0 family inet address 10.10.10.1/30
   ```

4. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 1 vlan-id 101
   user@host# set unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
     00:00:11:22:33:44
   ```

Results

Confirm the configuration of the logical interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
```

```
ge-1/3/1 {
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      address 10.10.10.1/30;
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 20.20.20.1/30 {
        arp 20.20.20.2 mac 00:00:11:22:33:44;
      }
    }
  }
}
```

Configuring the Single-Rate Two-Color Policer as a Logical Interface Policer

Step-by-Step Procedure

To configure a single-rate two-color policer as a logical interface policer:

1. Enable configuration of a single-rate two-color policer.

   ```
   [edit]
   user@host# edit firewall policer policer_IFL
   ```

2. Specify that the policer is a logical interface (aggregate) policer.

   ```
   [edit firewall policer policer_IFL]
   user@host# set logical-interface-policer
   ```

   A logical interface policer rate-limits traffic based on a percentage of the media rate of the physical interface underlying the logical interface to which the policer is applied. The policer is applied directly to the interface rather than referenced by a firewall filter.

3. Specify the policer traffic limits.

   a. Specify the bandwidth limit.

   - To specify the bandwidth limit as an absolute rate, from 8,000 bits per second through 50,000,000,000 bits per second, include the **bandwidth-limit** ***bps*** statement.
   - To specify the bandwidth limit as a percentage of the physical port speed on the interface, include the **bandwidth-percent** ***percent*** statement.

   In this example, the CLI commands and output are based on a bandwidth limit specified as a percentage rather than as an absolute rate.

   ```
   [edit firewall policer policer_IFL]
   user@host# set if-exceeding bandwidth-percent 90
   ```

b. Specify the burst-size limit, from 1,500 bytes through 100,000,000,000 bytes, which is the maximum packet size to be permitted for bursts of data that exceed the specified bandwidth limit.

```
[edit firewall policer policer_IFL]
user@host# set if-exceeding burst-size-limit 300k
```

4. Specify the policer actions to be taken on traffic that exceeds the configured rate limits.

- To discard the packet, include the **discard** statement.
- To set the loss-priority value of the packet, include the **loss-priority (low | medium-low | medium-high | high)** statement.
- To classify the packet to a forwarding class, include the **forwarding-class (*forwarding-class* | assured-forwarding | best-effort | expedited-forwarding | network-control)** statement.

In this example, the CLI commands and output are based on both setting the packet loss priority level and classifying the packet.

```
[edit firewall policer policer_IFL]
user@host# set then loss-priority high
user@host# set then forwarding-class best-effort
```

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer policer_IFL {
  logical-interface-policer;
  if-exceeding {
    bandwidth-percent 90;
    burst-size-limit 300k;
  }
  then {
    loss-priority high;
    forwarding-class best-effort;
  }
}
```

Applying the Logical Interface Policer to Input IPv4 Traffic at a Logical Interface

Step-by-Step Procedure To apply the two-color logical interface policer to input IPv4 traffic a logical interface:

1. Enable configuration of the logical interface.

```
[edit]
user@host# edit interfaces ge-1/3/1 unit 0
```

2. Apply the policer to all traffic types or to a specific traffic type on the logical interface.

   - To apply the policer to all traffic types, regardless of the protocol family, include the **policer (input | output)** ***policer-name*** statement at the **[edit interfaces** ***interface-name*** **unit** ***number*****]** hierarchy level.
   - To apply the policer to traffic of a specific protocol family, include the **policer (input | output)** ***policer-name*** statement at the **[edit interfaces** ***interface-name*** **unit** ***unit-number*** **family** ***family-name*****]** hierarchy level.

   To apply the logical interface policer to incoming packets, use the **policer input** ***policer-name*** statement. To apply the logical interface policer to outgoing packets, use the **policer output** ***policer-name*** statement.

   In this example, the CLI commands and output are based on rate-limiting the IPv4 input traffic at logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1 unit 0]
   user@host# set family inet policer input policer_IFL
   ```

Results Confirm the configuration of the interface by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      policer input policer_IFL;
      address 10.10.10.1/30;
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 20.20.20.1/30 {
        arp 20.20.20.2 mac 00:00:11:22:33:44;
      }
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 133
- Displaying Statistics for the Policer on page 133

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interface **ge-1/3/1.0**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface. The **Protocol inet** subsection contains a **Policer** field that would list the policer **policer_IFL** as an input or output logical interface policer as follows:

- **Input: policer_IFL-ge-1/3/1.0-log_int-i**
- **Output: policer_IFL-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to input traffic only.

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the **show policer** operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **policer_IFL**, the input and output policer names are displayed as follows:

- **policer_IFL-ge-1/3/1.0-log_int-i**
- **policer_IFL-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to input traffic only.

Example: Configuring a Three-Color Logical Interface (Aggregate) Policer

This example shows how to configure a two-rate three-color color-blind policer as a logical interface (aggregate) policer and apply the policer directly to Layer 2 input traffic at a supported logical interface.

- Requirements on page 134
- Overview on page 134
- Configuration on page 135
- Verification on page 138

Requirements

Before you begin, make sure that the logical interface to which you apply the three-color logical interface policer is hosted on a Gigabit Ethernet interface (**ge-**) or a 10-Gigabit Ethernet interface (**xe-**) on an MX Series router.

Overview

A two-rate three-color policer meters a traffic flow against a bandwidth limit and burst-size limit for guaranteed traffic, plus a second set of bandwidth and burst-size limits for peak traffic. Traffic that conforms to the limits for guaranteed traffic is categorized as green, and nonconforming traffic falls into one of two categories:

- Nonconforming traffic that does not exceed the bandwidth and burst-size limits for peak traffic is categorized as yellow.
- Nonconforming traffic that exceeds the bandwidth and burst-size limits for peak traffic is categorized as red.

A logical interface policer defines traffic rate-limiting rules that you can apply to multiple protocol families on the same logical interface without creating multiple instances of the policer.

NOTE: **You apply a logical interface policer directly to a logical interface at the logical unit level, and not by referencing the policer in a stateless firewall filter and then applying the filter to the logical interface at the protocol family level.**

Topology

In this example, you configure the two-rate three-color policer **trTCM2-cb** as a color-blind logical interface policer and apply the policer to incoming Layer 2 traffic on logical interface **ge-1/3/1.0**.

NOTE: **When using a three-color policer to rate-limit Layer 2 traffic, color-aware policing can be applied to egress traffic only.**

The policer defines guaranteed traffic rate limits such that traffic that conforms to the bandwidth limit of 40 Mbps with a 100 KB allowance for traffic bursting (based on the token-bucket formula) is categorized as green. As with any policed traffic, the packets in a green flow are implicitly set to a **low** loss priority and then transmitted.

Nonconforming traffic that falls within the peak traffic limits of a 60 Mbps bandwidth limit and a 200 KB allowance for traffic bursting (based on the token-bucket formula) is categorized as yellow. The packets in a yellow traffic flow are implicitly set to a **medium-high** loss priority and then transmitted.

Nonconforming traffic that exceeds the peak traffic limits are categorized as red. The packets in a red traffic flow are implicitly set to a **high** loss priority. In this example, the

optional policer action for red traffic (**loss-priority high then discard**) is configured, so packets in a red traffic flow are discarded instead of transmitted.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on page 135
- Configuring the Two-Rate Three-Color Policer as a Logical Interface Policer on page 136
- Applying the Three-Color Policer to the Layer 2 Input at the Logical Interface on page 137

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/3/1 vlan-tagging
set interfaces ge-1/3/1 unit 0 vlan-id 100
set interfaces ge-1/3/1 unit 0 family inet address 10.10.10.1/30
set interfaces ge-1/3/1 unit 1 vlan-id 101
set interfaces ge-1/3/1 unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
set firewall three-color-policer trTCM2-cb logical-interface-policer
set firewall three-color-policer trTCM2-cb two-rate color-blind
set firewall three-color-policer trTCM2-cb two-rate committed-information-rate 40m
set firewall three-color-policer trTCM2-cb two-rate committed-burst-size 100k
set firewall three-color-policer trTCM2-cb two-rate peak-information-rate 60m
set firewall three-color-policer trTCM2-cb two-rate peak-burst-size 200k
set firewall three-color-policer trTCM2-cb action loss-priority high then discard
set interfaces ge-1/3/1 unit 0 layer2-policer input-three-color trTCM2-cb
```

Configuring the Logical Interfaces

Step-by-Step Procedure

To configure the logical interfaces:

1. Enable configuration of the interface.

   ```
   [edit]
   user@host# edit interfaces ge-1/3/1
   ```

2. Configure single tagging.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set vlan-tagging
   ```

3. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 0 vlan-id 100
   user@host# set unit 0 family inet address 10.10.10.1/30
   ```

4. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   ```

```
user@host# set unit 1 vlan-id 101
user@host# set unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
```

Results Confirm the configuration of the logical interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      address 10.10.10.1/30;
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 20.20.20.1/30 {
        arp 20.20.20.2 mac 00:00:11:22:33:44;
      }
    }
  }
}
```

Configuring the Two-Rate Three-Color Policer as a Logical Interface Policer

Step-by-Step Procedure To configure the two-rate three-color policer as a logical interface policer:

1. Enable configuration of a three-color policer.

   ```
   [edit]
   user@host# edit firewall three-color-policer trTCM2-cb
   ```

2. Specify that the policer is a logical interface (aggregate) policer.

   ```
   [edit firewall three-color-policer trTCM2-cb]
   user@host# set logical-interface-policer
   ```

   A logical interface policer rate-limits traffic based on a percentage of the media rate of the physical interface underlying the logical interface to which the policer is applied, and the policer is applied directly to the interface rather than referenced by a firewall filter.

3. Specify that the policer is two-rate and color-blind.

   ```
   [edit firewall three-color-policer trTCM2-cb]
   user@host# set two-rate color-blind
   ```

   A color-aware three-color policer takes into account any coloring markings that might have been set for a packet by another traffic policer configured at a previous network node, and any preexisting color markings are used in determining the appropriate policing action for the packet.

Because you are applying this three-color policer applied to input at Layer 2, you must configure the policer to be color-blind.

4. Specify the policer traffic limits used to classify a green traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set two-rate committed-information-rate 40m
user@host# set two-rate committed-burst-size 100k
```

5. Specify the additional policer traffic limits used to classify a yellow or red traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set two-rate peak-information-rate 60m
user@host# set two-rate peak-burst-size 200k
```

6. (Optional) Specify the configured policer action for packets in a red traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set action loss-priority high then discard
```

In color-aware mode, the three-color policer configured action can increase the packet loss priority (PLP) level of a packet, but never decrease it. For example, if a color-aware three-color policer meters a packet with a medium PLP marking, it can raise the PLP level to high, but cannot reduce the PLP level to low.

Results Confirm the configuration of the three-color policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
three-color-policer trTCM2-cb {
    logical-interface-policer;
    action {
        loss-priority high then discard;
    }
    two-rate {
        color-blind;
        committed-information-rate 40m;
        committed-burst-size 100k;
        peak-information-rate 60m;
        peak-burst-size 200k;
    }
}
```

Applying the Three-Color Policer to the Layer 2 Input at the Logical Interface

Step-by-Step Procedure To apply the three-color policer to the Layer 2 input at the logical interface:

1. Enable application of Layer 2 logical interface policers.

```
[edit]
user@host# edit interfaces ge-1/3/1 unit 0
```

2. Apply the three-color logical interface policer to a logical interface input.

```
[edit interfaces ge-1/3/1 unit 0]
```

```
user@host# set layer2-policer input-three-color trTCM2-cb
```

Results Confirm the configuration of the logical interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
   vlan-tagging;
   unit 0 {
      vlan-id 100;
      layer2-policer {
         input-three-color trTCM2-cb;
      }
      family inet {
         address 10.10.10.1/30;
      }
   }
   unit 1 {
      vlan-id 101;
      family inet {
         address 20.20.20.1/30 {
            arp 20.20.20.2 mac 00:00:11:22:33:44;
         }
      }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 138
- Displaying Statistics for the Policer on page 139

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interface **ge-1/3/1.0**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface, and the **Protocol inet** section contains a **Policer** field that would list the policer **trTCM2-cb** as an input or output policer as follows:

- **Input: trTCM2-cb-ge-1/3/1.0-log_int-i**
- **Output: trTCM2-cb-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to in the input direction only.

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the show policer operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **trTCM2-cb**, the input and output policer names are displayed as follows:

- **trTCM2-cb-ge-1/3/1.0-log_int-i**
- **trTCM2-cb-e-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to input traffic only.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Guidelines for Applying Traffic Policers on page 24

Two-Color and Three-Color Physical Interface Policers

- Physical Interface Policer Overview on page 139
- Example: Configuring a Physical Interface Policer for Aggregate Traffic at a Physical Interface on page 141

Physical Interface Policer Overview

A *physical interface policer* is a two-color or three-color policer that defines traffic rate limiting that you can apply to input or output traffic for all the logical interfaces and protocol families configured on a physical interface, even if the logical interfaces belong to different routing instances. This feature is useful when you want to perform aggregate policing for different protocol families and different logical interfaces on the same physical interface.

For example, suppose that a provider edge (PE) router has numerous logical interfaces, each corresponding to a different customer, configured on the same link to a customer edge (CE) device. Now suppose that a customer wants to apply one set of rate limits aggregately for certain types of traffic on a single physical interface. To accomplish this, you could apply a single physical interface policer to the physical interface, which rate-limits all the logical interfaces configured on the interface and all the routing instances to which those interfaces belong.

To configure a single-rate two-color physical interface policer, include the **physical-interface-policer** statement at one of the following hierarchy levels:

- **[edit firewall** policer ***policer-name*****]**
- **[edit logical-system *logical-system-name* firewall** policer ***policer-name*****]**
- **[edit routing-instances *routing-instance-name* firewall** policer ***policer-name*****]**
- **[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* firewall** policer ***policer-name*****]**

To configure a single-rate or two-rate three-color physical interface policer, include the **physical-interface-policer** statement at one of the following hierarchy levels:

- **[edit firewall** three-color-policer ***policer-name*****]**
- **[edit logical-system *logical-system-name* firewall** three-color-policer ***policer-name*****]**
- **[edit routing-instances *routing-instance-name* firewall** three-color-policer ***policer-name*****]**
- **[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* firewall** three-color-policer ***policer-name*****]**

You apply a physical interface policer to Layer 3 traffic by referencing the policer from a stateless firewall filter term and then applying the filter to a logical interface. You cannot apply a physical interface to Layer 3 traffic directly to the interface configuration.

To reference a single-rate two-color policer from a stateless firewall filter term, use the **policer** nonterminating action. To reference a single-rate or two-rate three-color policer from a stateless firewall filter term, use the **three-color-policer** nonterminating action.

The following requirements apply to a stateless firewall filter that references a physical interface policer:

- You must configure the firewall filter for a specific, supported protocol family: **ipv4**, **ipv6**, **mpls**, **vpls**, or circuit cross-connect (**ccc**), but not for **family any**.
- You must configure the firewall filter as a *physical interface filter* by including the **physical-interface-filter** statement at the **[edit firewall family *family-name* filter *filter-name*]** hierarchy level.
- A firewall filter that is defined as a physical interface filter can reference a physical interface policer only.
- A firewall filter that is defined as a physical interface filter cannot reference a policer configured with the **interface-specific** statement.
- You cannot configure a firewall filter as both a physical interface filter and as a logical interface filter that also includes the **interface-specific** statement.

Example: Configuring a Physical Interface Policer for Aggregate Traffic at a Physical Interface

This example shows how to configure a single-rate two-color policer as a physical interface policer.

- Requirements on page 141
- Overview on page 141
- Configuration on page 142
- Verification on page 146

Requirements

No special configuration beyond device initialization is required before configuring this example.

Overview

A *physical interface policer* specifies rate-limiting for aggregate traffic, which encompasses all protocol families and logical interfaces configured on a physical interface, even if the interfaces belong to different routing instances.

You can apply a physical interface policer to Layer 3 input or output traffic only by referencing the policer from a stateless firewall filter that is configured for specific a specific protocol family (not for **family any**) and configured as a physical interface filter. You configure the filter terms with match conditions that select the types of packets you want to rate-limit, and you specify the physical interface policer as the action to apply to matched packets.

Topology

The physical interface policer in this example, **shared-policer-A**, rate-limits to 100,000,000 bps and permits a maximum burst of traffic of 500,000 bytes. You configure the policer to discard packets in nonconforming flows, but you could instead configure the policer to re-mark nonconforming traffic with a forwarding class, a packet loss priority (PLP) level, or both.

To be able to use the policer to rate-limit IPv4 traffic, you reference the policer from an IPv4 physical interface filter. For this example, you configure the filter to pass the policer IPv4 packets that meet either of the following match terms:

- Packets received through TCP and with the IP precedence fields **critical-ecp** (0xa0), **immediate** (0x40), or **priority** (0x20)
- Packets received through TCP and with the IP precedence fields **internet-control** (0xc0) or **routine** (0x00)

You could also reference the policer from physical interface filters for other protocol families.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on the Physical Interface on page 142
- Configuring a Physical Interface Policer on page 143
- Configuring an IPv4 Physical Interface Filter on page 144
- Applying the IPv4 Physical interface Filter to a Physical Interface on page 145

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces so-1/0/0 unit 0 family inet address 192.168.1.1/24
set interfaces so-1/0/0 unit 0 family vpls
set interfaces so-1/0/0 unit 1 family mpls
set firewall policer shared-policer-A physical-interface-policer
set firewall policer shared-policer-A if-exceeding bandwidth-limit 100m burst-size-limit
  500k
set firewall policer shared-policer-A then discard
set firewall family inet filter ipv4-filter physical-interface-filter
set firewall family inet filter ipv4-filter term tcp-police-1 from precedence [ critical-ecp
  immediate priority ]
set firewall family inet filter ipv4-filter term tcp-police-1 from protocol tcp
set firewall family inet filter ipv4-filter term tcp-police-1 then policer shared-policer-A
set firewall family inet filter ipv4-filter term tcp-police-2 from precedence [ internet-control
  routine ]
set firewall family inet filter ipv4-filter term tcp-police-2 from protocol tcp
set firewall family inet filter ipv4-filter term tcp-police-2 then policer shared-policer-A
set interfaces so-1/0/0 unit 0 family inet filter input ipv4-filter
```

Configuring the Logical Interfaces on the Physical Interface

Step-by-Step Procedure

To configure the logical interfaces on the physical interface:

1. Enable configuration of logical interfaces.

   ```
   [edit]
   user@host# edit interfaces so-1/0/0
   ```

2. Configure protocol families on logical unit 0.

   ```
   [edit interfaces so-1/0/0]
   user@host# set unit 0 family inet address 192.168.1.1/24
   user@host# set unit 0 family vpls
   ```

3. Configure protocol families on logical unit 1.

   ```
   [edit interfaces so-1/0/0]
   user@host# set unit 1 family mpls
   ```

Results Confirm the configuration of the firewall filter by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-1/0/0 {
  unit 0 {
    family inet {
      address 192.168.1.1/24;
    }
    family vpls;
  }
  unit 1 {
    family mpls;
  }
}
```

Configuring a Physical Interface Policer

Step-by-Step Procedure To configure a physical interface policer:

1. Enable configuration of the two-color policer.

   ```
   [edit]
   user@host# edit firewall policer shared-policer-A
   ```

2. Configure the type of two-color policer.

   ```
   [edit firewall policer shared-policer-A]
   user@host# set physical-interface-policer
   ```

3. Configure the traffic limits and the action for packets in a nonconforming traffic flow.

   ```
   [edit firewall policer shared-policer-A]
   user@host# set if-exceeding bandwidth-limit 100m burst-size-limit 500k
   user@host# set then discard
   ```

   For a physical interface filter, the actions you can configure for packets in a nonconforming traffic flow are to discard the packets, assign a forwarding class, assign a PLP value, or assign both a forwarding class and a PLP value.

Results Confirm the configuration of the policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
policer shared-policer-A {
  physical-interface-policer;
  if-exceeding {
    bandwidth-limit 100m;
    burst-size-limit 500k;
  }
  then discard;
}
```

Configuring an IPv4 Physical Interface Filter

Step-by-Step Procedure

To configure a physical interface policer as the action for terms in an IPv4 physical interface policer:

1. Configure a standard stateless firewall filter under a specific protocol family.

   ```
   [edit]
   user@host# edit firewall family inet filter ipv4-filter
   ```

   You cannot configure a physical interface firewall filter for **family any**.

2. Configure the filter as a physical interface filter so that you can apply the physical interface policer as an action.

   ```
   [edit firewall family inet filter ipv4-filter]
   user@host# set physical-interface-filter
   ```

3. Configure the first term to match IPv4 packets received through TCP with the IP precedence fields **critical-ecp**, **immediate**, or **priority** and to apply the physical interface policer as a filter action.

   ```
   [edit firewall family inet filter ipv4-filter]
   user@host# set term tcp-police-1 from precedence [ critical-ecp immediate priority
     ]
   user@host# set term tcp-police-1 from protocol tcp
   user@host# set term tcp-police-1 then policer shared-policer-A
   ```

4. Configure the first term to match IPv4 packets received through TCP with the IP precedence fields **internet-control** or **routine** and to apply the physical interface policer as a filter action.

   ```
   [edit firewall family inet filter ipv4-filter]
   user@host# set term tcp-police-2 from precedence [ internet-control routine ]
   user@host# set term tcp-police-2 from protocol tcp
   user@host# set term tcp-police-2 then policer shared-policer-A
   ```

Results

Confirm the configuration of the firewall filter by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
family inet {
  filter ipv4-filter {
    physical-interface-filter;
    term tcp-police-1 {
      from {
        precedence [ critical-ecp immediate priority ];
        protocol tcp;
      }
      then policer shared-policer-A;
    }
    term tcp-police-2 {
      from {
        precedence [ internet-control routine ];
        protocol tcp;
```

```
        }
        then policer shared-policer-A;
      }
    }
  }
  policer shared-policer-A {
    physical-interface-policer;
    if-exceeding {
      bandwidth-limit 100m;
      burst-size-limit 500k;
    }
    then discard;
  }
```

Applying the IPv4 Physical interface Filter to a Physical Interface

Step-by-Step Procedure

To apply the physical interface filter to a physical interface:

1. Enable configuration of IPv4 on the logical interface.

   ```
   [edit]
   user@host# edit interfaces so-1/0/0 unit 0 family inet
   ```

2. Apply the IPv4 physical interface filter in the input direction.

   ```
   [edit interfaces so-1/0/0 unit 0 family inet]
   user@host# set filter input ipv4-filter
   ```

Results

Confirm the configuration of the firewall filter by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-1/0/0 {
  unit 0 {
    family inet {
      filter {
        input ipv4-filter;
      }
      address 192.168.1.1/24;
    }
    family vpls;
  }
  unit 1 {
    family mpls;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying the Firewall Filters Applied to an Interface on page 146
- Displaying the Number of Packets Processed by the Policer at the Logical Interface on page 146

Displaying the Firewall Filters Applied to an Interface

Purpose Verify that the firewall filter **ipv4-filter** is applied to the IPv4 input traffic at logical interface **so-1/0/0.0**.

Action Use the **show interfaces statistics** operational mode command for logical interface **so-1/0/0.0**, and include the **detail** option. In the **Protocol inet** section of the command output, the **Input Filters** field shows that the firewall filter **ipv4-filter** is applied in the input direction.

```
user@host> show interfaces statistics so-1/0/0 detail
  Logical interface so-1/0/0.0 (Index 79) (SNMP ifIndex 510) (Generation 149)
    Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 4470, Generation: 173, Route table: 0
      Flags: Sendbcast-pkt-to-re, Protocol-Down
      Input Filters: ipv4-filter
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.39/16, Local: 10.39.1.1, Broadcast: 10.39.255.255,
Generation: 163
```

Displaying the Number of Packets Processed by the Policer at the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show firewall** operational mode command for the filter you applied to the logical interface.

```
user@host> show firewall filter ipv4-filter
Filter: ipv4-filter
Policers:
Name                                                Packets
shared-policer-A-tcp-police-1                         32863
shared-policer-A-tcp-police-2                          3870
```

The command output displays the name of policer (**shared-policer-A**), the name of the filter term (**police-1**) under which the policer action is specified, and the number of packets that matched the filter term. This is only the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.

Related Documentation

- "Firewall Filter Match Conditions Based on Numbers or Text Aliases" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- "Firewall Filter Match Conditions Based on Bit-Field Values" in the *Junos OS Firewall Filter and Policer Configuration Guide*

- “Firewall Filter Match Conditions Based on Address Fields” in the *Junos OS Firewall Filter and Policer Configuration Guide*
- “Firewall Filter Match Conditions Based on Address Classes” in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Statement Hierarchy for Configuring Policers on page 13
- Two-Color Policer Configuration Overview on page 15
- Three-Color Policer Configuration Overview on page 19
- Guidelines for Applying Traffic Policers on page 24
- **physical-interface-filter on page 200**
- **physical-interface-policer on page 201**

CHAPTER 8

Layer 2 Policers

- Hierarchical Policers on page 149
- Two-Color and Three-Color Policers at Layer 2 on page 156

Hierarchical Policers

- Hierarchical Policer Overview on page 149
- Example: Configuring a Hierarchical Policer on page 151

Hierarchical Policer Overview

You can use a hierarchical policer to rate-limit ingress Layer 2 traffic at a physical or logical interface and apply different policing actions based on whether the packets are classified for expedited forwarding (EF) or for a lower priority.

Hierarchical policing is supported on SONET interfaces hosted on M40e, M120, and M320 edge routers with incoming Flexible PIC Concentrators (FPCs) as SFPC and outgoing FPCs as FFPC, and on MX Series, T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs.

You can apply hierarchical policing to a physical interface or a logical interface. Applied to a physical interface configuration, a hierarchical policer rate-limits ingress Layer 2 traffic for all protocol families and logical interfaces configured on the physical interface. Applied to a logical interface configured with at least one protocol family, a hierarchical policer rate-limits ingress Layer 2 traffic for all protocol families configured on the logical interface. If you apply a hierarchical policer at a physical interface, you cannot also apply a hierarchical policer to any of the member logical interfaces.

A hierarchical policer configuration defines two policers—one for EF traffic only and another for non-EF traffic—that function in a hierarchical manner:

- Premium policer—You configure the premium policer with traffic limits for high-priority EF traffic only: a guaranteed bandwidth and a corresponding burst-size limit. EF traffic is categorized as nonconforming when its average arrival rate exceeds the guaranteed bandwidth and its average packet size exceeds the premium burst-size limit. For a premium policer, the only configurable action for nonconforming traffic is to discard the packets.

- Aggregate policer—You configure the aggregate policer with an aggregate bandwidth (to accommodate both high-priority EF traffic up to the guaranteed bandwidth and normal-priority non-EF traffic) and a burst-size limit for non-EF traffic only. Non-EF traffic is categorized as nonconforming when its average arrival rate exceeds the amount of aggregate bandwidth not currently consumed by EF traffic and its average packet size exceeds the burst-size limit defined in the aggregate policer. For an aggregate policer, the configurable actions for nonconforming traffic are to discard the packets, assign a forwarding class, assign a packet loss priority (PLP) level, or assign both a forwarding class and a PLP level to the packets.

NOTE: **You must configure the bandwidth limit of the premium policer at or below the bandwidth limit of the aggregate policer. If the two bandwidth limits are equal, then non-EF traffic passes through the interface unrestricted only while no EF traffic arrives at the interface.**

EF traffic is guaranteed the bandwidth specified as the premium bandwidth limit, while non-EF traffic is rate-limited to the amount of aggregate bandwidth not currently consumed by the EF traffic. Non-EF traffic is rate-limited to the entire aggregate bandwidth only while no EF traffic is present.

For example, suppose that you configure a hierarchical policer with the following components:

- Premium policer with bandwidth limit set to 2 Mbps, burst-size limit set to 3000 bytes, and nonconforming action set to discard packets.
- Aggregate policer with bandwidth limit set to 10 Mbps, burst-size limit set to 3000 bytes, and nonconforming action set to discard packets.

EF traffic is guaranteed a bandwidth of 2 Mbps. Bursts of EF traffic—EF traffic that arrives at the interface at rates above 2 Mbps—can also pass through the interface provided sufficient tokens are available in the 3000-byte bucket. When no tokens are available for a burst of non-EF traffic, packets are rate-limited using policing actions for the premium policer.

Non-EF traffic is metered to a bandwidth limit that ranges between 8 Mbps and 10 Mbps, depending on the average arrival rate of the EF traffic. Bursts of non-EF traffic—non-EF traffic that arrives at the interface at rates above the current limit for non-EF traffic—also pass through the interface provided sufficient tokens are available in the 3000-byte bucket. When non-EF traffic exceeds the currently allowed bandwidth or when no tokens are available for a burst of non-EF traffic, packets are rate-limited using policing actions for the aggregate policer.

Example: Configuring a Hierarchical Policer

This example shows how to configure a hierarchical policer and apply the policer to ingress Layer 2 traffic at a logical interface on a supported platform.

- Requirements on page 151
- Overview on page 151
- Configuration on page 151
- Verification on page 155

Requirements

Before you begin, be sure that your environment meets the following requirements:

- The interface on which you apply the hierarchical policer is a SONET interface hosted on one of the following routing platforms:
  - M40e, M120, or M320 edge router with incoming FPCs as SFPC and outgoing FPCs as FFPC.
  - MX Series, T320, T640, or T1600 core router with Enhanced Intelligent Queuing (IQE) PICs.
- No other policer is applied to the input of the interface on which you apply the hierarchical policer.
- You are aware that, if you apply the hierarchical policer to logical interface on which an input filter is also applied, the policer is executed first.

Overview

In this example, you configure a hierarchical policer and apply the policer to ingress Layer 2 traffic at a logical interface.

Topology

You apply the policer to the SONET logical interface **so-1/0/0.0**, which you configure for IPv4 and VPLS traffic. When you apply the hierarchical policer to that logical interface, both IPv4 and VPLS traffic is hierarchically rate-limited.

You also configure the logical interface **so-1/0/0.1** for MPLS traffic. If you choose to apply the hierarchical policer to physical interface **so-1/0/0**, hierarchical policing would apply to IPv4 and VPLS traffic at **so-1/0/0.0** and to MPLS traffic at **so-1/0/0.1**.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Defining the Interfaces on page 152
- Defining the Forwarding Classes on page 153
- Configuring the Hierarchical Policer on page 153
- Applying the Hierarchical Policer to Layer 2 Ingress Traffic at a Physical or Logical Interface on page 154

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces so-1/0/0 unit 0 family inet address 192.168.1.1/24
set interfaces so-1/0/0 unit 0 family vpls
set interfaces so-1/0/0 unit 1 family mpls
set class-of-service forwarding-classes class fc0 queue-num 0 priority high
  policing-priority premium
set class-of-service forwarding-classes class fc1 queue-num 1 priority low policing-priority
  normal
set class-of-service forwarding-classes class fc2 queue-num 2 priority low policing-priority
  normal
set class-of-service forwarding-classes class fc3 queue-num 3 priority low policing-priority
  normal
set firewall hierarchical-policer policer1 aggregate if-exceeding bandwidth-limit 300m
  burst-size-limit 30k
set firewall hierarchical-policer policer1 aggregate then forwarding-class fc1
set firewall hierarchical-policer policer1 premium if-exceeding bandwidth-limit 100m
  burst-size-limit 50k
set firewall hierarchical-policer policer1 premium then discard
set interfaces so-1/0/0 unit 0 layer2-policer input-hierarchical-policer policer1
```

Defining the Interfaces

Step-by-Step Procedure

To define the interfaces:

1. Enable configuration of the physical interface.

   ```
   [edit]
   user@host# edit interfaces so-1/0/0
   ```

2. Configure logical unit 0.

   ```
   [edit interfaces so-1/0/0]
   user@host# set unit 0 family inet address 192.168.1.1/24
   user@host# set unit 0 family vpls
   ```

   If you apply a Layer 2 policer to this logical interface, you must configure at least one protocol family.

3. Configure logical unit 1.

   ```
   [edit interfaces so-1/0/0]
   user@host# set unit 1 family mpls
   ```

Results Confirm the configuration of the interfaces by entering the **show interfaces** configuration command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-1/0/0 {
  unit 0 {
    family inet {
      address 192.168.1.1/24;
    }
    family vpls;
  }
  unit 1 {
    family mpls;
  }
}
```

Defining the Forwarding Classes

Step-by-Step Procedure To define the forwarding classes referenced as aggregate policer actions:

1. Enable configuration of the forwarding classes.

```
[edit]
user@host# edit class-of-service forwarding-classes
```

2. Define the forwarding classes.

```
[edit class-of-service forwarding-classes]
user@host# set class fc0 queue-num 0 priority high policing-priority premium
user@host# set class fc1 queue-num 1 priority low policing-priority normal
user@host# set class fc2 queue-num 2 priority low policing-priority normal
user@host# set class fc3 queue-num 3 priority low policing-priority normal
```

Results Confirm the configuration of the forwarding classes referenced as aggregate policer actions by entering the **show class-of-service** configuration command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show class-of-service
forwarding-classes {
  class fc0 queue-num 0 priority high policing-priority premium;
  class fc1 queue-num 1 priority low policing-priority normal;
  class fc2 queue-num 2 priority low policing-priority normal;
  class fc3 queue-num 3 priority low policing-priority normal;
}
```

Configuring the Hierarchical Policer

Step-by-Step Procedure To configure a hierarchical policer:

1. Enable configuration of the hierarchical policer.

```
[edit]
user@host# edit firewall hierarchical-policer policer1
```

2. Configure the aggregate policer.

```
[edit firewall hierarchical-policer policer1]
user@host# set aggregate if-exceeding bandwidth-limit 300m burst-size-limit 30k
user@host# set aggregate then forwarding-class fc1
```

For the aggregate policer, the configurable actions for a packet in a nonconforming flow are to discard the packet, change the loss priority, change the forwarding class, or change both the loss priority and the forwarding class.

3. Configure the premium policer.

```
[edit firewall hierarchical-policer policer1]
user@host# set premium if-exceeding bandwidth-limit 100m burst-size-limit 50k
user@host# set premium then discard
```

The bandwidth limit for the premium policer must not be greater than that of the aggregate policer.

For the premium policer, the only configurable action for a packet in a nonconforming traffic flow is to discard the packet.

Results Confirm the configuration of the hierarchical policer by entering the **show firewall** configuration command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
hierarchical-policer policer1 {
  aggregate {
    if-exceeding {
      bandwidth-limit 300m;
      burst-size-limit 30k;
    }
    then {
      forwarding-class fc1;
    }
  }
  premium {
    if-exceeding {
      bandwidth-limit 100m;
      burst-size-limit 50k;
    }
    then {
      discard;
    }
  }
}
```

Applying the Hierarchical Policer to Layer 2 Ingress Traffic at a Physical or Logical Interface

Step-by-Step Procedure To hierarchically rate-limit Layer 2 ingress traffic for IPv4 and VPLS traffic only on logical interface **so-1/0/0.0**, reference the policer from the logical interface configuration:

1. Enable configuration of the logical interface.

```
[edit]
```

```
user@host# edit interfaces so-1/0/0 unit 0
```

When you apply a policer to Layer 2 traffic at a logical interface, you must define at least one protocol family for the logical interface.

2. Apply the policer to the logical interface.

```
[edit]
user@host# set layer2-policer input-hierarchical-policer policer1
```

Alternatively, to hierarchically rate-limit Layer 2 ingress traffic for all protocol families and for *all logical interfaces* configured on physical interface **so-1/0/0**, you could reference the policer from the physical interface configuration.

Results Confirm the configuration of the hierarchical policer by entering the **show interfaces** configuration command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
so-1/0/0 {
  unit 0 {
    layer2-policer {
      input-hierarchical-policer policer1;
    }
    family inet {
      address 192.168.1.1/24;
    }
    family vpls;
  }
  unit 1 {
    family mpls;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 155
- Displaying Statistics for the Policer on page 156

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interface **so-1/0/0.0**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface, and the **Protocol inet** section contains a **Policer** field that would list the policer **policer1** as an input or output policer as follows:

- **Input: policer1-so-1/0/0.0-inet-i**
- **Output: policer1-so-1/0/0.0-inet-o**

In this example, the policer is applied to logical interface traffic in the input direction only.

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the show policer operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **policer1**, the input and output policer names are displayed as follows:

- **policer1-so-1/0/0.0-inet-i**
- **policer1-so-1/0/0.0-inet-o**

The **-inet-i** suffix denotes a policer applied to IPv4 input traffic, while the **-inet-o** suffix denotes a policer applied to IPv4 output traffic. In this example, the policer is applied to input traffic only.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Hierarchical Policer Configuration Overview on page 22
- Guidelines for Applying Traffic Policers on page 24

Two-Color and Three-Color Policers at Layer 2

- Two-Color Policing at Layer 2 Overview on page 156
- Three-Color Policing at Layer 2 Overview on page 158
- Example: Configuring a Three-Color Logical Interface (Aggregate) Policer on page 159

Two-Color Policing at Layer 2 Overview

This topic covers the following information:

- Guidelines for Configuring Two-Color Policing of Layer 2 Traffic on page 157
- Statement Hierarchy for Configuring a Two-Color Policer for Layer 2 Traffic on page 157
- Statement Hierarchy for Applying a Two-Color Policer to Layer 2 Traffic on page 157

Guidelines for Configuring Two-Color Policing of Layer 2 Traffic

The following guidelines apply to two-color policing of Layer 2 traffic:

- You can apply a two-color policer to ingress or egress Layer 2 traffic at a logical interface hosted on a Gigabit Ethernet interface (**ge-**) or a 10-Gigabit Ethernet interface (**xe-**) only.
- A single logical interface supports Layer 2 policing in both directions.
- You can apply a two-color policer to Layer 2 traffic as a logical interface policer only. You cannot apply a two-color policer to Layer 2 traffic as a stateless firewall filter action.
- You can apply a two-color policer to Layer 2 traffic by referencing the policer in the interface configuration at the logical unit level, and not at the protocol level.

For information about configuring three-color policing of Layer 2 traffic, see "Three-Color Policing at Layer 2 Overview" on page 158.

Statement Hierarchy for Configuring a Two-Color Policer for Layer 2 Traffic

To enable a single-rate two-color policer to rate-limit Layer 2 traffic, include the **logical-interface-policer** statement in the **policer** configuration.

```
firewall {
    policer policer-name {
        logical-interface-policer;
        if-exceeding {
            (bandwidth-limit bps | bandwidth-percent percentage);
            burst-size-limit bytes;
        }
        then {
            discard;
            forwarding-class class-name;
            loss-priority (high | low | medium-high | medium-low);
        }
    }
}
```

You can include the configuration at the following hierarchy levels:

- **[edit]**
- **[edit logical-systems *logical-system-name*]**

Statement Hierarchy for Applying a Two-Color Policer to Layer 2 Traffic

To apply a logical interface policer to Layer 2 traffic, include the **layer2-policer input-policer *policer-name*** statement or the **layer2-policer output-policer *policer-name*** statement to a supported logical interface. Use the **input-policer** or **output-policer** statements to apply a two-color policer at Layer 2.

```
interfaces {
    (ge-fpc/pic/port | xe-fpc/pic/port) {
        unit unit-number {
```

```
        layer2-policer {
          input-policer policer-name;
          output-policer policer-name;
        }
      }
    }
  }
```

You can include the configuration at the following hierarchy levels:

- **[edit]**
- **[edit logical-systems *logical-system-name*]**

Three-Color Policing at Layer 2 Overview

This topic covers the following information:

- Guidelines for Configuring Three-Color Policing of Layer 2 Traffic on page 158
- Statement Hierarchy for Configuring a Three-Color Policer for Layer 2 Traffic on page 158
- Statement Hierarchy for Applying a Three-Color Policer to Layer 2 Traffic on page 159

Guidelines for Configuring Three-Color Policing of Layer 2 Traffic

The following guidelines apply to three-color policing of Layer 2 traffic:

- You can apply a three-color policer to Layer 2 traffic at a logical interface hosted on a Gigabit Ethernet interface (**ge-**) or a 10-Gigabit Ethernet interface (**xe-**) only.
- A single logical interface supports Layer 2 policing in both directions.
- You can apply a three-color policer to Layer 2 traffic as a logical interface policer only. You cannot apply a two-color policer to Layer 2 traffic as a stateless firewall filter action.
- You can apply a three-color policer to Layer 2 traffic by referencing the policer in the interface configuration at the logical unit level, and not at the protocol level.
- You can apply a color-aware three-color policer to Layer 2 traffic in the egress direction only, but you apply a color-blind three-color policer to Layer 2 traffic in either direction.

For information about configuring two-color policing of Layer 2 traffic, see "Two-Color Policing at Layer 2 Overview" on page 156.

Statement Hierarchy for Configuring a Three-Color Policer for Layer 2 Traffic

To enable a single-rate or two-rate three-color policer to rate-limit Layer 2 traffic, include the **logical-interface-policer** statement in the **three-color-policer** configuration.

```
firewall {
  three-color-policer policer-name {
    action {
      loss-priority high then discard;
    }
    logical-interface-policer;
    single-rate {
```

```
        (color-aware | color-blind);
        committed-burst-size bytes;
        committed-information-rate bps;
        excess-burst-size bytes;
      }
      two-rate {
        (color-aware | color-blind);
        committed-burst-size bytes;
        committed-information-rate bps;
        peak-burst-size bytes;
        peak-information-rate bps;
      }
    }
  }
```

You can include the configuration at the following hierarchy levels:

- **[edit]**
- **[edit logical-systems *logical-system-name*]**

Statement Hierarchy for Applying a Three-Color Policer to Layer 2 Traffic

To apply a logical interface policer to Layer 2 traffic, include the **layer2-policer** statement for a supported logical interface at the logical unit level. Use the **input-three-color *policer-name*** statement or **output-three-color *policer-name*** statement to specify the direction of the traffic to be policed.

```
interfaces {
  (ge-fpc/pic/port | xe-fpc/pic/port) {
    unit unit-number {
      layer2-policer {
        input-three-color policer-name;
        output-three-color policer-name;
      }
    }
  }
}
```

You can include the configuration at the following hierarchy levels:

- **[edit]**
- **[edit logical-systems *logical-system-name*]**

Example: Configuring a Three-Color Logical Interface (Aggregate) Policer

This example shows how to configure a two-rate three-color color-blind policer as a logical interface (aggregate) policer and apply the policer directly to Layer 2 input traffic at a supported logical interface.

- Requirements on page 160
- Overview on page 160
- Configuration on page 161
- Verification on page 164

Requirements

Before you begin, make sure that the logical interface to which you apply the three-color logical interface policer is hosted on a Gigabit Ethernet interface (**ge-**) or a 10-Gigabit Ethernet interface (**xe-**) on an MX Series router.

Overview

A two-rate three-color policer meters a traffic flow against a bandwidth limit and burst-size limit for guaranteed traffic, plus a second set of bandwidth and burst-size limits for peak traffic. Traffic that conforms to the limits for guaranteed traffic is categorized as green, and nonconforming traffic falls into one of two categories:

- Nonconforming traffic that does not exceed the bandwidth and burst-size limits for peak traffic is categorized as yellow.
- Nonconforming traffic that exceeds the bandwidth and burst-size limits for peak traffic is categorized as red.

A logical interface policer defines traffic rate-limiting rules that you can apply to multiple protocol families on the same logical interface without creating multiple instances of the policer.

NOTE: **You apply a logical interface policer directly to a logical interface at the logical unit level, and not by referencing the policer in a stateless firewall filter and then applying the filter to the logical interface at the protocol family level.**

Topology

In this example, you configure the two-rate three-color policer **trTCM2-cb** as a color-blind logical interface policer and apply the policer to incoming Layer 2 traffic on logical interface **ge-1/3/1.0**.

NOTE: **When using a three-color policer to rate-limit Layer 2 traffic, color-aware policing can be applied to egress traffic only.**

The policer defines guaranteed traffic rate limits such that traffic that conforms to the bandwidth limit of 40 Mbps with a 100 KB allowance for traffic bursting (based on the token-bucket formula) is categorized as green. As with any policed traffic, the packets in a green flow are implicitly set to a **low** loss priority and then transmitted.

Nonconforming traffic that falls within the peak traffic limits of a 60 Mbps bandwidth limit and a 200 KB allowance for traffic bursting (based on the token-bucket formula) is categorized as yellow. The packets in a yellow traffic flow are implicitly set to a **medium-high** loss priority and then transmitted.

Nonconforming traffic that exceeds the peak traffic limits are categorized as red. The packets in a red traffic flow are implicitly set to a **high** loss priority. In this example, the

optional policer action for red traffic (**loss-priority high then discard**) is configured, so packets in a red traffic flow are discarded instead of transmitted.

Configuration

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see "Using the CLI Editor in Configuration Mode" on page 217.

To configure this example, perform the following tasks:

- Configuring the Logical Interfaces on page 161
- Configuring the Two-Rate Three-Color Policer as a Logical Interface Policer on page 162
- Applying the Three-Color Policer to the Layer 2 Input at the Logical Interface on page 163

CLI Quick Configuration

To quickly configure this example, copy the following configuration commands into a text file, remove any line breaks, and then paste the commands into the CLI at the **[edit]** hierarchy level.

```
set interfaces ge-1/3/1 vlan-tagging
set interfaces ge-1/3/1 unit 0 vlan-id 100
set interfaces ge-1/3/1 unit 0 family inet address 10.10.10.1/30
set interfaces ge-1/3/1 unit 1 vlan-id 101
set interfaces ge-1/3/1 unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
set firewall three-color-policer trTCM2-cb logical-interface-policer
set firewall three-color-policer trTCM2-cb two-rate color-blind
set firewall three-color-policer trTCM2-cb two-rate committed-information-rate 40m
set firewall three-color-policer trTCM2-cb two-rate committed-burst-size 100k
set firewall three-color-policer trTCM2-cb two-rate peak-information-rate 60m
set firewall three-color-policer trTCM2-cb two-rate peak-burst-size 200k
set firewall three-color-policer trTCM2-cb action loss-priority high then discard
set interfaces ge-1/3/1 unit 0 layer2-policer input-three-color trTCM2-cb
```

Configuring the Logical Interfaces

Step-by-Step Procedure

To configure the logical interfaces:

1. Enable configuration of the interface.

   ```
   [edit]
   user@host# edit interfaces ge-1/3/1
   ```

2. Configure single tagging.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set vlan-tagging
   ```

3. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   user@host# set unit 0 vlan-id 100
   user@host# set unit 0 family inet address 10.10.10.1/30
   ```

4. Configure logical interface **ge-1/3/1.0**.

   ```
   [edit interfaces ge-1/3/1]
   ```

```
user@host# set unit 1 vlan-id 101
user@host# set unit 1 family inet address 20.20.20.1/30 arp 20.20.20.2 mac
  00:00:11:22:33:44
```

Results Confirm the configuration of the logical interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
  vlan-tagging;
  unit 0 {
    vlan-id 100;
    family inet {
      address 10.10.10.1/30;
    }
  }
  unit 1 {
    vlan-id 101;
    family inet {
      address 20.20.20.1/30 {
        arp 20.20.20.2 mac 00:00:11:22:33:44;
      }
    }
  }
}
```

Configuring the Two-Rate Three-Color Policer as a Logical Interface Policer

Step-by-Step Procedure To configure the two-rate three-color policer as a logical interface policer:

1. Enable configuration of a three-color policer.

   ```
   [edit]
   user@host# edit firewall three-color-policer trTCM2-cb
   ```

2. Specify that the policer is a logical interface (aggregate) policer.

   ```
   [edit firewall three-color-policer trTCM2-cb]
   user@host# set logical-interface-policer
   ```

   A logical interface policer rate-limits traffic based on a percentage of the media rate of the physical interface underlying the logical interface to which the policer is applied, and the policer is applied directly to the interface rather than referenced by a firewall filter.

3. Specify that the policer is two-rate and color-blind.

   ```
   [edit firewall three-color-policer trTCM2-cb]
   user@host# set two-rate color-blind
   ```

   A color-aware three-color policer takes into account any coloring markings that might have been set for a packet by another traffic policer configured at a previous network node, and any preexisting color markings are used in determining the appropriate policing action for the packet.

Because you are applying this three-color policer applied to input at Layer 2, you must configure the policer to be color-blind.

4. Specify the policer traffic limits used to classify a green traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set two-rate committed-information-rate 40m
user@host# set two-rate committed-burst-size 100k
```

5. Specify the additional policer traffic limits used to classify a yellow or red traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set two-rate peak-information-rate 60m
user@host# set two-rate peak-burst-size 200k
```

6. (Optional) Specify the configured policer action for packets in a red traffic flow.

```
[edit firewall three-color-policer trTCM2-cb]
user@host# set action loss-priority high then discard
```

In color-aware mode, the three-color policer configured action can increase the packet loss priority (PLP) level of a packet, but never decrease it. For example, if a color-aware three-color policer meters a packet with a medium PLP marking, it can raise the PLP level to high, but cannot reduce the PLP level to low.

Results Confirm the configuration of the three-color policer by entering the **show firewall** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show firewall
three-color-policer trTCM2-cb {
    logical-interface-policer;
    action {
        loss-priority high then discard;
    }
    two-rate {
        color-blind;
        committed-information-rate 40m;
        committed-burst-size 100k;
        peak-information-rate 60m;
        peak-burst-size 200k;
    }
}
```

Applying the Three-Color Policer to the Layer 2 Input at the Logical Interface

Step-by-Step Procedure To apply the three-color policer to the Layer 2 input at the logical interface:

1. Enable application of Layer 2 logical interface policers.

```
[edit]
user@host# edit interfaces ge-1/3/1 unit 0
```

2. Apply the three-color logical interface policer to a logical interface input.

```
[edit interfaces ge-1/3/1 unit 0]
```

```
user@host# set layer2-policer input-three-color trTCM2-cb
```

Results Confirm the configuration of the logical interfaces by entering the **show interfaces** configuration mode command. If the command output does not display the intended configuration, repeat the instructions in this procedure to correct the configuration.

```
[edit]
user@host# show interfaces
ge-1/3/1 {
   vlan-tagging;
   unit 0 {
      vlan-id 100;
      layer2-policer {
         input-three-color trTCM2-cb;
      }
      family inet {
         address 10.10.10.1/30;
      }
   }
   unit 1 {
      vlan-id 101;
      family inet {
         address 20.20.20.1/30 {
            arp 20.20.20.2 mac 00:00:11:22:33:44;
         }
      }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Displaying Traffic Statistics and Policers for the Logical Interface on page 164
- Displaying Statistics for the Policer on page 165

Displaying Traffic Statistics and Policers for the Logical Interface

Purpose Verify the traffic flow through the logical interface and that the policer is evaluated when packets are received on the logical interface.

Action Use the **show interfaces** operational mode command for logical interface **ge-1/3/1.0**, and include the **detail** or **extensive** option. The command output section for **Traffic statistics** lists the number of bytes and packets received and transmitted on the logical interface, and the **Protocol inet** section contains a **Policer** field that would list the policer **trTCM2-cb** as an input or output policer as follows:

- **Input: trTCM2-cb-ge-1/3/1.0-log_int-i**
- **Output: trTCM2-cb-ge-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to in the input direction only.

Displaying Statistics for the Policer

Purpose Verify the number of packets evaluated by the policer.

Action Use the show policer operational mode command and optionally specify the name of the policer. The command output displays the number of packets evaluated by each configured policer (or the specified policer), in each direction. For the policer **trTCM2-cb**, the input and output policer names are displayed as follows:

- **trTCM2-cb-ge-1/3/1.0-log_int-i**
- **trTCM2-cb-e-1/3/1.0-log_int-o**

The **log_int-i** suffix denotes a logical interface policer applied to input traffic, while the **log_int-o** suffix denotes a logical interface policer applied to output traffic. In this example, the logical interface policer is applied to input traffic only.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Guidelines for Applying Traffic Policers on page 24
- layer2-policer on page 191
- logical-interface-policer on page 193
- policer (Configuring) on page 203
- three-color-policer (Configuring) on page 209

CHAPTER 9

Policer Configuration Statements

action

Syntax

```
action {
  loss-priority high then discard;
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall three-color-policer *name*],
[edit firewall three-color-policer *name*],
[edit logical-systems *logical-system-name* firewall three-color-policer *name*]

Release Information

Statement introduced in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... three-color-policer]** hierarchy level introduced in Junos OS Release 11.4.

Description

Discard traffic on a logical interface using tricolor marking policing.

NOTE: This statement is supported only on IQ2 interfaces.

The remaining statement is explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Basic Single-Rate Three-Color Policers on page 113
- Basic Two-Rate Three-Color Policers on page 119
- Two-Color and Three-Color Logical Interface Policers on page 127
- Two-Color and Three-Color Physical Interface Policers on page 139
- Two-Color and Three-Color Policers at Layer 2 on page 156
- **loss-priority high then discard on page 194**

aggregate (Hierarchical Policer)

Syntax

```
aggregate {
  if-exceeding {
    bandwidth-limit bandwidth;
    burst-size-limit burst;
  }
  then {
    discard;
  }
}
```

Hierarchy Level [edit dynamic-profiles *profile-name* firewall hierarchical-policer *name*],
[edit firewall hierarchical-policer]

Release Information Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... hierarchical-policer *name*]** hierarchy level introduced in Junos OS Release 11.4.

Description On M40e, M120, and M320 edge routers with Flexible PIC Concentrator (FPC) input as FFPC and FPC output as SFPC, and on MX Series, T320, T640, and T1600 edge routers with Enhanced Intelligent Queuing (IQE) PICs, configure an aggregate hierarchical policer.

The remaining statements are explained separately.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Hierarchical Policers on page 149
- bandwidth-limit (Hierarchical Policer) on page 169
- burst-size-limit (Hierarchical Policer) on page 174
- hierarchical-policer on page 186
- if-exceeding (Hierarchical Policer) on page 187
- premium (Hierarchical Policer) on page 207

bandwidth-limit (Hierarchical Policer)

Syntax bandwidth-limit *bps*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall hierarchical-policer aggregate if-exceeding],
[editdynamic-profiles *profile-name* firewall hierarchical-policer premium if-exceeding],
[edit firewall hierarchical-policer aggregate if-exceeding],
[edit firewall hierarchical-policer premium if-exceeding]

Release Information Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... if-exceeding]** hierarchy level introduced in Junos OS Release 11.4.

Description For M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs, configure the maximum average bandwidth for premium or aggregate traffic in a hierarchical policer.

Options *bps*—You can specify the number of bits per second either as a decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 32,000 through 50,000,000,000

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Calculation of Policer Burst-Size Limit on page 33
- **aggregate (Hierarchical Policer) on page 168**
- **burst-size-limit (Hierarchical Policer) on page 174**
- **premium (Hierarchical Policer) on page 207**

bandwidth-limit (Policer)

Syntax bandwidth-limit *bps*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name* if-exceeding],
[edit firewall policer *policer-name* if-exceeding],
[edit logical-systems *logical-system-name* policer *policer-name* if-exceeding]

Release Information Statement introduced before Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... if-exceeding]** hierarchy level introduced in Junos OS Release 11.4.

Description For a single-rate two-color policer, configure the bandwidth limit as a number of bits per second. Single-rate two-color policing uses the single token bucket algorithm to measure traffic-flow conformance to a two-color policer rate limit.

Traffic at the interface that conforms to the bandwidth limit is categorized green. Traffic that exceeds the specified rate is also categorized as green provided that sufficient tokens remain in the single token bucket. Packets in a green flow are implicitly marked with **low** packet loss priority (PLP) and then passed through the interface.

Traffic that exceeds the specified rate when insufficient tokens remain in the single token bucket is categorized red. Depending on the configuration of the two-color policer, packets in a red traffic flow might be implicitly discarded; or the packets might be re-marked with a specified forwarding class, a specified PLP, or both, and then passed through the interface.

NOTE: This statement specifies the bandwidth limit as an absolute number of bits per second. Alternatively, for single-rate two-color policers only, you can use the **bandwidth-percent** *percentage* statement to specify the bandwidth limit as a percentage of either the physical interface port speed or the configured logical interface shaping rate.

Single-rate two-color policing allows bursts of traffic for short periods, whereas single-rate and two-rate three-color policing allows more sustained bursts of traffic.

Hierarchical policing is a form of two-color policing that applies different policing actions based on whether the packets are classified for expedited forwarding (EF) or for a lower priority. You apply a hierarchical policer to ingress Layer 2 traffic to allows bursts of EF traffic for short period and bursts of non-EF traffic for short periods, with EF traffic always taking precedence over non-EF traffic.

Options *bps*—You can specify the number of bits per second either as a decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: (M Series, MX Series, and T Series routers) 8000 through 50,000,000,000

Default: None.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Calculation of Policer Burst-Size Limit on page 33
- **bandwidth-percent on page 172**
- **burst-size-limit (Policer) on page 175**

bandwidth-percent

Syntax bandwidth-percent *percentage*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name* if-exceeding],
[edit firewall policer *policer-name* if-exceeding],
[edit logical-systems *logical-system-name* policer *policer-name* if-exceeding]

Release Information Statement introduced before Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... if-exceeding]** hierarchy level introduced in Junos OS Release 11.4.

Description For a single-rate two-color policer, configure the bandwidth limit as a percentage value. Single-rate two-color policing uses the *single token bucket algorithm* to measure traffic-flow conformance to a two-color policer rate limit.

Traffic at the interface that conforms to the bandwidth limit is categorized green. Traffic that exceeds the specified rate is also categorized as green provided that sufficient tokens remain in the single token bucket. Packets in a green flow are implicitly marked with **low** packet loss priority and then passed through the interface.

Traffic that exceeds the specified rate when insufficient tokens remain in the single token bucket is categorized red. Depending on the configuration of the two-color policer, packets in a red traffic flow might be implicitly discarded; or the packets might be re-marked with a specified forwarding class, a specified PLP, or both, and then passed through the interface.

NOTE: This statement specifies the bandwidth limit as a percentage of either the physical interface port speed or the configured logical interface shaping rate. Alternatively, you can use the **bandwidth-limit** *bps* statement to specify the bandwidth limit as an absolute number of bits per second.

The function of the bandwidth limit is extended by the burst size (configured using the **burst-size-limit** *bytes* statement) to allow bursts of traffic up to a limit based on the overall traffic load:

- When a single-rate two-color policer is applied to the input or output traffic at an interface, the initial capacity for traffic bursting is equal to the number of bytes specified by this statement.
- During periods of relatively low traffic (traffic that arrives at or departs from the interface at overall rates below the token arrival rate), unused tokens accumulate in the bucket, but only up to the configured token bucket depth.

Single-rate two-color policing allows bursts of traffic for short periods, whereas single-rate and two-rate three-color policing allows more sustained bursts of traffic.

Hierarchical policing is a form of two-color policing that applies different policing actions based on whether the packets are classified for expedited forwarding (EF) or for a lower

priority. You apply a hierarchical policer to ingress Layer 2 traffic to allows bursts of EF traffic for short period and bursts of non-EF traffic for short periods, with EF traffic always taking precedence over non-EF traffic.

Options

percentage—Traffic rate as a percentage of either the physical interface media rate or the logical interface configured shaping rate. You can configure a shaping rate on a logical interface by using class-of-service statement.

NOTE: You cannot rate-limit based on bandwidth percentage for aggregate, tunnel, and software interfaces. The bandwidth percentage policer cannot be used for forwarding table filters. Bandwidth percentage policers can only be used for interface-specific filters.

Range: 0 through 100

Default: None.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Calculation of Policer Burst-Size Limit on page 33
- Bandwidth Policers on page 55
- **bandwidth-limit (Policer) on page 170**
- **burst-size-limit (Policer) on page 175**

burst-size-limit (Hierarchical Policer)

Syntax burst-size-limit *bytes*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall hierarchical-policer aggregate if-exceeding],
[editdynamic-profiles *profile-name* firewall hierarchical-policer premium if-exceeding],
[edit firewall hierarchical-policer aggregate if-exceeding],
[edit firewall hierarchical-policer premium if-exceeding]

Release Information Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... if exceeding]** hierarchy level introduced in Junos OS Release 11.4.

Description For M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs, configure the burst-size limit for premium or aggregate traffic in a hierarchical policer.

Options *bytes*—Burst-size limit in bytes. The minimum recommended value is the maximum transmission unit (MTU) of the IP packets being policed. You can specify the value either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 1500 through 2,147,450,880

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Calculation of Policer Burst-Size Limit on page 33
- Hierarchical Policers on page 149
- **aggregate (Hierarchical Policer) on page 168**
- **bandwidth-limit (Hierarchical Policer) on page 169**
- **premium (Hierarchical Policer) on page 207**

burst-size-limit (Policer)

Syntax burst-size-limit *bytes*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name* if-exceeding],
[edit firewall policer *policer-name* if-exceeding],
[edit logical-systems *logical-system-name* policer *policer-name* if-exceeding]

Release Information Statement introduced before Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... if-exceeding]** hierarchy level introduced in Junos OS Release 11.4.

Description For a single-rate two-color policer, configure the burst size as a number of bytes. The burst size allows for short periods of traffic bursting (back-to-back traffic at average rates that exceed the configured bandwidth limit). Single-rate two-color policing uses the *single token bucket algorithm* to measure traffic-flow conformance to a two-color policer rate limit.

Traffic at the interface that conforms to the bandwidth limit is categorized green. Traffic that exceeds the specified rate is also categorized as green provided that sufficient tokens remain in the single token bucket. Packets in a green flow are implicitly marked with **low** packet loss priority and then passed through the interface.

Traffic that exceeds the specified rate when insufficient tokens remain in the single token bucket is categorized red. Depending on the configuration of the two-color policer, packets in a red traffic flow might be implicitly discarded; or the packets might be re-marked with a specified forwarding class, a specified PLP, or both, and then passed through the interface.

The burst size extends the function of the bandwidth limit (configured using either the **bandwidth-limit** *bps* statement or the **bandwidth-percent** *percentage* statement) to allow bursts of traffic up to a limit based on the overall traffic load:

- When a single-rate two-color policer is applied to the input or output traffic at an interface, the initial capacity for traffic bursting is equal to the number of bytes specified by this statement.
- During periods of relatively low traffic (traffic that arrives at or departs from the interface at overall rates below the token arrival rate), unused tokens accumulate in the bucket, but only up to the configured token bucket depth.

Single-rate two-color policing allows bursts of traffic for short periods, whereas single-rate and two-rate three-color policing allows more sustained bursts of traffic.

Hierarchical policing is a form of two-color policing that applies different policing actions based on whether the packets are classified for expedited forwarding (EF) or for a lower priority. You apply a hierarchical policer to ingress Layer 2 traffic to allows bursts of EF traffic for short period and bursts of non-EF traffic for short periods, with EF traffic always taking precedence over non-EF traffic.

Options

bytes—Burst size limit in bytes. The minimum recommended value is the maximum transmission unit (MTU) of the IP packets being policed. You can specify the value either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 1500 through 100,000,000,000

Default: None

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Single Token Bucket Algorithm on page 28
- Calculation of Policer Burst-Size Limit on page 33
- **bandwidth-limit (Policer) on page 170**
- **bandwidth-percent on page 172**

color-aware

Syntax color-aware;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* single-rate],
[edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* single-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... single-rate]** and **[edit dynamic-profiles ... two-rate]** hierarchy levels introduced in Junos OS Release 11.4.

Description For a three-color policer, configure the way preclassified packets are metered. In color-aware mode, the local router can assign a higher packet loss priority, but cannot assign a lower packet loss priority.

For example, suppose an upstream router assigned medium-high packet loss priority to a packet because the packet exceeded the committed information rate on the upstream router interface.

- If the local router applies color-aware policing to the packet, the router *cannot* change the packet loss priority to low, even if the packet conforms to the configured committed information route on the local router interface.
- If the local router applies color-blind policing to the packet, the router *can* change the packet loss priority to low if the packet conforms to the configured committed information route on the local router interface.

NOTE: **A color-aware policer cannot be applied to Layer 2 traffic.**

Default If you omit the **color-aware** statement, the default behavior is color-aware mode.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Color Modes for Three-Color Policers on page 111
- color-blind on page 178

color-blind

Syntax color-blind;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* single-rate],
[edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* single-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... single-rate]** and **[edit dynamic-profiles ... two-rate]** hierarchy levels introduced in Junos OS Release 11.4.

Description For a three-color policer, configure the way preclassified packets are metered. In color-blind mode, the local router ignores the preclassification of packets and can assign a higher or lower packet loss priority.

For example, suppose an upstream router assigned medium-high packet loss priority to a packet because the packet exceeded the committed information rate on the upstream router interface.

- If the local router applies color-aware policing to the packet, the router *cannot* change the packet loss priority to low, even if the packet conforms to the configured committed information route on the local router interface.

  NOTE: **A color-aware policer cannot be applied to Layer 2 traffic.**

- If the local router applies color-blind policing to the packet, the router *can* change the packet loss priority to low if the packet conforms to the configured committed information route on the local router interface.

Default If you omit the **color-blind** statement, the default behavior is color-aware mode.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Color Modes for Three-Color Policers on page 111
- color-aware on page 177

committed-burst-size

Syntax committed-burst-size *bytes*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* single-rate],
[edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* single-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... single-rate]** and **[edit dynamic-profiles ... two-rate]** hierarchy levels introduced in Junos OS Release 11.4.

Description For a three-color policer, configure the committed burst size (CBS) as a number of bytes.

NOTE: When you include the **committed-burst-size** statement in the configuration, you must also include the **committed-information-rate** statement at the same hierarchy level.

In three-color policing, a committed information rate (CIR) defines the guaranteed bandwidth for traffic arriving at or departing from the interface under normal line conditions. A flow of traffic at an average rate that conforms to the CIR is categorized green.

During periods of average traffic rates below the CIR, any unused bandwidth capacity accumulates up to a maximum amount defined by the CBS. Short periods of bursting traffic (back-to-back traffic at averages rates that exceed the CIR) are also categorized as green provided that unused bandwidth capacity is available.

Traffic that exceeds both the CIR and the CBS is considered nonconforming.

Single-rate three-color policers use a *dual token bucket algorithm* to measure traffic against a single rate limit. Nonconforming traffic is categorized as yellow or red, based on the **excess-burst-size** statement included in the policer configuration.

Two-rate three-color policers use a *dual-rate dual token bucket algorithm* to measure traffic against two rate limits. Nonconforming traffic is categorized as yellow or red based on the **peak-information-rate** and **peak-burst-rate** statements included in the policer configuration.

Options ***bytes***—Number of bytes. You can specify a value in bytes either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 1500 through 100,000,000,000 bytes

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Dual Token Bucket Algorithms on page 30
- Calculation of Policer Burst-Size Limit on page 33
- **committed-information-rate on page 181**
- **excess-burst-size on page 183**
- **peak-burst-size on page 197**
- **peak-information-rate on page 199**

committed-information-rate

Syntax committed-information-rate *bps*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* single-rate],
[edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* single-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... single-rate]** and **[edit dynamic-profiles ... two-rate]** hierarchy levels introduced in Junos OS Release 11.4.

Description For a three-color policer, configure the committed information rate as a number of bits per second. The committed information rate (CIR) is the guaranteed bandwidth for traffic arriving at or departing from the interface under normal line conditions.

NOTE: When you include the **committed-information-rate** statement in the configuration, you must also include the **committed-burst-size** statement at the same hierarchy level.

In three-color policing, a CIR defines the guaranteed bandwidth for traffic arriving at or departing from the interface under normal line conditions. A flow of traffic at an average rate that conforms to the CIR is categorized green.

During periods of average traffic rates below the CIR, any unused bandwidth capacity accumulates up to a maximum amount defined by the committed burst size (CBS). Short periods of bursting traffic (back-to-back traffic at averages rates that exceed the CIR) are also categorized as green provided that unused bandwidth capacity is available.

Traffic that exceeds both the CIR and the CBS is considered nonconforming.

Single-rate three-color policers use a *dual token bucket algorithm* to measure traffic against a single rate limit. Nonconforming traffic is categorized as yellow or red, based on the **excess-burst-size** statement included in the policer configuration.

Two-rate three-color policers use a *dual-rate dual token bucket algorithm* to measure traffic against two rate limits. Nonconforming traffic is categorized as yellow or red based on the **peak-information-rate** and **peak-burst-rate** statements included in the policer configuration.

Options *bps*—Number of bits per second. You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 32,000 through 40,000,000,000 bps

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Dual Token Bucket Algorithms on page 30
- Calculation of Policer Burst-Size Limit on page 33
- committed-burst-size on page 179
- excess-burst-size on page 183
- peak-burst-size on page 197
- peak-information-rate on page 199

excess-burst-size

Syntax excess-burst-size *bytes*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* single-rate],
[edit firewall three-color-policer *policer-name* single-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... single-rate]** hierarchy level introduced in Junos Release OS 11.4.

Description For a single-rate three-color policer, configure the excess burst size (EBS) as a number of bytes. The EBS allows for moderate periods of bursting traffic that exceeds both the committed information rate (CIR) and the committed burst size (CBS).

NOTE: When you include the **excess-burst-size** statement in the configuration, you must also include the **committed-burst-size** and **committed-information-rate** statements at the same hierarchy level.

Traffic that exceeds both the CIR and the CBS is considered nonconforming.

Single-rate three-color policing uses a *dual token bucket algorithm* to measure traffic against a single rate limit. Nonconforming traffic is categorized as yellow or red based on the **excess-burst-size** statement included in the policer configuration.

During periods of traffic that conforms to the CIR, any unused portion of the guaranteed bandwidth capacity accumulates in the first token bucket, up to the maximum number of bytes defined by the CBS. If any accumulated bandwidth capacity overflows the first bucket, the excess accumulates in a second token bucket, up to the maximum number of bytes defined by the EBS.

A nonconforming traffic flow is categorized yellow if its size conforms to bandwidth capacity accumulated in the first token bucket. Packets in a yellow flow are marked with **medium-high** packet loss priority (PLP) and then passed through the interface.

A nonconforming traffic flow is categorized red if its size exceeds the bandwidth capacity accumulated in the second token bucket. Packets in a red traffic flow are marked with **high** PLP and then either passed through the interface or optionally discarded.

Options *bytes*—Number of bytes. You can specify a value in bytes either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 1500 through 100,000,000,000 bytes

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Dual Token Bucket Algorithms on page 30
- Calculation of Policer Burst-Size Limit on page 33
- committed-burst-size on page 179
- committed-information-rate on page 181

filter-specific

Syntax filter-specific;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name*],
[edit firewall family inet prefix-action *name*],
[edit firewall policer *policer-name*],
[edit logical-systems *logical-system-name* firewall policer *policer-name*],
[edit logical-systems *logical-system-name* firewall family inet prefix-action *name*]

Release Information Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... policer *policer-name*]** hierarchy level introduced in Junos OS Release 11.4.

Description Set the prefix-specific action or policer to operate in *filter-specific* mode, meaning that a single policer and counter are shared by all filter terms that reference the prefix-specific action or policer. By default, the prefix-specific action or policer operates in *term-specific* mode, meaning that a separate policer and counter are used for each filter term that references the prefix-specific action or policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Filter-Specific Policer Overview on page 64
- Prefix-Specific Counting and Policing Overview on page 71
- Filter-Specific Counter and Policer Set Overview on page 74

forwarding-class (Firewall Filter Action)

Syntax forwarding-class *class-name*;

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.

Description Set the forwarding class of incoming packets.

Options ***class-name***—Name of the forwarding class.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Policer Color-Marking and Actions on page 26
- Multifield Classification Overview on page 87

hierarchical-policer

Syntax

```
hierarchical-policer policer-name {
  aggregate {
    if-exceeding {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
    }
  }
  premium {
    if-exceeding {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
    }
  }
}
```

Hierarchy Level [edit dynamic-profiles *profile-name* firewall],
[edit firewall]

Release Information Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... firewall]** hierarchy level introduced in Junos OS Release 11.4.

Description On M40e, M120, and M320 edge routers with Flexible PIC Concentrator (FPC) input as FFPC and FPC output as SFPC, and on MX Series, T320, T640, and T1600 edge routers with Enhanced Intelligent Queuing (IQE) PICs, specify a hierarchical policer.

Options *policer-name*—Name that identifies the policer. The name can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (“ ”).

The remaining statements are explained separately.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Hierarchical Policers on page 149
- aggregate (Hierarchical Policer) on page 168
- bandwidth-limit (Hierarchical Policer) on page 169
- burst-size-limit (Hierarchical Policer) on page 174
- if-exceeding (Hierarchical Policer) on page 187

- premium (Hierarchical Policer) on page 207

if-exceeding (Hierarchical Policer)

Syntax

```
if-exceeding {
  bandwidth-limit bps;
  burst-size-limit bytes;
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall hierarchical-policer aggregate],
[edit dynamic-profiles *profile-name* firewall hierarchical-policer premium],
[edit firewall hierarchical-policer aggregate],
[edit firewall hierarchical-policer premium]

Release Information

Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... aggregate]** and **[edit dynamic-profiles ... premium]** hierarchy level introduced in Junos OS Release 11.4.

Description

For M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs, specify bandwidth and burst limits for a premium or aggregate component of a hierarchical policer.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Hierarchical Policers on page 149
- aggregate (Hierarchical Policer) on page 168
- bandwidth-limit (Hierarchical Policer) on page 169
- burst-size-limit (Hierarchical Policer) on page 174
- hierarchical-policer on page 186
- premium (Hierarchical Policer) on page 207

if-exceeding (Policer)

Syntax

```
if-exceeding {
  (bandwidth-limit bps | bandwidth-percent number);
  burst-size-limit bytes;
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall policer *policer-name*],
[edit firewall policer *policer-name*],
[edit logical-systems *logical-system-name* firewall policer *policer-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... policer *policer-name*]** hierarchy level introduced in Junos OS Release 11.4.

Description

Configure rate limits for a single-rate two-color policer.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Two-Color Policer Configuration Overview on page 15
- Hierarchical Policer Configuration Overview on page 22
- Basic Single-Rate Two-Color Policers on page 39
- Bandwidth Policers on page 55
- Filter-Specific Counters and Policers on page 64
- Prefix-Specific Counting and Policing Actions on page 71
- Multifield Classification on page 87
- Policer Overhead to Account for Rate Shaping in the Traffic Manager on page 102
- Hierarchical Policers on page 149

input-hierarchical-policer

Syntax input-hierarchical-policer *policer-name*;

Hierarchy Level [edit interfaces *interface-name* layer2-policer],
[edit interfaces *interface-name* unit *logical-unit-number* layer2-policer],
[edit logical-systems *logical-system-name* interfaces *interface-name* layer2-policer]
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* layer2-policer]

Release Information Statement introduced in Junos OS Release 9.5.

Description Apply a hierarchical policer to the Layer 2 input traffic for all protocol families at the physical or logical interface.

Options ***policer-name***—Name of the hierarchical policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Hierarchical Policers on page 149
- layer2-policer on page 191

input-policer

Syntax input-policer *policer-name*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* layer2-policer],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* layer2-policer]

Release Information Statement introduced in Junos OS Release 8.2.

Description Apply a single-rate two-color policer to the Layer 2 input traffic at the logical interface. The **input-policer** and **input-three-color** statements are mutually exclusive.

Options ***policer-name***—Name of the single-rate two-color policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Two-Color and Three-Color Policers at Layer 2 on page 156
- input-three-color on page 190
- layer2-policer on page 191
- logical-interface-policer on page 193
- output-policer on page 195

input-three-color

Syntax input-three-color *policer-name*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* layer2-policer],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* layer2-policer]

Release Information Statement introduced in Junos OS Release 8.2.

Description Apply a single-rate or two-rate three-color policer to the Layer 2 input traffic at the logical interface. The **input-policer** and **input-three-color** statements are mutually exclusive.

Options ***policer-name***—Name of the single-rate or two-rate three-color policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Two-Color and Three-Color Policers at Layer 2 on page 156
- input-policer on page 189
- layer2-policer on page 191
- logical-interface-policer on page 193
- output-three-color on page 196

layer2-policer

Syntax layer2-policer { ... }

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces *interface-name* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name*]
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Release Information Statement introduced in Junos OS Release 8.2.

Description Apply a traffic policer to Layer 2 traffic at a supported interface.

Apply a two-color or three-color logical interface policer to the Layer 2 input or output traffic at the logical interface. The following interfaces are supported:

- 1-Gigabit Ethernet interfaces on M Series, MX Series, and T Series routers
- 10-Gigabit Ethernet IQ2 and IQ2E interfaces on M Series, MX Series, and T Series routers

Apply a hierarchical policer to the Layer 2 input traffic for all protocol families at the physical or logical interface. The following interfaces are supported:

- SONET interfaces hosted on M40e, M120, and M320 edge routers with incoming Flexible PIC Concentrators (FPCs) as SFPC and outgoing FPCs as FFPC
- Interfaces on MX Series, T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs

Options The statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policers on page 149
- input-hierarchical-policer on page 189
- Two-Color and Three-Color Policers at Layer 2 on page 156
- input-policer on page 189
- input-three-color on page 190
- output-policer on page 195
- output-three-color on page 196

load-balance-group

Syntax

```
load-balance-group group-name {
  next-hop-group [ group-names ];
}
```

Hierarchy Level [edit firewall]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure a load-balance group.

Options ***group-name***—Name of load-balance group.

group-names—Name of next-hop groups to include in the load-balance group set.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Configuring Load-Balance Groups in the *Junos OS Routing Policy Configuration Guide*

logical-bandwidth-policer

Syntax logical-bandwidth-policer;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name*],
[edit firewall policer *policer-name*],
[edit logical-systems *logical-system-name* firewall policer *policer-name*]

Release Information Statement introduced in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... policer *policer-name*]** hierarchy level introduced in Junos OS Release 11.4.

Description For a policer with a bandwidth limit configured as a percentage (using the bandwidth-percent statement), specify that the percentage be based on the shaping rate defined on the logical interface, rather than on the media rate of the physical interface.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Bandwidth Policers on page 55
- **bandwidth-percent on page 172**
- interface-specific statement in the *Junos OS Firewall Filter and Policer Configuration Guide*

logical-interface-policer

Syntax logical-interface-policer;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall policer *policer-name*],
[edit dynamic-profiles *profile-name* firewall three-color-policer *name*],
[edit firewall policer *policer-name*],
[edit firewall three-color-policer *name*],
[edit logical-systems *logical-system-name* firewall policer *policer-name*],
[edit logical-systems *logical-system-name* firewall three-color-policer *name*]

Release Information Statement introduced before Junos OS Release 7.4.
Support at the **[edit firewall three-color-policer *name*]** hierarchy level introduced in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... policer *policer-name*]** and **[edit dynamic-profiles ... three-color-policer *name*]** hierarchy levels introduced in Junos OS Release 11.4.

Description Configure a logical interface (aggregate) policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Two-Color and Three-Color Logical Interface Policers on page 127

loss-priority (Firewall Filter Action)

Syntax loss-priority (high | low);

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.

Description Set the loss priority of incoming packets.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Policer Color-Marking and Actions on page 26
- Multifield Classification Overview on page 87

loss-priority high then discard (Three-Color Policer)

Syntax loss-priority high then discard;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* action],
[edit firewall three-color-policer *policer-name* action],
[edit logical-systems *logical-system-name* firewall three-color-policer *policer-name* action]

Release Information Statement introduced before Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... action]** hierarchy level introduced in Junos OS Release 11.4.

Description For packets with high loss priority, discard the packets. The loss priority setting is implicit and is not configurable. Include this statement if you do not want the local router to forward packets that have high packet loss priority.

For single-rate three-color policers, the Junos OS assigns high loss priority to packets that exceed the committed information rate and the excess burst size.

For two-rate three-color policers, the Junos OS assigns high loss priority to packets that exceed the peak information rate and the peak burst size.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Basic Single-Rate Three-Color Policers on page 113
- Basic Two-Rate Three-Color Policers on page 119
- Two-Color and Three-Color Logical Interface Policers on page 127
- Two-Color and Three-Color Physical Interface Policers on page 139
- Two-Color and Three-Color Policers at Layer 2 on page 156
- **action on page 167**

output-policer

Syntax output-policer *policer-name*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* layer2-policer],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* layer2-policer]

Release Information Statement introduced in Junos OS Release 8.2.

Description Apply a single-rate two-color policer to the Layer 2 output traffic at the logical interface. The **output-policer** and **output-three-color** statements are mutually exclusive.

Options ***policer-name***—Name of the single-rate two-color policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Two-Color and Three-Color Policers at Layer 2 on page 156
- input-policer on page 189
- layer2-policer on page 191
- logical-interface-policer on page 193
- output-three-color on page 196

output-three-color

Syntax output-three-color *policer-name*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* layer2-policer],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* layer2-policer]

Release Information Statement introduced in Junos OS Release 8.2.

Description Apply a single-rate or two-rate three-color policer to the Layer 2 output traffic at the logical interface. The **output-policer** and **output-three-color** statements are mutually exclusive.

Options ***policer-name***—Name of the single-rate or two-rate three-color policer.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Two-Color and Three-Color Policers at Layer 2 on page 156
- input-three-color on page 190
- layer2-policer on page 191
- logical-interface-policer on page 193
- output-policer on page 195

peak-burst-size

Syntax peak-burst-size *bytes*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... two-rate]** hierarchy level introduced in Junos OS Release 11.4.

Description For a two-rate three-color policer, configure the peak burst size (PBS) as a number of bytes. The PBS defines the maximum number of bytes of unused peak bandwidth capacity that can be accumulated. The accumulated bandwidth allows for moderate periods of bursting traffic that exceeds the peak information rate (PIR) and the committed burst size (CBS).

NOTE: When you include the **peak-burst-size** statement in the configuration, you must also include the **committed-burst-size** and **peak-information-rate** statements at the same hierarchy level.

Two-rate three-color policers use a *dual-rate dual token bucket algorithm* to measure traffic against two rate limits.

- A traffic flow is categorized green if it conforms to both the committed information rate (CIR) and the CBS-bounded accumulation of available committed bandwidth capacity.
- A traffic flow is categorized yellow if exceeds the CIR and CBS but conforms to the PIR. Packets in a yellow flow are marked with **medium-high** packet loss priority (PLP) and then passed through the interface.
- A traffic flow is categorized red if exceeds the PIR and the PBS-bounded accumulation of available peak bandwidth capacity. Packets in a red traffic flow are marked with **high** PLP and then either passed through the interface or optionally discarded.

Options ***bytes***—Number of bytes. You can specify a value in bytes either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 1500 through 100,000,000,000 bytes

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Bandwidth and Burst-Size Limits on page 25

- Policer Color-Marking and Actions on page 26
- Dual Token Bucket Algorithms on page 30
- Calculation of Policer Burst-Size Limit on page 33
- committed-burst-size on page 179
- committed-information-rate on page 181
- excess-burst-size on page 183
- peak-information-rate on page 199

peak-information-rate

Syntax peak-information-rate *bps*;

Hierarchy Level [edit dynamic-profiles *profile-name* firewall three-color-policer *name* two-rate],
[edit firewall three-color-policer *policer-name* two-rate]

Release Information Statement introduced in Junos OS Release 7.4.
Support at the **[edit dynamic-profiles ... two-rate]** hierarchy level introduced in Junos OS Release 11.4.

Description For a two-rate three-color policer, configure the peak information rate (PIR) as a number of bits per second. The PIR is the maximum rate for traffic arriving at or departing from the interface under peak line conditions. Traffic that exceeds the committed information rate (CIR) and the committed burst size (CBS) is metered to the PIR.

NOTE: When you include the **peak-information-rate** statement in the configuration, you must also include the **committed-information-rate** and **peak-burst-size** statements at the same hierarchy level.

Two-rate three-color policers use a *dual-rate dual token bucket algorithm* to measure traffic against two rate limits.

- A traffic flow is categorized green if it conforms to both the CIR and the CBS-bounded accumulation of available committed bandwidth capacity.
- A traffic flow is categorized yellow if exceeds the CIR and CBS but conforms to the PIR. Packets in a yellow flow are marked with **medium-high** packet loss priority (PLP) and then passed through the interface.
- A traffic flow is categorized red if exceeds the PIR and the PBS-bounded accumulation of available peak bandwidth capacity. Packets in a red traffic flow are marked with **high** PLP and then either passed through the interface or optionally discarded.

Options *bps*—Number of bits per second. You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Range: 32,000 through 40,000,000,000 bps

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- Policer Bandwidth and Burst-Size Limits on page 25
- Policer Color-Marking and Actions on page 26
- Dual Token Bucket Algorithms on page 30

- Calculation of Policer Burst-Size Limit on page 33
- committed-burst-size on page 179
- committed-information-rate on page 181
- excess-burst-size on page 183
- peak-burst-size on page 197

physical-interface-filter

Syntax physical-interface-filter;

Hierarchy Level [edit firewall family *family-name* filter *filter-name*],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name*],
[edit routing-instances *routing-instance-name* firewall family *family-name* filter *filter-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* firewall family *family-name* filter *filter-name*]

Release Information Statement introduced in Junos OS Release 9.6.

Description Configure a physical interface filter. Use this statement to reference a physical interface policer for the specified protocol family.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Two-Color and Three-Color Physical Interface Policers on page 139
- physical-interface-policer on page 201
- policer (Configuring) on page 203

physical-interface-policer

Syntax physical-interface-policer;

Hierarchy Level
[edit dynamic-profiles *profile-name* firewall policer *policer-name*],
[edit firewall policer *policer-name*],
[edit firewall three-color-policer *policer-name*],
[edit logical-system *logical-system-name* firewall policer *policer-name*],
[edit logical-system *logical-system-name* three-color-policer *policer-name*],
[edit routing-instances *routing-instance-name* firewall policer *policer-name*],
[edit routing-instances *routing-instance-name* firewall three-color-policer *policer-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* firewall policer *policer-name*],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* firewall three-color-policer *policer-name*]

Release Information
Statement introduced in Junos OS Release 9.6.
Support at the **[edit dynamic-profiles ... policer *policer-name*]** hierarchy level introduced in Junos Release OS 11.4.

Description Configure an aggregate policer for a physical interface. A physical interface policer applies to all the logical interfaces and protocol families configured on a physical interface. As a result, a single physical interface policer can be applied to multiple routing instances because this policer includes all the logical interfaces configured on the physical interface even if they belong to different routing instances.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Two-Color and Three-Color Physical Interface Policers on page 139
- physical-interface-filter on page 200

policer (Applying to a Logical Interface)

Syntax

```
policer {
    input policer-name;
    output policer-name;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *unit-number*],
[edit interfaces *interface-name* unit *unit-number* family *family*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family *family*]

Description

Apply a single-rate two-color policer—except for a physical interface policer—to Layer 3 input or output traffic at a logical interface.

- To rate-limit all traffic types, regardless of the protocol family, you can apply a logical interface policer at the logical unit level of a supported interface.
- To rate-limit traffic of a specific protocol family, you can apply a basic two-color policer, a bandwidth policer, or a logical interface policer at the protocol family level of a supported interface.

NOTE: You cannot apply a physical interface policer as part of the interface configuration. You can apply a physical interface policer by referencing the policer from a physical interface filter term.

Options

input *policer-name*—Name of one policer to evaluate packets received on the interface.

output *policer-name*—Name of one policer to evaluate packets transmitted on the interface.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Single-Rate Two-Color Policer Overview on page 39
- Bandwidth Policer Overview on page 56
- Logical Interface (Aggregate) Policer Overview on page 127

policer (Configuring)

Syntax

```
policer policer-name {
  filter-specific;
  if-exceeding {
    bandwidth-limit bps;
    bandwidth-percent number;
    burst-size-limit bytes;
  }
  logical-interface-policer;
  physical-interface-policer;
  then {
    policer-action;
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall],
[edit firewall],
[edit logical-systems *logical-system-name* firewall]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
physical-interface-policer statement introduced in Junos OS Release 9.6.
Support at the **[edit dynamic-profiles ... firewall]** hierarchy level introduced in Junos OS Release 11.4.

Description

Configure policer rate limits and actions. When included at the **[edit firewall]** hierarchy level, the **policer** statement creates a template, and you do not have to configure a policer individually for every firewall filter or interface. To activate a policer, you must include the **policer-action** modifier in the **then** statement in a firewall filter term or on an interface.

Options

policer-action—One or more actions to take:

- **discard**—Discard traffic that exceeds the rate limits.
- **forwarding-class *class-name***—Specify the particular forwarding class.
- **loss-priority**—Set the packet loss priority (PLP) to **low**, **medium-low**, **medium-high**, or **high**.

policer-name—Name that identifies the policer. The name can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (" ").

then—Actions to take on matching packets.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Single-Rate Two-Color Policer Overview on page 39
- Bandwidth Policer Overview on page 56
- Physical Interface Policer Overview on page 139
- Logical Interface (Aggregate) Policer Overview on page 127

policer (Firewall Filter Action)

Syntax policer *policer-name*;

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.

Description For T Series routers and M320 routers with Enhanced II Flexible PIC Concentrators (FPCs) and the T640 Core Router with Enhanced Scaling FPC4, apply a tricolor marking policer.

Options ***policer-name***—Name of a single-rate two-color policer to use to rate-limit traffic.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Two-Color Policer Configuration Overview on page 15

prefix-action (Configuring)

Syntax

```
prefix-action prefix-action-name {
  count;
  destination-prefix-length prefix-length;
  filter-specific;
  policer policer-name;
  source-prefix-length prefix-length;
  subnet-prefix-length prefix-length;
}
```

Hierarchy Level [edit firewall family inet],
[edit logical-systems *logical-system-name* firewall family inet]

Release Information Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.

Description Configure a prefix-specific action.

Options

count—Enable counter.

destination-prefix-length *prefix-length*—Destination prefix length.

Range: 0 through 32

filter-specific—Create the prefix-specific set of policers and counters as a filter-specific set. If this option is not specified, the prefix-specific set of policers and counters are created as term-specific.

policer *policer-name*—Policer name.

source-prefix-length *prefix-length*—Source prefix length.

Range: 0 through 32

subnet-prefix-length *prefix-length*—Subnet prefix length.

Range: 0 through 32

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Prefix-Specific Counting and Policing Actions on page 71

prefix-action (Firewall Filter Action)

Syntax prefix-action *prefix-action-name*;

Hierarchy Level [edit firewall family inet filter *filter-name* term *term-name* then],
[edit logical-systems *logical-system-name* firewall family inet filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.

Description Reference a prefix-specific action.

Options *prefix-action-name*—Name of a prefix-specific action to use to rate-limit traffic.

Related Documentation

- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Prefix-Specific Counting and Policing Actions on page 71

premium (Hierarchical Policer)

Syntax

```
premium {
  if-exceeding {
    bandwidth-limit bandwidth;
    burst-size-limit burst;
  }
  then {
    discard;
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall hierarchical-policer],
[edit firewall hierarchical-policer]

Release Information

Statement introduced in Junos OS Release 9.5.
Support at the **[edit dynamic-profiles ... hierarchical-policer *name*]** hierarchy level introduced in Junos OS Release 11.4.

Description

On M40e, M120, and M320 edge routers with FPC input as FFPC and FPC output as SFPC, and on MX Series, T320, T640, and T1600 edge routers with Enhanced Intelligent Queuing (IQE) PICs, specify a premium level for a hierarchical policer.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Hierarchical Policer Configuration Overview on page 22
- Hierarchical Policers on page 149
- aggregate (Hierarchical Policer) on page 168
- bandwidth-limit (Hierarchical Policer) on page 169
- burst-size-limit (Hierarchical Policer) on page 174
- hierarchical-policer on page 186
- if-exceeding (Hierarchical Policer) on page 187

single-rate

Syntax

```
single-rate {
  (color-aware | color-blind);
  committed-information-rate bps;
  committed-burst-size bytes;
  excess-burst-size bytes;
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall three-color-policer *name*],
[edit firewall three-color-policer *policer-name*],
[edit logical-systems *logical-system-name* firewall three-color-policer *policer-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... three-color-policer *name*]** hierarchy level introduced in Junos OS Release 11.4.

Description

Configure a single-rate three-color policer in which marking is based on the committed information rate (CIR), committed burst size (CBS), and excess burst size (EBS).

Packets that conform to the CIR or the CBS are assigned low loss priority (green). Packets that exceed the CIR and the CBS but are within the EBS are assigned medium-high loss priority (yellow). Packets that exceed the EBS are assigned high loss priority (red).

Green and yellow packets are always forwarded; this action is not configurable. You can configure red packets to be discarded. By default, red packets are forwarded.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- color-aware on page 177
- color-blind on page 178
- two-rate on page 211

three-color-policer (Configuring)

Syntax

```
three-color-policer policer-name {
    action {
        loss-priority high then discard;
    }
    logical-interface-policer;
    physical-interface-policer;
    single-rate {
        (color-aware | color-blind);
        committed-information-rate bps;
        committed-burst-size bytes;
        excess-burst-size bytes;
    }
    two-rate {
        (color-aware | color-blind);
        committed-information-rate bps;
        committed-burst-size bytes;
        peak-information-rate bps;
        peak-burst-size bytes;
    }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall],
[edit firewall],
[edit logical-systems *logical-system-name* firewall]

Release Information

Statement introduced before Junos OS Release 7.4.
action statement introduced in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... firewall]** hierarchy level introduced in Junos OS Release 11.4.

Description

Configure a three-color policer.

Options

policer-name—Name of the three-color policer. Reference this name when you apply the policer to an interface.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Statement Hierarchy for Configuring Policers on page 13
- Three-Color Policer Configuration Guidelines on page 111
- Basic Single-Rate Three-Color Policers on page 113
- Basic Two-Rate Three-Color Policers on page 119
- Two-Color and Three-Color Logical Interface Policers on page 127
- Two-Color and Three-Color Physical Interface Policers on page 139

- Two-Color and Three-Color Policers at Layer 2 on page 156

three-color-policer (Firewall Filter Action)

Syntax

```
three-color-policer {
    (single-rate | two-rate) policer-name;
}
```

Hierarchy Level

[edit firewall family *family-name* filter *filter-name* term *term-name* then],
[edit logical-systems *logical-system-name* firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information

Statement introduced before Junos OS Release 7.4.
single-rate statement added in Junos OS Release 8.2.
Logical systems support introduced in Junos OS Release 9.3.

Description

For T Series routers and M320 routers with Enhanced II Flexible PIC Concentrators (FPCs) and the T640 Core Router with Enhanced Scaling FPC4, apply a tricolor marking policer.

Options

single-rate—Named tricolor policer is a single-rate policer.

two-rate—Named tricolor policer is a two-rate policer.

policer-name—Name of three-color policer to use to rate-limit traffic.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- "Standard Firewall Filter Nonterminating Actions" in the *Junos OS Firewall Filter and Policer Configuration Guide*
- Three-Color Policer Configuration Overview on page 19

two-rate

Syntax

```
two-rate {
  (color-aware | color-blind);
  committed-information-rate bps;
  committed-burst-size bytes;
  peak-information-rate bps;
  peak-burst-size bytes;
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall three-color-policer *name*],
[edit firewall three-color-policer *policer-name*],
[edit logical-systems *logical-system-name* firewall three-color-policer *policer-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
Support at the **[edit dynamic-profiles ... three-color-policer *name*** hierarchy levels introduced in Junos OS Release 11.4.

Description

Configure a two-rate three-color policer in which marking is based on the committed information rate (CIR), committed burst size (CBS), peak information rate (PIR), and peak burst size (PBS).

Packets that conform to the CIR or the CBS are assigned low loss priority (green). Packets that exceed the CIR and the CBS but are within the PIR or the PBS are assigned medium-high loss priority (yellow). Packets that exceed the PIR and the PBS are assigned high loss priority (red).

Green and yellow packets are always forwarded; this action is not configurable. You can configure red packets to be discarded. By default, red packets are forwarded.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- Three-Color Policer Configuration Overview on page 19
- color-aware on page 177
- color-blind on page 178
- single-rate on page 208

PART 3

Administration

- Traffic Policing Standards on page 215
- Traffic Policing Reference on page 217
- Firewall Filter and Policer Operational Mode Commands on page 221

CHAPTER 10

Traffic Policing Standards

- Supported Standards for Policing on page 215

Supported Standards for Policing

Three-color policers are part of an assured forwarding (AF) per-hop-behavior (PHB) classification system for a Differentiated Services (DiffServ) environment, which is described and defined in the following RFCs:

- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2475, *An Architecture for Differentiated Service*
- RFC 2597, *Assured Forwarding PHB Group*
- RFC 2598, *An Expedited Forwarding PHB*
- RFC 2698, *A Two Rate Three Color Marker*

In a DiffServ environment, the most significant 6 bits of the type-of-service (ToS) octet in the IP header contain a value called the *Differentiated Services code point* (DSCP). Within the DSCP field, the most significant 3 bits are interpreted as the *IP precedence* field, which can be used to select different per-hop forwarding treatments for the packet.

CHAPTER 11

Traffic Policing Reference

- Using the CLI Editor in Configuration Mode on page 217

Using the CLI Editor in Configuration Mode

This topic describes some of the basic commands that you must use to enter configuration mode in the command-line interface (CLI) editor, navigate through the configuration hierarchy, get help, and commit or revert the changes that you make during the configuration session.

Task	Command/Statement	Example
Edit Your Configuration		
Enter configuration mode. When you first log in to the device, the device is in operational mode. You must explicitly enter configuration mode. When you do, the CLI prompt changes from **user@host>** to **user@host#** and the hierarchy level appears in square brackets.	**configure**	user@host> **configure** [edit] user@host#
Create a statement hierarchy. You can use the **edit** command to simultaneously create a hierarchy and move to that new level in the hierarchy. You cannot use the **edit** command to change the value of identifiers.	edit *hierarchy-level value*	[edit] user@host# **edit security zones security-zone myzone** [edit security zones security-zone myzone] user@host#
Create a statement hierarchy and set identifier values. The **set** command is similar to **edit** except that your current level in the hierarchy does not change.	set *hierarchy-level value*	[edit] user@host# **set security zones security-zone myzone** [edit] user@host#
Navigate the Hierarchy		

Task	Command/Statement	Example
Navigate down to an existing hierarchy level.	edit *hierarchy-level*	[edit] user@host# **edit security zones** [edit security zones] user@host#
Navigate up one level in the hierarchy.	up	[edit security zones] user@host# **up** [edit security] user@host#
Navigate to the top of the hierarchy.	top	[edit security zones] user@host# **top** [edit] user@host#
Commit or Revert Changes		
Commit your configuration.	commit	[edit] user@host# **commit** commit complete
Roll back changes from the current session. Use the **rollback** command to revert all changes from the current configuration session. When you run the **rollback** command before exiting your session or committing changes, the software loads the most recently committed configuration onto the device. You must enter the **rollback** statement at the **edit** level in the hierarchy.	rollback	[edit] user@host# **rollback** load complete
Exit Configuration Mode		
Commit the configuration and exit configuration mode.	commit and-quit	[edit] user@host# **commit and-quit** user@host>
Exit configuration mode without committing your configuration. You must navigate to the top of the hierarchy using the **up** or **top** commands before you can exit configuration mode.	exit	[edit] user@host# **exit** The configuration has been changed but not committed Exit with uncommitted changes? [yes,no] (yes)
Get Help		

Task	Command/Statement	Example
Display a list of valid options for the current hierarchy level.	?	[edit] user@host# **edit security zones ?** Possible completions: <[Enter]> Execute this command > functional-zone Functional zone > security-zone Security zones | Pipe through a command [edit]

CHAPTER 12

Firewall Filter and Policer Operational Mode Commands

clear firewall

Syntax clear firewall (all | counter *counter-name* | filter *filter-name* | logical-system *logical-system-name*)

Syntax (EX Series Switch) clear firewall (all | counter *counter-name* | filter *filter-name*)

Release Information Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
logical-system option introduced in Junos OS Release 9.3.

Description Clear statistics about configured firewall filters.

NOTE: The clear firewall command cannot be used to clear the Routing Engine filter counters on a backup Routing Engine that is enabled for GRES.

If you clear statistics for firewall filters that are applied to Trio-based DPCs and that also use the **prefix-action** action on matched packets, wait at least 5 seconds before you enter the **show firewall prefix-action-stats** command. A 5-second pause between issuing the **clear firewall** and **show firewall prefix-action-stats** commands avoids a possible timeout of the **show firewall prefix-action-stats** command.

Options all—Clear the packet and byte counts for all filters.

counter *counter-name*—Clear the packet and byte counts for a filter counter that has been configured with the counter firewall filter action.

filter *filter-name*—Clear the packet and byte counts for the specified firewall filter.

logical-system *logical-system-name*—Clear the packet and byte counts for the specified logical system.

Required Privilege Level clear

Related Documentation
- show firewall on page 223

List of Sample Output clear firewall all on page 222

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear firewall all

```
user@host> clear firewall all
```

show firewall

Syntax

show firewall
<filter *filter-name*>
<counter *counter-name*>
<log>
<logical-system (all | *logical-system-name*)>
<terse>

Syntax (EX Series Switch)

show firewall
<filter *filter-name*>
<counter *counter-name*>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
logical-system option introduced in Junos OS Release 9.3.
terse option introduced in Junos OS Release 9.4.

Description

Display statistics about configured firewall filters.

Options

none—(Optional) Display statistics about configured firewall filters.

filter *filter-name*—(Optional) Name of a configured filter.

counter *counter-name*—(Optional) Name of a filter counter.

logical-system (all | *logical-system-name*)—(Optional) Perform this operation on all logical systems or on a particular system.

log—(Optional) Display log entries for firewall filters.

terse—(Optional) Display firewall filter names only.

Required Privilege Level

view

Related Documentation

- clear firewall on page 222

List of Sample Output

show firewall filter on page 225
show firewall filter (Dynamic Input Filter) on page 225
show firewall (Logical Systems) on page 225

Output Fields

Table 10 on page 224 lists the output fields for the **show firewall** command. Output fields are listed in the approximate order in which they appear.

Table 10: show firewall Output Fields

Field Name	Field Description
Filter	Name of a filter that has been configured with the **filter** statement at the **[edit firewall]** hierarchy level. When an interface-specific filter is displayed, the name of the filter is followed by the full interface name and by either **-i** for an input filter or **-o** for an output filter. When dynamic filters are displayed, the name of the filter is followed by the full interface name and by either **-in** for an input filter or **-out** for an output filter. When a logical system–specific filter is displayed, the name of the filter is prefixed with two underscore (__) characters and the name of the logical system (for example, **__ls1/filter1**).
Counters	Display filter counter information: • **Name**—Name of a filter counter that has been configured with the **counter** firewall filter action. • **Bytes**—Number of bytes that match the filter term under which the **counter** action is specified. • **Packets**—Number of packets that matched the filter term under which the **counter** action is specified.
Policers	Display policer information: • **Name**—Name of policer. • **Bytes**—(I-chip DPCs only) Number of bytes that match the filter term under which the policer action is specified. This is only the number out-of-specification (out-of-spec) byte counts, not all the bytes in all packets policed by the policer. • **Packets**—Number of packets that matched the filter term under which the policer action is specified. This is only the number of out-of-specification (out-of-spec) packet counts, not all packets policed by the policer.

Sample Output

show firewall filter

```
user@host> show firewall filter test
Filter: test
Counters:
Name                                Bytes              Packets
Counter-1                               0                    0
Counter-2                               0                    0
Policers:
Name                                Bytes              Packets
Policer-1                            2770                   70
```

show firewall filter (Dynamic Input Filter)

```
user@host> show firewall filter dfwd-ge-5/0/0.1-in
Filter: dfwd-ge-5/0/0.1-in
Counters:
Name                                                Bytes              Packets
c1-ge-5/0/0.1-in                                        0                    0
```

show firewall (Logical Systems)

```
user@host>show firewall

Filter: __lr1/test
Counters:
Name                                                Bytes              Packets
icmp                                                  420                    5
Filter: __default_bpdu_filter__
Filter: __lr1/inet_filter1
Counters:
Name                                                Bytes              Packets
inet_tcp_count                                          0                    0
inet_udp_count                                          0                    0
Filter: __lr1/inet_filter2
Counters:
Name                                                Bytes              Packets
inet_icmp_count                                         0                    0
inet_pim_count                                          0                    0
Filter: __lr2/inet_filter1
Counters:
Name                                                Bytes              Packets
inet_tcp_count                                          0                    0
inet_udp_count                                          0                    0
```

show firewall filter version

Syntax show firewall filter version <*filter-name*>

Release Information Command introduced in Junos OS Release 10.2R2.

Description Display the version number of the installed firewall filter in the Routing Engine.

Options none—(Optional) Display the version number of all installed firewall filters.

filter-name—(Optional) Name of a configured filter. If you specify the name of a filter, only the version number of that filter is displayed.

Additional Information The initial version number is 1. This number increments by one when you modify the firewall filter settings or an associated prefix action. The maximum version number is 4,294,967,295. When the version number reaches 4,294,967,295, this number is reset to 1.

Required Privilege Level view

List of Sample Output show firewall filter version on page 226

Output Fields Table 11 on page 226 lists the output fields for the **show firewall filter version** command. Output fields are listed in the approximate order in which they appear.

Table 11: show firewall filter version Output Fields

Field Name	Field Description
Filter	Name of a filter that has been configured with the **filter** statement at the **[edit firewall]** hierarchy level.
Version	Display the version number of the firewall filter.

Sample Output

show firewall filter version

```
user@host> show firewall filter version
Filter version information :
Filter                                                  Version
test                                                         10
```

show firewall log

Syntax

show firewall log
<detail>
<interface *interface-name*>
<logical-system (*logical-system-name* | all)>

Syntax (EX Series Switch)

show firewall log
<detail>
<interface *interface-name*>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
logical-system option introduced in Junos OS Release 9.3.

Description

Display log information about firewall filters.

Options

none—Display log information about firewall filters.

detail—(Optional) Display detailed information.

interface *interface-name*—(Optional) Display log information about a specific interface.

logical-system (*logical-system-name* | all)—(Optional) Perform this operation on all logical systems or on a particular system.

Required Privilege Level

view

List of Sample Output

show firewall log on page 228
show firewall log detail on page 228

Output Fields

Table 12 on page 227 lists the output fields for the **show firewall log** command. Output fields are listed in the approximate order in which they appear.

Table 12: show firewall log Output Fields

Field Name	Field Description
Time of Log	Time that the event occurred.
Filter	Name of a filter that has been configured with the **filter** statement at the **[edit firewall]** hierarchy level. • A hyphen (-) indicates that the packet was handled by the Packet Forwarding Engine. • A space (no hyphen) indicates the packet was handled by the Routing Engine. • The notation **pfe** indicates packets logged by the Packet Forwarding Engine hardware filters.

Table 12: show firewall log Output Fields *(continued)*

Field Name	Field Description
Filter Action	Filter action: • **A**—Accept • **D**—Discard • **R**—Reject
Name of Interface	Ingress interface for the packet.
Name of protocol	Packet's protocol name: **egp**, **gre**, **icmp**, **ipip**, **ospf**, **pim**, **rsvp**, **tcp**, or **udp**.
Packet length	Length of the packet.
Source address	Packet's source address.
Destination address	Packet's destination address and port.

Sample Output

show firewall log

```
user@host>show firewall log
Time      Filter    Action Interface     Protocol  Src Addr      Dest Addr

13:10:12  pfe       D      rlsq0.902     ICMP      180.1.177.2   180.1.177.1

13:10:11  pfe       D      rlsq0.902     ICMP      180.1.177.2   180.1.177.1
```

show firewall log detail

```
user@host> show firewall log detail
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0Name of protocol: TCP, Packet Length: 50824, Source address:
172.17.22.108:829,
Destination address: 192.168.70.66:513
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0
Name of protocol: TCP, Packet Length: 1020, Source address: 172.17.22.108:829,
Destination address: 192.168.70.66:513
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0
Name of protocol: TCP, Packet Length: 49245, Source address: 172.17.22.108:829,
Destination address: 192.168.70.66:513
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0
Name of protocol: TCP, Packet Length: 49245, Source address: 172.17.22.108:829,
Destination address: 192.168.70.66:513
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0
Name of protocol: TCP, Packet Length: 49245, Source address: 172.17.22.108:829,
Destination address: 192.168.70.66:513
Time of Log: 2004-10-13 10:37:17 PDT, Filter: f, Filter action: accept, Name of
interface: fxp0.0
Name of protocol: TCP, Packet Length: 49245, Source address: 172.17.22.108:829,
```



```
Destination address: 192.168.70.66:513
....
```

show firewall prefix-action-stats

Syntax show firewall prefix-action-stats filter *filter-name* prefix-action *prefix-action-name*
<from *number* to *number*>
<logical-system (*logical-system-name* | all)>

Release Information Command introduced before Junos OS Release 7.4.
logical-system option introduced in Junos OS Release 9.3.

Description Display prefix action statistics about configured firewall filters.

If you clear statistics for firewall filters that are applied to Trio-based DPCs and that also use the **prefix-action** action on matched packets, wait at least 5 seconds before you enter the **show firewall prefix-action-stats** command. A 5-second pause between issuing the **clear firewall** and **show firewall prefix-action-stats** commands avoids a possible timeout of the **show firewall prefix-action-stats** command.

Options filter *filter-name*—Name of a filter.

prefix-action *prefix-action-name*—Name of a prefix action.

from *number* to *number*—(Optional) Starting and ending counter or policer.

logical-system (*logical-system-name* | all)—(Optional) Perform this operation on all logical systems or on a particular system.

Required Privilege Level view

Related Documentation
- clear firewall on page 222

List of Sample Output show firewall prefix-action-stats on page 230

Output Fields Table 13 on page 230 lists the output fields for the **show firewall prefix-action-stats** command. Output fields are listed in the approximate order in which they appear.

Table 13: show firewall prefix-action-stats Output Fields

Field Name	Field Description
Filter	Filter name. Filters configured for logical systems include the name of the filter prefixed with the two underscore characters (__) and the name of the logical system (for example, **__ls1/filter1**).

Sample Output

show firewall prefix-action-stats

```
user@host> show firewall prefix-action-stats filter test prefix-action act1
Filter: __ls2/test
```

show policer

Syntax
show policer
<policer-name>

Release Information
Command introduced before Junos OS Release 7.4.

Description
Display the number of policed packets for a given policer or an aggregate policer. An aggregate policer is an aggregate of different policers on the same logical interface.

Options
none—Display the number of policed packets for all configured policers.

policer-name—(Optional) Display the number of policed packets for the specified policer.

Required Privilege Level
view

List of Sample Output
show policer on page 231
show policer (Aggregate Policer) on page 231

Output Fields
Table 14 on page 231 lists the output fields for the **show policer** command. Output fields are listed in the approximate order in which they appear.

Table 14: show policer Output Fields

Field Name	Field Description
Name	Name of the policer.
Bytes	(For policers applied to logical interfaces on I-chip DPCs only) Total number of bytes policed by the specified policer.
Packets	Total number of packets policed by the specified policer.

Sample Output

show policer

```
user@host> show policer
Policers:
Name                                                Bytes              Packets
__default_arp_policer__                            314520               5242
pol-2M-ge-1/2/0.1-inet-i                         10372300             103723
pol-2M-ge-1/2/0.1-inet6-i                         7727800              77278
pol-2M-ge-1/2/0.1-mpls-i                          7070336              67984
pol-2M-ge-1/2/0.1001-vpls-i                      65153700             651537
pol-2M-ge-1/2/0.2001-vpls-i                      65180900             651809
pol-2M-ge-1/2/0.3001-ccc-i                       62202144             647939
```

show policer (Aggregate Policer)

```
user@host> show policer
Policers:
Name                                                Packets
__default_arp_policer__                                   0
P1-ae0.0-log_int-o                                        0
P2-ge-7/0/2.0-inet-o                                      0
```

```
P2-ge-7/0/2.0-inet6-o                                0
__policer_tmpl__-term                                0
__policer_tmpl__-fc0                                 0
__policer_tmpl__-fc0                                 0
__policer_tmpl__-fc1                                 0
__policer_tmpl__-fc0                                 0
__policer_tmpl__-fc1                                 0
__policer_tmpl__-fc2                                 0
__policer_tmpl__-fc0                                 0
__policer_tmpl__-fc1                                 0
__policer_tmpl__-fc2                                 0
__policer_tmpl__-fc3                                 0
```

PART 4

Index

- Index on page 235

Index

A

action statement....167
aggregate (logical interface) policer
  configuration statement for....193
  example
    single-rate two-color....128
    two-rate three-color....133, 159
  overview....127
aggregate statement
  hierarchical policer....168

B

bandwidth policer, logical
  example....57
  overview....56
bandwidth-limit statement
  hierarchical policer....169
  policer....170
bandwidth-percent statement
  policer....172
burst-size-limit statement....175
  hierarchical policer....174

C

class-of-service *See* CoS
clear firewall command....222
color markings
  policers....26
color modes for three-color policer....111
color-aware statement....177
color-blind statement....178
committed-burst-size statement....179
committed-information-rate statement....181
configuration and application overview
  hierarchical policers....22
  single-rate two-color policers....15
  three-color policers....19
CoS
  forwarding classes....87
  policer actions, overview....3
  RED drop profiles....87

D

denial-of-service attacks, preventing....65
diagnosis
  displaying stateless firewall filter configurations....69
  displaying stateless firewall filter statistics....70
  verifying stateless firewall filter DoS protection....69
  verifying stateless firewall filter flood protection....69
DoS (denial-of-service) attacks, preventing....65
dual token bucket algorithms....30

E

excess-burst-size statement....183

F

filter-specific
  counting and policing set....74
  policer....64
filter-specific policing option
  configuration scenarios....81
  example....74
  overview....71
filter-specific statement....184
  configuration scenarios....81
  example....74
  overview....64, 71, 74
firewall
  filter version
    displaying....226
  statistics
    displaying....223
firewall filters
  log information, displaying....227
  physical interface filters....200
  policed packets, displaying....231
  statistics
    clearing....222
    displaying....230
flooding, preventing....65
forwarding class
  policer actions
    overview....3
forwarding classes....87
forwarding-class statement
  stateless firewall filter action....185

H

hierarchical policer
- bandwidth limit....25
- burst-size limit....25
- color markings and actions....26
- configuration and application overview....22
- configuration statement for
  - aggregate....168
  - premium....207
- example....151
- overview....7, 149
- single token bucket algorithm....28

hierarchical-policer statement....186

I

ICMP (Internet Control Message Protocol), policers....65

if-exceeding statement
- hierarchical policer....187
- single-rate two-color policer....188

input-hierarchical-policer statement....189

input-policer statement....189

input-three-color statement....190

Internet Control Message Protocol policers....65

L

Layer 2 policer
- hierarchical policer
  - configuration overview....22
  - example....151
  - overview....149
- three-color policer
  - overview....158
- two-color policer
  - overview....156

layer2-policer statement....191
- hierarchical policing....22

Layer 2 policer
- three-color-policer
  - example....133, 159

load-balance-group statement....192

logical bandwidth policer
- example....57
- overview....56

logical interface (aggregate) policer
- configuration statement for....193
- example
  - single-rate two-color....128
  - two-rate three-color....133, 159
- overview....127

logical interface-policer statement....193

logical-bandwidth-policer statement....192

loopback interface, applying stateless firewall filters to (configuration editor)....65

loss-priority statement
- stateless firewall filter action....193

M

multifield classification
- example....92
- limitations on M Series routers....90
- overview....87
- requirements and restrictions....89

N

naming conventions
- three-color policer....112

O

output-policer statement....195

output-three-color statement....196

P

packet loss priority
- policer actions
  - overview....3

peak-burst-size statement....197

peak-information-rate statement....199

physical interface policer
- configuration statement for....201
- example....141
- overview....139

physical-interface-filter statement....200

physical-interface-policer statement....201

ping command (stateless firewall filter)....69
- explanation....69

policer
- and firewall filter
  - order of operations....10
- applying to a logical interface....202
- bandwidth limit....25
- burst size
  - calculation of....33

burst-size limit....25
color markings and actions....26
filter-specific....64
guidelines for applying....24
overview....3
prefix-specific action
configuration scenarios....81
example....74
overview....71
statement hierarchy....13
supported standards....215
term-specific....64
traffic-limiting criteria....25
types....7
policer actions
forwarding class
overview....3
packet loss-priority
overview....3
policer overhead for rate shaping
example....103
overview....102
policer statement
configuring....203
stateless firewall filter action....204
policer, hierarchical
and firewall filter
order of operations....10
bandwidth limit....25
burst size
guidelines for calculating....33
burst-size limit....25
color markings and actions....26
configuration and application overview....22
configuration statement for....186
aggregate....168
premium....207
example....151
overview....7, 24, 149
single token bucket algorithm....28
policer, Layer 2
hierarchical policer
configuration overview....22
example....151
overview....149
three-color policer
overview....158
two-color policer
overview....156
policer, multifield classification
example....92
limitations on M Series routers....90
overview....87
requirements and restrictions....89
policer, single-rate three-color
bandwidth limit....25
burst size
guidelines for calculating....33
burst-size limit....25
color markings and actions....26
color modes....111
configuration and application overview....19
dual token bucket algorithm....30
example....114
logical interface (aggregate)
overview....127
naming conventions....112
overview....7, 113
physical interface policer
overview....139
supported platforms....111
policer, single-rate two-color
bandwidth limit....25
burst size
guidelines for calculating....33
burst-size limit....25
color markings and actions....26
configuration and application overview....15
example....40, 46
logical bandwidth
example....57
overview....56
logical interface (aggregate)
example....128
overview....127
overview....7, 39
physical interface policer
example....141
overview....139
prefix-specific action
configuration scenarios....81
example....74
overview....71
single token bucket algorithm....28
policer, two-rate three-color
bandwidth limit....25
burst size
guidelines for calculating....33

burst-size limit....25
color markings and actions....26
color modes....111
configuration and application overview....19
dual-rate dual token bucket algorithm....30
example....120
logical interface (aggregate)
example....133, 159
overview....127
naming conventions....112
overview....7, 119
physical interface policer
overview....139
supported platforms....111
policers
for stateless firewall filters....65
policers, displaying....231
prefix-action statement
configuration scenarios....81
configuring....205
example....74
firewall filter action....206
overview....71
prefix-specific action
filter-specific....74
term-specific....74
prefix-specific counting and policing
configuration scenarios....81
example....74
overview....71
premium statement
hierarchical policer....207

R

rate-shaping
configuring policer overhead for
example....103
overview....102
RED drop profiles....87
Routing Engine
protecting against DoS attacks....65
routing solutions
protecting against DoS attacks....65

S

sample configurations
firewall filter configurations....69
show firewall command....69, 223
show firewall filter protect-RE command....70
show firewall filter version command....226
show firewall log command....227
show firewall prefix-action-stats command....230
show interfaces lo0 command....65
show interfaces policers command....128
show policer command....231
single token bucket algorithm....28
single-rate statement....208
single-rate three-color policer
and firewall filter
order of operations....10
bandwidth limit....25
burst-size limit....25
color markings and actions....26
color modes....111
configuration and application summary....19
dual token bucket algorithm....30
example....114
Layer 2 policer
overview....158
logical interface (aggregate)
overview....127
naming conventions....112
overview....7, 24, 113
physical interface policer
overview....139
supported platforms....111
single-rate two-color policer
and firewall filter
order of operations....10
at Layer 2
overview....156
burst-size limit....25
color markings and actions....26
configuration and application overview....15
example....40, 46
logical bandwidth
example....57
overview....56
logical interface (aggregate)
example....128
overview....127
overview....7, 24, 39
physical interface policer
example....141
overview....139

prefix-specific action
configuration scenarios....81
example....74
overview....71
single token bucket algorithm....28
standard stateless firewall filters
multifield classification
example....92
limitations on M Series routers....90
overview....87
requirements and restrictions....89
standards
supported for policing....215
stateless firewall filters
applying to an interface (configuration editor)....65
displaying configurations....69
displaying statistics....70
policers for....65
protecting the Routing Engine against TCP floods....65
verifying configuration....69
verifying flood protection....69
statistics
stateless firewall filters....70
supported platforms
three-color policer....111

T

TCP policers....65
telnet command....69
term-specific
counting and policing set....74
policer....64
three-color policer
color modes....111
naming conventions....112
single-rate
example....114
overview....113
supported platforms....111
two-rate....113, 119
example....120
overview....119
See also policer, single-rate three-color
See also policer, two-rate three-color
three-color-policer statement....209
stateless firewall filter action....210
token bucket algorithm
dual bucket....30
dual-rate dual bucket....30
single bucket....28
traffic-limiting criteria
policers....25
two-rate statement....211
two-rate three-color policer
bandwidth limit....25
burst-size limit....25
color markings and actions....26
color modes....111
configuration and application overview....19
dual-rate dual token bucket algorithm....30
example....120
Layer 2 policer
overview....158
logical interface (aggregate)
example....133, 159
overview....127
naming conventions....112
overview....7, 24, 119
physical interface policer
overview....139
supported platforms....111
two-rate three-color-policer
and firewall filter
order of operations....10

V

verification
stateless firewall filter flood protection....69
stateless firewall filters....69
stateless firewall statistics....70