

# Class of Service Overview and Examples for EX9200 Switches



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## Documentation and Release Notes

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To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

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## Supported Platforms

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For the features described in this document, the following platforms are supported:

- EX Series

## Using the Examples in This Manual

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If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the CLI User Guide.

## Documentation Conventions

Table 1 on page xi defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page xi defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies book names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS System Basics Configuration Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
<b>Text like this</b>	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Enclose optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b>  ( <i>string1</i>   <i>string2</i>   <i>string3</i> )
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	<b>community name members [</b> <i>community-ids</i> <b>]</b>
Indentation and braces ( { } )	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
<b>GUI Conventions</b>		
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

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We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net), or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:  
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

## Opening a Case with JTAC

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- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

## PART 1

# Overview

- [CoS Overview on page 3](#)
- [CoS Input and Output Configuration on page 13](#)
- [Packet Flow Through the CoS Process on page 15](#)



## CHAPTER 1

# CoS Overview

- [CoS Overview on page 3](#)
- [CoS Standards on page 4](#)
- [Understanding Packet Flow Across a Network on page 4](#)
- [Junos CoS Components on page 5](#)
- [Default CoS Settings on page 7](#)
- [CoS Applications Overview on page 9](#)
- [Interface Types That Do Not Support CoS on page 10](#)
- [VPLS and Default CoS Classification on page 11](#)

## CoS Overview

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When a network experiences congestion and delay, some packets must be dropped. The Juniper Networks® Junos® operating system (Junos OS) class of service (CoS) enables you to divide traffic into classes and offer various levels of throughput and packet loss when congestion occurs. This allows packet loss to happen according to rules that you configure.

For interfaces that carry IPv4, IPv6, and MPLS traffic, you can configure the Junos OS CoS features to provide multiple classes of service for different applications. On the routing device, you can configure multiple forwarding classes for transmitting packets, define which packets are placed into each output queue, schedule the transmission service level for each queue, and manage congestion using a random early detection (RED) algorithm.

The Junos OS CoS features provide a set of mechanisms that you can use to provide differentiated services when best-effort traffic delivery is insufficient. In designing CoS applications, you must give careful consideration to your service needs, and you must thoroughly plan and design your CoS configuration to ensure consistency across all routing devices in a CoS domain. You must also consider all the routing devices and other networking equipment in the CoS domain to ensure interoperability among all equipment.

Because Juniper Networks routing devices implement CoS in hardware rather than in software, you can experiment with and deploy CoS features without adversely affecting packet forwarding and routing performance.

- Related Documentation**
- [Hardware Capabilities and Limitations](#)

## CoS Standards

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The standards for Juniper Networks® Junos® operating system (Junos OS) class of service (CoS) capabilities are defined in the following RFCs:

- RFC 2474, *Definition of the Differentiated Services Field in the IPv4 and IPv6 Headers*
- RFC 2597, *Assured Forwarding PHB Group*
- RFC 2598, *An Expedited Forwarding PHB*
- RFC 2698, *A Two Rate Three Color Marker*

## Understanding Packet Flow Across a Network

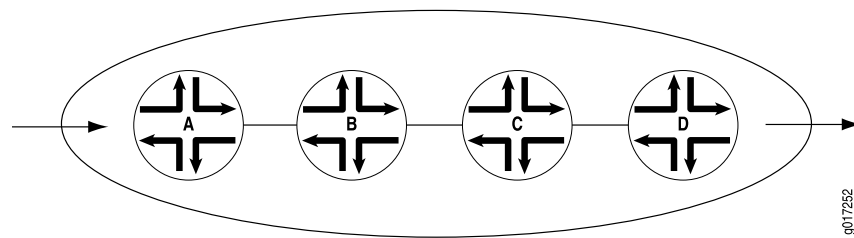
---

CoS works by examining traffic entering at the edge of your network. The edge routing devices classify traffic into defined service groups, to provide the special treatment of traffic across the network. For example, voice traffic can be sent across certain links, and data traffic can use other links. In addition, the data traffic streams can be serviced differently along the network path to ensure that higher-paying customers receive better service. As the traffic leaves the network at the far edge, you can reclassify the traffic.

To support CoS, you must configure each routing device in the network. Generally, each routing device examines the packets that enter it to determine their CoS settings. These settings then dictate which packets are first transmitted to the next downstream routing device. In addition, the routing devices at the edges of the network might be required to alter the CoS settings of the packets that enter the network from the customer or peer networks.

In [Figure 1 on page 5](#), Router A is receiving traffic from a customer network. As each packet enters, Router A examines the packet's current CoS settings and classifies the traffic into one of the groupings defined by the Internet service provider (ISP). This definition allows Router A to prioritize its resources for servicing the traffic streams it is receiving. In addition, Router A might alter the CoS settings (forwarding class and loss priority) of the packets to better match the ISP's traffic groups. When Router B receives the packets, it examines the CoS settings, determines the appropriate traffic group, and processes the packet according to those settings. It then transmits the packets to Router C, which performs the same actions. Router D also examines the packets and determines the appropriate group. Because Router D sits at the far end of the network, the ISP might decide once again to alter the CoS settings of the packets before Router D transmits them to the neighboring network.

Figure 1: Packet Flow Across the Network



## Junos CoS Components

The Juniper Networks® Junos® operating system (Junos OS) CoS consists of many components that you can combine and tune to provide the level of services required by customers.

The Junos OS CoS components include:

- **Code-point aliases**—A *code-point alias* assigns a name to a pattern of code-point bits. You can use this name instead of the bit pattern when you configure other CoS components, such as classifiers, drop-profile maps, and rewrite rules.
- **Classifiers**—*Packet classification* refers to the examination of an incoming packet. This function associates the packet with a particular CoS servicing level. In the Junos OS, classifiers associate incoming packets with a forwarding class and loss priority and, based on the associated forwarding class, assign packets to output queues. Two general types of classifiers are supported:
  - **Behavior aggregate or CoS value traffic classifiers**—A *behavior aggregate* (BA) is a method of classification that operates on a packet as it enters the routing device. The CoS value in the packet header is examined, and this single field determines the CoS settings applied to the packet. BA classifiers allow you to set the forwarding class and loss priority of a packet based on 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 traffic classifiers**—A *multifield* classifier is a second method for classifying traffic flows. Unlike a behavior aggregate, a multifield classifier can examine multiple fields in the packet. Examples of some fields that a multifield classifier can examine include the source and destination address of the packet as well as the source and destination port numbers of the packet. With multifield classifiers, you set the forwarding class and loss priority of a packet based on firewall filter rules.
- **Forwarding classes**—The *forwarding classes* affect the forwarding, scheduling, and marking policies applied to packets as they transit a routing device. The forwarding class plus the loss priority define the per-hop behavior. Four categories of forwarding classes are supported: best effort, assured forwarding, expedited forwarding, and network control. For Juniper Networks M Series Multiservice Edge Routers, four forwarding classes are supported. You can configure up to one each of the four types of forwarding classes. For M120 and M320 Multiservice Edge Routers, Juniper Networks MX Series 3D Universal Edge Routers, Juniper Networks T Series Core Routers and EX Series switches, 16 forwarding classes are supported, so you can classify packets more

granularly. For example, you can configure multiple classes of expedited forwarding (EF) traffic: EF, EF1, and EF2.

- **Loss priorities**—*Loss priorities* allow you to set the priority of dropping a packet. Loss priority affects the scheduling of a packet without affecting the packet's relative ordering. You can use the packet loss priority (PLP) bit as part of a congestion control strategy. You can use the loss priority setting to identify packets that have experienced congestion. Typically you mark packets exceeding some service level with a high loss priority. You set loss priority by configuring a classifier or a policer. The loss priority is used later in the workflow to select one of the drop profiles used by RED.
- **Forwarding policy options**—These options allow you to associate forwarding classes with next hops. Forwarding policy also allows you to create classification overrides, which assign forwarding classes to sets of prefixes.
- **Transmission scheduling and rate control**—These parameters provide you with a variety of tools to manage traffic flows:
  - **Queuing**—After a packet is sent to the outgoing interface on a routing device, it is queued for transmission on the physical media. The amount of time a packet is queued on the routing device is determined by the availability of the outgoing physical media as well as the amount of traffic using the interface.
  - **Schedulers**—An individual routing device interface has multiple queues assigned to store packets. The routing device determines which queue to service based on a particular method of scheduling. This process often involves a determination of which type of packet should be transmitted before another. The Junos OS schedulers allow you to define the priority, bandwidth, delay buffer size, rate control status, and RED drop profiles to be applied to a particular queue for packet transmission.
  - **Fabric schedulers**—For M320 and T Series routers only, fabric schedulers allow you to identify a packet as high or low priority based on its forwarding class, and to associate schedulers with the fabric priorities.
  - **Policers for traffic classes**—*Policers* allow you to limit traffic of a certain class to a specified bandwidth and burst size. Packets exceeding the policer limits can be discarded, or can be assigned to a different forwarding class, a different loss priority, or both. You define policers with filters that can be associated with input or output interfaces.
- **Rewrite rules**—A *rewrite rule* sets the appropriate CoS bits in the outgoing packet. This allows the next downstream routing device to classify the packet into the appropriate service group. Rewriting, or marking, outbound packets is useful when the routing device is at the border of a network and must alter the CoS values to meet the policies of the targeted peer.

## Default CoS Settings

---

If you do not configure any CoS settings on your routing device, the software performs some CoS functions to ensure that user traffic and protocol packets are forwarded with minimum delay when the network is experiencing congestion. Some default mappings are automatically applied to each logical interface that you configure. Other default mappings, such as explicit default classifiers and rewrite rules, are in operation only if you explicitly associate them with an interface.

You can display default CoS settings by issuing the **show class-of-service** operational mode command. This section includes sample output displaying the default CoS settings. The sample output is truncated for brevity.

**show class-of-service**      user@host> **show class-of-service**

#### Default Forwarding Classes

Forwarding class	Queue
best-effort	0
expedited-forwarding	1
assured-forwarding	2
network-control	3

#### Default Code-Point Aliases

Code point type: dscp

Alias	Bit pattern
af11	001010
af12	001100

...

Code point type: dscp-ipv6

...

Code point type: exp

...

Code point type: ieee-802.1

...

Code point type: inet-precedence

...

#### Default Classifiers

Classifier: dscp-default, Code point type: dscp, Index: 7

...

Classifier: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 8

...

Classifier: exp-default, Code point type: exp, Index: 9

...

Classifier: ieee8021p-default, Code point type: ieee-802.1, Index: 10

...

Classifier: ipprec-default, Code point type: inet-precedence, Index: 11

...

Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 12

...

#### Default Frame Relay Loss Priority Map

Loss-priority-map: frame-relay-de-default, Code point type: frame-relay-de, Index: 13

Code point	Loss priority
0	low
1	high

#### Default Rewrite Rules

Rewrite rule: dscp-default, Code point type: dscp, Index: 24

Forwarding class	Loss priority	Code point
best-effort	low	000000
best-effort	high	000000

...

Rewrite rule: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 25

...

Rewrite rule: exp-default, Code point type: exp, Index: 26

...

Rewrite rule: ieee8021p-default, Code point type: ieee-802.1, Index: 27

...

Rewrite rule: ipprec-default, Code point type: inet-precedence, Index: 28

...

**Default Drop Profile**

Drop profile: &lt;default-drop-profile&gt;, Type: discrete, Index: 1

Fill level	Drop probability
100	100

**Default Schedulers**

Scheduler map: &lt;default&gt;, Index: 2

Scheduler: &lt;default-be&gt;, Forwarding class: best-effort, Index: 17

Transmit rate: 95 percent, Rate Limit: none, Buffer size: 95 percent, Priority: low

Drop profiles:

Loss priority	Protocol	Index	Name
Low	Any	1	<default-drop-profile>
High	Any	1	<default-drop-profile>

...

**Related Documentation**

- Default Forwarding Classes
- Default Behavior Aggregate Classification Overview
- Default Drop Profile
- Default Schedulers Overview
- Default Fabric Priority Queuing

**CoS Applications Overview**

You can configure CoS features to meet your application needs. Because the components are generic, you can use a single CoS configuration syntax across multiple routing devices. CoS mechanisms are useful for two broad classes of applications. These applications can be referred to as *in the box* and *across the network*.

In-the-box applications use CoS mechanisms to provide special treatment for packets passing through a single node on the network. You can monitor the incoming traffic on each interface, using CoS to provide preferred service to some interfaces (that is, to some customers) while limiting the service provided to other interfaces. You can also filter outgoing traffic by the packet's destination, thus providing preferred service to some destinations.

Across-the-network applications use CoS mechanisms to provide differentiated treatment to different classes of packets across a set of nodes in a network. In these types of applications, you typically control the ingress and egress routing devices to a routing domain and all the routing devices within the domain. You can use the Junos OS CoS features to modify packets traveling through the domain to indicate the packet's priority across the domain.

Specifically, you modify the CoS code points in packet headers, remapping these bits to values that correspond to levels of service. When all routing devices in the domain are configured to associate the precedence bits with specific service levels, packets traveling across the domain receive the same level of service from the ingress point to the egress point. For CoS to work in this case, the mapping between the precedence bits and service levels must be identical across all routing devices in the domain.

The Junos OS CoS applications support the following range of mechanisms:

- **Differentiated Services (DiffServ)**—The CoS application supports DiffServ, which uses 6-bit IPv4 and IPv6 header type-of-service (ToS) byte settings. The configuration uses CoS values in the IP and IPv6 ToS fields to determine the forwarding class associated with each packet.

- **Layer 2 to Layer 3 CoS mapping**—The CoS application supports mapping of Layer 2 (IEEE 802.1p) packet headers to routing device forwarding class and loss-priority values.

Layer 2 to Layer 3 CoS mapping involves setting the forwarding class and loss priority based on information in the Layer 2 header. Output involves mapping the forwarding class and loss priority to a Layer 2-specific marking. You can mark the Layer 2 and Layer 3 headers simultaneously.

- **MPLS EXP**—Supports configuration of mapping of MPLS experimental (EXP) bit settings to routing device forwarding classes and vice versa.
- **VPN outer-label marking**—Supports setting of outer-label EXP bits, also known as CoS bits, based on MPLS EXP mapping.

---

## Interface Types That Do Not Support CoS

---

For original Channelized OC12 PICs, limited CoS functionality is supported. For more information, contact Juniper Networks customer support.



**NOTE:** Transmission scheduling is not supported on 8-port, 12-port, and 48-port Fast Ethernet PICs.

You can configure CoS on all interfaces, except the following:

- **cau4**—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ PIC).
- **coc1**—Channelized OC1 IQ interface (configured on the Channelized OC12 IQ PIC).
- **coc12**—Channelized OC12 IQ interface (configured on the Channelized OC12 IQ PIC).
- **cstm-1**—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ PIC).
- **ct1**—Channelized T1 IQ interface (configured on the Channelized DS3 IQ PIC or Channelized OC12 IQ PIC).
- **ct3**—Channelized T3 IQ interface (configured on the Channelized DS3 IQ PIC or Channelized OC12 IQ PIC).

- **ce1**—Channelized E1 IQ interface (configured on the Channelized E1 IQ PIC or Channelized STM1 IQ PIC).
- **dsc**—Discard interface.
- **fxp**—Management and internal Ethernet interfaces.
- **lo**—Loopback interface. This interface is internally generated.
- **pe**—Encapsulates packets destined for the rendezvous point routing device. This interface is present on the first-hop routing device.
- **pd**—De-encapsulates packets at the rendezvous point. This interface is present on the rendezvous point.
- **vt**—Virtual loopback tunnel interface.



**NOTE:** For channelized interfaces, you can configure CoS on channels, but not at the controller level. For a complex configuration example, see the Junos OS Feature Guides.

## VPLS and Default CoS Classification

A VPLS routing instance with the **no-tunnel-services** option configured has a default classifier applied to the label-switched interface for all VPLS packets coming from the remote VPLS PE. This default classifier is modifiable only on MX Series routers. On T Series, when **no-tunnel-services** option is configured, the custom classifier for VPLS instances is not supported.



**NOTE:** With **no-tunnel-services** configured, custom classifier for VPLS routing instances on T Series and LMNR based FPC for M320 is not supported. When a wild card configuration or an explicit routing instances are configured for VPLS on CoS CLI, the custom classifier binding results in default classifier binding on Packet Forwarding Engine (PFE).

For example, on routing devices with eight queues (Juniper Networks M120 and M320 Multiservice Edge Routers, MX Series Ethernet Services Routers, and T Series Core Routers), the default classification applied to **no-tunnel-services** VPLS packets are shown in [Table 3 on page 11](#).

**Table 3: Default VPLS Classifiers**

MPLS Label EXP Bits	Forwarding Class/Queue
000	0
001	1
010	2

Table 3: Default VPLS Classifiers (*continued*)

MPLS Label EXP Bits	Forwarding Class/Queue
011	3
100	4
101	5
110	6
111	7



**NOTE:** Forwarding class to queue number mapping is not always one-to-one. Forwarding classes and queues are only the same when default forwarding-class-to-queue mapping is in effect. For more information about configuring forwarding class and queues, see [Configuring Forwarding Classes](#).

On MX Series routers, VPLS filters and policers act on a Layer 2 frame that includes the media access control (MAC) header (after any VLAN rewrite or other rules are applied), but does not include the cyclical redundancy check (CRC) field.



**NOTE:** On MX Series routers, if you apply a counter in a firewall for egress MPLS or VPLS packets with the EXP bits set to 0, the counter will not tally these packets.

# CoS Input and Output Configuration

- [CoS Inputs and Outputs Overview on page 13](#)

## CoS Inputs and Outputs Overview

Some CoS components map one set of values to another set of values. Each mapping contains one or more inputs and one or more outputs.

Some CoS components map one set of values to another set of values. Each mapping contains one or more inputs and one or more outputs. When you configure a mapping, you set the outputs for a given set of inputs, as shown in [Table 4 on page 13](#).

Table 4: CoS Mappings—Inputs and Outputs

CoS Mappings	Inputs	Outputs	Comments
classifiers	code-points	forwarding-class loss-priority	The map sets the forwarding class and PLP for a specific set of code points.
drop-profile-map	loss-priority protocol	drop-profile	The map sets the drop profile for a specific PLP and protocol type.
rewrite-rules	loss-priority	code-points	The map sets the code points for a specific forwarding class and PLP.

- Related Documentation
- [Default Behavior Aggregate Classification Overview](#)
  - [Configuring Drop Profile Maps for Schedulers](#)
  - [Applying Default Rewrite Rules](#)
  - [CoS Inputs and Outputs Examples](#)



# Packet Flow Through the CoS Process

- [Packet Flow Through the CoS Process Overview on page 15](#)

## Packet Flow Through the CoS Process Overview

---

Perhaps the best way to understand Junos CoS is to examine how a packet is treated on its way through the CoS process. This topic includes a description of each step and figures illustrating the process.

The following steps describe the CoS process:

1. A logical interface has one or more classifiers of different types applied to it (at the **[edit class-of-service interfaces]** hierarchy level). The types of classifiers are based on which part of the incoming packet the classifier examines (for example, EXP bits, IEEE 802.1p bits, or DSCP bits). You can use a translation table to rewrite the values of these bits on ingress.



**NOTE:** You can only rewrite the values of these bits on ingress on the Juniper Networks M40e, M120, M320 Multiservice Edge Routers, and T Series Core Routers with IQE PICs. For more information about rewriting the values of these bits on ingress, see [Configuring ToS Translation Tables](#).

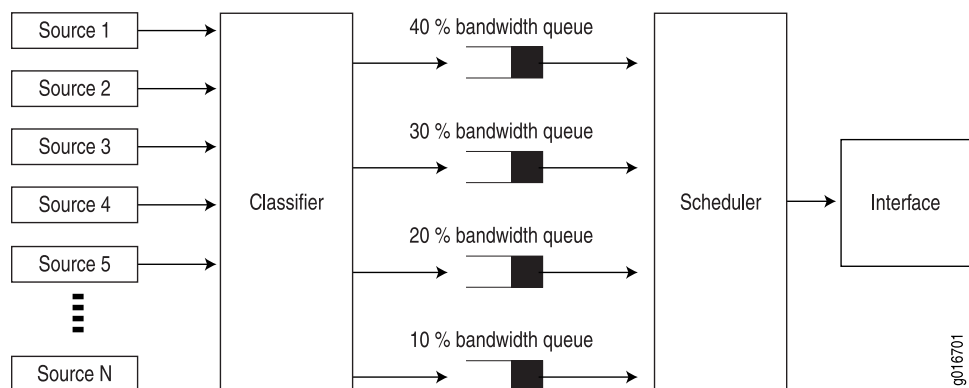
2. The classifier assigns the packet to a forwarding class and a loss priority (at the **[edit class-of-service classifiers]** hierarchy level).
3. Each forwarding class is assigned to a queue (at the **[edit class-of-service forwarding-classes]** hierarchy level).
4. Input (and output) policers meter traffic and might change the forwarding class and loss priority if a traffic flow exceeds its service level.
5. The physical or logical interface has a scheduler map applied to it (at the **[edit class-of-service interfaces]** hierarchy level).

At the **[edit class-of-service interfaces]** hierarchy level, the **scheduler-map** and **rewrite-rules** statements affect the outgoing packets, and the **classifiers** statement affects the incoming packets.

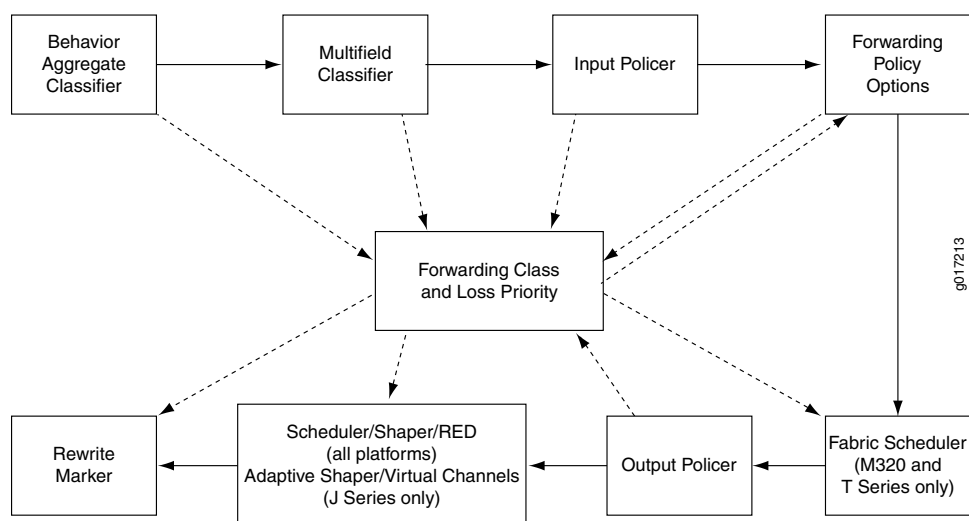
6. The scheduler defines how traffic is treated in the output queue—for example, the transmit rate, buffer size, priority, and drop profile (at the **[edit class-of-service schedulers]** hierarchy level).
7. The scheduler map assigns a scheduler to each forwarding class (at the **[edit class-of-service scheduler-maps]** hierarchy level).
8. The drop-profile defines how aggressively to drop packets that are using a particular scheduler (at the **[edit class-of-service drop-profiles]** hierarchy level).
9. The rewrite rule takes effect as the packet leaves a logical interface that has a rewrite rule configured (at the **[edit class-of-service rewrite-rules]** hierarchy level). The rewrite rule writes information to the packet (for example, EXP or DSCP bits) according to the forwarding class and loss priority of the packet.

Figure 2 on page 16 and Figure 3 on page 16 show the components of the Junos CoS features, illustrating the sequence in which they interact.

**Figure 2: CoS Classifier, Queues, and Scheduler**



**Figure 3: Packet Flow Through CoS Configurable Components**



Each outer box in [Figure 3 on page 16](#) represents a process component. The components in the upper row apply to inbound packets, and the components in the lower row apply to outbound packets. The arrows with the solid lines point in the direction of packet flow.

The middle box (forwarding class and loss priority) represents two data values that can either be inputs to or outputs of the process components. The arrows with the dotted lines indicate inputs and outputs (or settings and actions based on settings). For example, the multifield classifier sets the forwarding class and loss priority of incoming packets. This means that the forwarding class and loss priority are outputs of the classifier; thus, the arrow points away from the classifier. The scheduler receives the forwarding class and loss priority settings, and queues the outgoing packet based on those settings. This means that the forwarding class and loss priority are inputs to the scheduler; thus, the arrow points to the scheduler.

Typically, only a combination of some components (not all) is used to define a CoS service offering.

**Related  
Documentation**

- [Packet Flow Through the CoS Process Configuration Example](#)



## PART 2

# Configuration

- [Configuration Statements on page 21](#)



## CHAPTER 4

# Configuration Statements

- [\[edit chassis\] Hierarchy Level on page 21](#)
- [\[edit class-of-service\] Hierarchy Level on page 29](#)
- [\[edit firewall\] Hierarchy Level on page 33](#)
- [\[edit interfaces\] Hierarchy Level on page 46](#)

### [\[edit chassis\] Hierarchy Level](#)

---

```
chassis {
  aggregated-devices {
    ethernet {
      device-count number;
      lacp {
        link-protection {
          non-revertive;
        }
        system-priority;
      }
    }
    sonet {
      device-count number;
    }
    maximum-links maximum-links-limit;
  }
  alarm {
    ds1 {
      ais (ignore | red | yellow);
      ylw (ignore | red | yellow);
    }
    ethernet {
      link-down (ignore | red | yellow);
    }
    integrated-services {
      failure (ignore | red | yellow);
    }
    management-ethernet {
      link-down (ignore | red | yellow);
    }
    relay
    input {
      port port-number {
```

```
        mode (close | open);
        trigger (ignore | red | yellow;
    }
}
output{
    port port-number {
        input-relay input-relay;
        mode (close | open);
        temperature;
    }
}
serial {
    cts-absent (ignore | red | yellow);
    dcd-absent (ignore | red | yellow);
    dsr-absent (ignore | red | yellow);
    loss-of-rx-clock (ignore | red | yellow);
    loss-of-tx-clock (ignore | red | yellow);
    tm-absent (ignore | red | yellow);
}
services {
    hw-down (ignore | red | yellow);
    linkdown (ignore | red | yellow);
    pic-hold-reset (ignore | red | yellow);
    pic-reset (ignore | red | yellow);
    rx-errors (ignore | red | yellow);
    sw-down (ignore | red | yellow);
    tx-errors (ignore | red | yellow);
}
sonet {
    (ais-l | ais-p | ber-sd | ber-sf | locd | lol | lop-p | los | pll | plm-p | rfi-l | rfl-p | uneq-p)
    (ignore | red | yellow);
}
t3 {
    (ais | exz | ferf | idle | lcv | lof | los | pll | ylw) (ignore | red | yellow);
}
}
cluster {
    control-link-recovery;
    control-ports {
        fpc slot-number port port-number;
    }
    heartbeat-interval milliseconds;
    heartbeat-threshold number;
    redundancy-group {
        ... the redundancy-group subhierarchy appears at the end of the [edit chassis cluster]
        hierarchy ...
    }
    reth-count number;
    traceoptions {
        file <filename> <files number> <match regular-expression> <size maximum-file-size>
        <world-readable | no-world-readable>;
        flag flag;
        level severity;
        no-remote-trace;
    }
    redundancy-group group-number {
```

```

gratuitous-arp-count number;
hold-down-interval seconds;
interface-monitor {
    interface-name weight number;
}
ip-monitoring {
    family {
        inet {
            ipv4-address {
                interface rethindex.logical-unit-number secondary-ip-address ipv4-address;
                weight number;
            }
        }
    }
    global-threshold number;
    global-weight number;
    retry-count count;
    retry-interval interval;
}
node node-number priority priority-number;
preempt;
}
config-button {
    no-clear;
    no-rescue;
}
container-devices {
    device-count number;
}
craft-lockout;
disable-power-management;
disk-partition partition-name (/config | /var) {
    level (full | high) {
        free-space threshold-value (mb | percent);
    }
}
enhanced-policer;
extended-statistics;
fabric {
    degraded {
        action-fpc-restart-disable;
        degraded-fabric-detection-enable
        degraded-fpc-bad-plane-threshold number-bad-planes;
    }
    redundancy-mode (increased-bandwidth | redundant);
}
filter;
fpc slot-number {
    ... the fpc subhierarchy appears after the main [edit chassis] hierarchy ...
}
fpc-feb-connectivity {
    fpc slot-number feb (slot-number | none);
}
fpc-resync;
fru-poweron-sequence sequence;
lcc index {

```

```
... the lcc subhierarchy appears after the main [edit chassis] hierarchy ...
}
maximum-ecmp value;
memory-enhanced {
    filter;
    route;
    vpn-label;
}
network-services (ethernet | enhanced-ethernet | ip | enhanced-ip);
(packet-scheduling | no-packet-scheduling);
pem {
    minimum number;
}
policer-drop-probability-low;
ppp-subscriber-services (disable | enable);
redundancy {
    cfeb slot (always | preferred);
    failover {
        on-disk-failure;
        on-loss-of-keepalives;
    }
    feb {
        redundancy-group group-name {
            description description;
            feb slot-number <backup | primary>;
            no-auto-failover;
        }
    }
    graceful-switchover;
    keepalive-time seconds;
    routing-engine slot-number (backup | disabled | master);
    sfm slot-number (always | preferred);
    ssb slot-number (always | preferred);
}
route-memory-enhanced;
route-localization {
    inet (chassis);
    inet6;
}
routing-engine {
    bios {
        no-auto-upgrade;
    }
    on-disk-failure disk-failure-action (halt | reboot);
}
sfm slot-number {
    power off;
}
sib {
    minimum number;
}
(source-route | no-source-route);
state [
    cb-upgrade [on | off];
]
synchronization { # for M Series and T Series routers
```

```

primary (external-a | external-b);
secondary (external-a | external-b);
signal-type (e1 | t1);
switching-mode (non-revertive | revertive);
transmitter-enable;
validation-interval seconds;
y-cable-line-termination;
}
synchronization { # for MX80 and MX240 routers
  clock-mode (auto-select | free-run);
  esmc-transmit {
    interfaces (all | interface-name);
  }
  hold-interval {
    configuration-change seconds;
    restart seconds;
    switchover seconds;
  }
  network-option (option-1 | option-2);
  quality-mode-enable;
  selection-mode (configured-quality|received-quality);
  source {
    (external-a | external-b) {
      priority number;
      quality-level (prc | prs |sec | smc | ssu-a | ssu-b | st2 | st3 | st3e | st4 | stu | tnc);
      request (force-switch | lockout);
    }
    interfaces interface-name {
      priority number;
      quality-level (prc | prs |sec | smc | ssu-a | ssu-b | st2 | st3 | st3e | st4 | stu | tnc);
      request (force-switch | lockout);
      wait-to-restore minutes;
    }
  }
  switchover-mode (revertive | non-revertive);
}
synchronization { # for ACX Series routers
  clock-mode (auto-select | free-run);
  esmc-transmit {
    interfaces (all | interface-name);
  }
  hold-interval {
    configuration-change seconds;
    restart seconds;
    switchover seconds;
  }
  network-option (option-1 | option-2);
  quality-mode-enable;
  selection-mode (configured-quality | received-quality);
  source {
    (bits | gps) {
      priority number;
      quality-level (prc | prs |sec | smc | ssu-a | ssu-b | st2 | st3 | st3e | st4 | stu | tnc);
      request (force-switch | lockout);
    }
    interfaces interface-name {

```

```
        priority number;
        quality-level (prc | prs | sec | smc | ssu-a | ssu-b | st2 | st3 | st3e | st4 | stu | tnc);
        request (force-switch | lockout);
        wait-to-restore minutes;
    }
}
switchover-mode(non-revertive | revertive);
}
system-domains {
    protected-system-domains psdnumerical-index {
        control-plane-bandwidth-percent percent;
        control-slot-numbers [ slot-numbers ];
        control-system-id control-system-id;
        description description;
        fpcs [ slot-numbers ];
    }
    root-domain-id root-domain-id;
}
vrf-mtu-check;
}

chassis {
    fpc slot-number {
        number-of-ports active-ports;
        offline;
        pic slot-number {
            ... the pic subhierarchy appears after the main [edit chassis fpc slot-number] hierarchy
            ...
        }
        port-mirror-instance port-mirror-instance-name;
        power (off | on);
        sampling-instance instance-name;
    }

    fpc slot-number {
        pic slot-number {
            adaptive-services {
                service-package (layer-2 | layer-3 | ...the following extension-provider subhierarchy
                ...);
            }
            extension-provider {
                control-cores number;
                data-cores number;
                data-flow-affinity {
                    hash-key (layer-3 | layer-4);
                }
                channelization;
                forwarding-db-size megabytes;
                object-cache-size megabytes;
                package package-name;
                policy-db-size megabytes;
                syslog {
                    facility {
                        severity;
                        destination (pic-console | routing-engine);
                    }
                }
            }
        }
    }
}
```

```

        wired-process-mem-size megabytes;
    }
}
aggregated-devices {
    ima {
        device-count number;
    }
}
aggregate-ports;
atm-cell-relay-accumulation;
atm-l2circuit-mode (aal5 | cell | trunk trunk);
cel {
    e1 port-number {
        channel-group group-number timeslots slot-number;
    }
}
ct3 {
    port port-number {
        t1 link-number {
            channel-group group-number timeslots slot-number;
        }
    }
}
ethernet {
    pic-mode (enhanced-switching | routing | switching);
}
fibre-channel {
    port port-number;
    port-range port-range-low port-range-high
}
egress-policer-overhead bytes;
forwarding-mode {
    sa-multicast;
    vlan-steering {
        vlan-rule (high-low | odd-even);
    }
}
framing (e1 | e3 | sdh | sonet | t1 | t3);
idle-cell-format {
    itu-t;
    payload-pattern payload-pattern-byte;
}
ingress-policer-overhead bytes;
inline-services {
    bandwidth (1g | 10g);
}
linerate-mode;
max-queues-per-interface (4 | 8);
mlfr-uni-nni-bundles number;
no-concatenate;
no-multi-rate;
port port-number {
    framing (e1 | e3 | sdh | sonet | t1 | t3);
    forwarding-mode {
        sa-multicast;
    }
}

```

```
    speed ( oc3-stm1 | oc12-stm4 | oc48-stm16);
  }
  port-mirror-instance port-mirror-instance-name;
  q-pic-large-buffer {
    (large-scale | small-scale);
  }
  red-buffer-occupancy {
    weighted-averaged <instant-usage-weight-exponent weight-value>;
  }
  shdsl {
    pic-mode (1-port-atm | 2-port-atm);
  }
  sparse-dlcis;
  traffic-manager {
    egress-shaping-overhead number;
    ingress-shaping-overhead number;
    mode {
      egress-only;
      ingress-and-egress;
      session-shaping;
    }
  }
  tunnel-queuing;
  tunnel-services {
    bandwidth (1g | 10g | 20g | 40g);
    tunnel-only;
  }
  vtmapping (itu-t | klm);
}
}

chassis {
  lcc index {
    fpc slot-number {
      ... the fpc subhierarchy appears after the main [edit chassis lcc index] hierarchy ...
    }
    offline;
    online-expected;
  }
}

lcc index {
  fpc slot-number {
    pic slot-number {
      ... the pic subhierarchy appears after the main [edit chassis lcc index fpc slot-number] hierarchy ...
    }
    power (off | on);
    sampling-instance instance-name;
  }

  fpc slot-number {
    pic slot-number {
      aggregate-ports;
      atm-cell-relay-accumulation;
    }
  }
}
```

```

atm-l2circuit-mode (aal5 | cell | trunk trunk);
framing (e1 | e3 | sdh | sonet | t1 | t3);
idle-cell-format {
    itu-t;
    payload-pattern payload-pattern-byte;
}
linerate-mode;
max-queues-per-interface (4 | 8);
no-concatenate;
no-mcast-replication;
no-pre-classifier;
port port-number {
    framing (e1 | e3 | sdh | sonet | t1 | t3);
}
q-pic-large-buffer {
    (large-scale | small-scale);
}
red-buffer-occupancy {
    weighted-averaged <instant-usage-weight-exponent weight-value>;
}
shdsl {
    pic-mode (1-port-atm | 2-port-atm);
}
traffic-manager {
    egress-shaping-overhead bytes;
    ingress-shaping-overhead bytes;
    mode {
        egress-only;
        ingress-and-egress;
    }
}
}
}
}
}

```

**Related Documentation** • [Notational Conventions Used in Junos OS Configuration Hierarchies](#)

## [\[edit class-of-service\] Hierarchy Level](#)

```

class-of-service {
    classifiers {
        type classifier-name {
            forwarding-class class-name {
                loss-priority (high | low | medium-high | medium-low) code-points [ aliases bits ];
            }
            import (classifier-name | default);
        }
    }
    code-point-aliases {
        (dscp | dscp-ipv6 | exp | ieee-802.1 | ieee-802.1ad | inet-precedence) {
            alias-name bits;
        }
    }
    drop-profiles {

```

```
    profile-name {
        fill-level percentage drop-probability percentage;
        interpolate {
            drop-probability value;
            fill-level value;
        }
    }
}
fabric {
    scheduler-map {
        priority (high | low) scheduler scheduler-name;
    }
}
forwarding-class-map {
    map-name {
        class class-name queue-num queue-number <restricted-queue queue-number>;
    }
}
forwarding-classes {
    class class-name policing-priority (normal | premium) queue-num queue-number
        priority (high | low);
    queue queue-number class-name policing-priority (normal | premium) priority (high |
        low);
}
forwarding-policy {
    class class-name {
        classification-override {
            forwarding-class class-name;
        }
    }
    next-hop-map map-name {
        forwarding-class class-name {
            discard;
            lsp-next-hop [ lsp-regular-expressions ];
            next-hop [ next-hop-names ];
            non-lsp-next-hop;
        }
    }
}
fragmentation-maps {
    map-name {
        forwarding-class class-name {
            drop-timeout milliseconds;
            fragment-threshold bytes;
            multilink-class number;
            no-fragmentation;
        }
    }
}
host-outbound-traffic {
    dscp-code-point value;
    forwarding-class class-name;
    ieee-802.1 {
        default value;
        rewrite-rules;
    }
}
```

```

    tcp {
        raise-internet-control-priority;
    }
}
interfaces {
    ... the interfaces subhierarchy appears after the main [edit class-of-service] hierarchy
    ...
}
restricted-queues {
    forwarding-class class-name queue-number;
}
rewrite-rules {
    (dscp | dscp-ipv6 | exp | frame-relay-de | ieee-802.1 | ieee-802.1ad | inet-precedence)
    rewrite-rule {
        forwarding-class class-name {
            loss-priority level code-point (alias | bits);
        }
        import (rewrite-rule | default);
    }
}
routing-instances routing-instance-name {
    classifiers {
        dscp (classifier-name | default);
        dscp-ipv6 (classifier-name | default);
        exp (classifier-name | default);
        ieee-208.1 (classifier-name | default | encapsulated | vlan-tag (inner | outer));
    }
}
scheduler-maps {
    map-name {
        forwarding-class class-name scheduler scheduler-name;
    }
}
schedulers {
    scheduler-name {
        adjust-minimum value;
        adjust-percent value;
        buffer-size (exact | percent percentage | remainder);
        drop-profile-map loss-priority (any | high | low | medium-high | medium-low)
            protocol any;
        excess-priority (high | low | medium-high | medium-low);
        excess-rate (percent percentage | proportion proportion);
        priority (high | low | medium-high | medium-low | strict-high);
        shaping-rate (bps | percent percentage | burst-size size);
        transmit-rate (bps | percent percentage | remainder) <exact | rate-limit>;
    }
}
traceoptions {
    file <files number> <match regular-expression> <size maximum-file-size>
        <world-readable | no-world-readable>;
    flag flag;
    no-remote-trace;
}
traffic-control-profiles {
    profile-name {

```

```
adjust-minimum rate;
delay-buffer-rate (bps | cps cps | percent percentage);
excess-rate (percent percentage | proportion value);
guaranteed-rate (bps | percent percentage) <burst-size bytes>;
overhead-accounting (frame-mode | cell-mode) <bytes byte-value>;
scheduler-map map-name;
shaping-rate (bps | percent percentage) <burst-size bytes>;
}
}
tri-color;
}

class-of-service {
  interfaces {
    interface-name {
      excess-bandwidth-share (equal | proportional value);
      input-excess-bandwidth-share (equal | proportional value);
      input-scheduler-map map-name;
      input-shaping-rate bps;
      input-traffic-control-profile profile-name;
      output-forwarding-class-map map-name;
      output-traffic-control-profile profile-name;
      scheduler-map map-name;
      scheduler-map-chassis (map-name | derived);
      shaping-rate bps;
      unit (logical-unit-number | *) {
        classifiers {
          dscp (classifier-name | default) {
            family [ inet mpls ];
          }
          dscp-ipv6 (classifier-name | default) {
            family [ inet mpls ];
          }
          exp (classifier-name | default);
          ieee-208.1 (classifier-name | default) <vlan-tag (inner | outer)>;
          ieee-208.1ad (classifier-name | default);
          inet-precedence (classifier-name | default);
        }
        forwarding-class class-name;
        input-scheduler-map map-name;
        input-shaping-rate bps;
        input-traffic-control-profile profile-name shared-instance instance-name;
        loss-priority-maps {
          (map-name | default);
        }
        loss-priority-rewrites {
          (map-name | default);
        }
        output-forwarding-class-map map-name;
        output-traffic-control-profile profile-name shared-instance instance-name;
        rewrite-rules {
          dscp (rule-name | default) <protocol mpls>;
          dscp-ipv6 (rule-name | default);
          exp (rule-name | default) <protocol [ mpls-any | mpls-inet-both |
            mpls-inet-both-non-vpn ]>;
          exp-push-push-push default;
        }
      }
    }
  }
}
```

```

exp-swap-push-push default;
ieee-802.1 (rewrite-name | default) <vlan-tag (outer | outer-and-inner)>;
ieee-802.1ad (rewrite-name | default) <vlan-tag (outer | outer-and-inner)>;
inet-precedence (rewrite-name | default) <protocol mpls>;
}
scheduler-map map-name;
shaping-rate bps;
translation-table (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 |
to-exp-from-exp | to-inet-precedence-from-inet-precedence) table-name;
}
}
interface-set interface-set-name {
excess-bandwidth-share (equal | proportional value);
input-excess-bandwidth-share (equal | proportional value);
input-traffic-control-profile profile-name;
input-traffic-control-profile-remaining profile-name;
internal-node;
output-traffic-control-profile profile-name;
output-traffic-control-profile-remaining profile-name;
}
}
}

```

**Related Documentation**

- [Notational Conventions Used in Junos OS Configuration Hierarchies](#)

## [\[edit firewall\] Hierarchy Level](#)

Several statements in the **[edit firewall]** hierarchy are valid at numerous locations within the hierarchy. To make the complete hierarchy easier to read, the repeated statements are listed in the following sections, which are referenced at the appropriate locations in “Complete [edit firewall] Hierarchy” on page 38.

- [Common Firewall Actions on page 33](#)
- [Common IP Firewall Actions on page 34](#)
- [Common IPv4 Firewall Actions on page 34](#)
- [Common IP Firewall Match Conditions on page 35](#)
- [Common IPv4 Firewall Match Conditions on page 36](#)
- [Common Layer 2 Firewall Match Conditions on page 36](#)
- [Complete \[edit firewall\] Hierarchy on page 38](#)

## Common Firewall Actions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “Complete [edit firewall] Hierarchy” on page 38 instead of the statements being repeated.

- **[edit firewall family (any | ccc | ethernet-switching | inet | inet6 | mpls | vpls) filter *filter-name* term *term-name* then]**
- **[edit firewall filter *filter-name* term *term-name* then]**

The common firewall actions are as follows:

```
count counter-name;  
forwarding-class class-name;  
loss-priority (high | low | medium-high | medium-low);  
next term;  
policer policer-name;  
three-color-policer policer-name {  
    (single-rate single-rate-policer-name | two-rate two-rate-policer-name);  
}
```

## Common IP Firewall Actions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “[Complete \[edit firewall\] Hierarchy](#)” on page 38 instead of the statements being repeated.

- **[edit firewall family inet filter *filter-name* term *term-name* then]**
- **[edit firewall family inet6 filter *filter-name* term *term-name* then]**
- **[edit firewall filter *filter-name* term *term-name* then]**

The common IP firewall actions are as follows:

```
log;  
logical-system logical-system-name <routing-instance routing-instance-name>  
    <topology topology-name>;  
port-mirror;  
port-mirror-instance instance-name;  
routing-instance routing-instance-name <topology topology-name>;  
sample;  
service-filter-hit;  
syslog;  
topology topology-name;
```

## Common IPv4 Firewall Actions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “[Complete \[edit firewall\] Hierarchy](#)” on page 38 instead of the statements being repeated.

- **[edit firewall family inet filter *filter-name* term *term-name* then]**
- **[edit firewall filter *filter-name* term *term-name* then]**

The common IP version 4 (IPv4) firewall actions are as follows:

```
(accept | discard <accounting collector-name> | reject <administratively-prohibited |  
    bad-host-tos | bad-network-tos | fragmentation-needed | host-prohibited |  
    host-unknown | host-unreachable | network-prohibited | network-unknown |  
    network-unreachable | port-unreachable | precedence-cutoff | precedence-violation |  
    protocol-unreachable | source-host-isolated | source-route-failed | tcp-reset>);  
ipsec-sa sa-name;  
load-balance sa-name;  
next-hop-group group-name;  
prefix-action action-name;
```

## Common IP Firewall Match Conditions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “[Complete \[edit firewall\] Hierarchy](#)” on page 38 instead of the statements being repeated.

- **[edit firewall family inet dialer-filter *filter-name* term *term-name* from]** (with the exceptions noted at this level in “[Complete \[edit firewall\] Hierarchy](#)” on page 38)
- **[edit firewall family inet filter *filter-name* term *term-name* from]**
- **[edit firewall family inet6 dialer-filter *filter-name* term *term-name* from]** (with the exceptions noted at this level in “[Complete \[edit firewall\] Hierarchy](#)” on page 38)
- **[edit firewall family inet6 filter *filter-name* term *term-name* from]**
- **[edit firewall filter *filter-name* term *term-name* from]**

The common IP firewall match conditions are as follows:

```

address {
    ip-prefix</prefix-length> <except>;
}
destination-address {
    ip-prefix</prefix-length> <except>;
}
destination-class [ class-names ] | destination-class-except [ class-names ];
(destination-port [ port-names ] | destination-port-except [ port-names ]);
destination-prefix-list {
    list-name <except>;
}
(forwarding-class [ class-names ] | forwarding-class-except [ class-names ]);
 icmp-code [ codes ] | icmp-code-except [ codes ];
 icmp-type [ types ] | icmp-type-except [ types ];
interface interface-name;
(interface-group [ group-names ] | interface-group-except [ group-names ]);
interface-set set-name;
(loss-priority [ priorities ] | loss-priority-except [ priorities ]);
(packet-length [ values ] | packet-length-except [ values ]);
(port [ port-names ] | port-except [ port-names ]);
prefix-list {
    list-name <except>;
}
service-filter-hit;
source-address {
    ip-prefix</prefix-length> <except>;
}
(source-class [ class-names ] | source-class-except [ class-names ]);
(source-port [ port-names ] | source-port-except [ port-names ]);
source-prefix-list {
    list-name <except>;
}
tcp-established;
tcp-flags flag;
tcp-initial;

```

## Common IPv4 Firewall Match Conditions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “[Complete \[edit firewall\] Hierarchy](#)” on page 38 instead of the statements being repeated.

- `[edit firewall family inet dialer-filter filter-name term term-name from]` (with the exceptions noted at this level in “[Complete \[edit firewall\] Hierarchy](#)” on page 38)
- `[edit firewall family inet filter filter-name term term-name from]`
- `[edit firewall filter filter-name term term-name from]`

The common IPv4 firewall match conditions are as follows:

```
(ah-spi [ values ] | ah-spi-except [ values ]);
(dscp [ code-point-values ] | dscp-except [ code-point-values ]);
(esp-spi [ values ] | esp-spi-except [ values ]);
first-fragment;
fragment-flags flag;
(fragment-offset [ offsets ] | fragment-offset-except [ offsets ]);
(ip-options [ option-names ] | ip-options-except [ option-names ]);
is-fragment;
(precedence [ precedence-names ] | precedence-except [ precedence-names ]);
(protocol [ protocol-names ] | protocol-except [ protocol-names ]);
(ttl [ ttl-values ] | ttl-except [ ttl-values ]);
```

## Common Layer 2 Firewall Match Conditions

This section lists statements that are valid at the following hierarchy levels, and is referenced at those levels in “[Complete \[edit firewall\] Hierarchy](#)” on page 38 instead of the statements being repeated.

- `[edit firewall family ethernet-switching filter filter-name term term-name from]`
- `[edit firewall family vpls filter filter-name term term-name from]`

The common Layer 2 firewall match conditions are as follows:

```
destination-mac-address {
    mac-address <except>;
}
(destination-port [ port-names ] | destination-port-except [ port-names ]);
(dscp [ code-point-values ] | dscp-except [ code-point-values ]);
(ether-type [ protocol-types ] | ether-type-except [ protocol-types ]);
(forwarding-class [ class-names ] | forwarding-class-except [ class-names ]);
(icmp-code [ codes ] | icmp-code-except [ codes ]);
(icmp-type [ types ] | icmp-type-except [ types ]);
(interface-group [ group-names ] | interface-group-except [ group-names ]);
ip-address {
    ip-prefix</prefix-length> <except>;
}
ip-destination-address {
    ip-prefix</prefix-length> <except>;
}
```

```
(ip-precedence [ precedence-names ] | ip-precedence-except [ precedence-names ] );
(ip-protocol [ protocol-names ] | ip-protocol-except [ protocol-names ] );
ip-source-address ip-prefix </prefix-length>;
(learn-vlan-1p-priority [ priorities ] | learn-vlan-1p-priority [ priorities ] );
(learn-vlan-id [ vlan-ids ] | learn-vlan-id-except [ vlan-ids ] );
(loss-priority [ priorities ] | loss-priority-except [ priorities ] );
(port [ port-names ] | port-except [ port-names ] );
source-mac-address {
    mac-address <except>;
}
(source-port [ port-names ] | source-port-except [ port-names ] );
tcp-flags flag;
(traffic-type [ broadcast known-unicast multicast unknown-unicast ] |
    traffic-type-except [ broadcast known-unicast multicast unknown-unicast ] );
(user-vlan-1p-priority [ priorities ] | user-vlan-1p-priority [ priorities ] );
(user-vlan-id [ vlan-ids ] | user-vlan-id-except [ vlan-ids ] );
(vlan-ether-type [ protocol-types ] | vlan-ether-type-except [ protocol-types ] );
```

## Complete [edit firewall] Hierarchy

```
firewall {
  family (any | ccc | ethernet-switching | inet | inet6 | mpls | vpls) {
    ... the family subhierarchies appear after the main [edit firewall] hierarchy ...
  }
  filter filter-name {
    accounting-profile [ profile-names ];
    enhanced-mode;
    interface-shared-with;
    interface-specific;
    physical-interface-policer;
    term term-name {
      filter filter-name;
      from {
        ... statements in Common IP Firewall Match Conditions on page 35 AND
           statements in Common IPv4 Firewall Match Conditions on page 36 ...
      }
      then {
        ... statements in Common Firewall Actions on page 33 AND
           statements in Common IP Firewall Actions on page 34 AND
           statements in Common IPv4 Firewall Actions on page 34 ...
      }
    }
  }
}
hierarchical-policer policer-name {
  aggregate {
    if-exceeding {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
      forwarding-class class-name;
      loss-priority (high | low | medium-high | medium-low);
    }
  }
  logical-interface-policer;
  physical-interface-policer;
  premium {
    if-exceeding {
      bandwidth-limit bps;
      burst-size-limit bytes;
    }
    then {
      discard;
    }
  }
}
shared-bandwidth-policer;
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;
  }
  filter-specific;
  logical-interface-policer;
  physical-interface-policer;
  shared-bandwidth-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;
  }
}
}

firewall {
  family any {
    filter filter-name {
      interface-shared;
      term term-name {
        from {
          (forwarding-class [ class-names ] | forwarding-class-except [ class-names ]);
          interface interface-name;
          interface-set set-name;
          (loss-priority [ priorities ] | loss-priority-except [ priorities ]);
          (packet-length [ values ] | packet-length-except [ values ]);
        }
        then {
          ... statements in Common Firewall Actions on page 33 PLUS ...
          (accept | discard);
        }
      }
    }
  }
}

```

```
    }  
  }  
}
```

```
firewall {  
  family ccc {  
    filter filter-name {  
      accounting-profile [ profile-names ];  
      physical-interface-filter;  
      interface-specific;  
      term term-name {  
        filter filter-name;  
        from {  
          (forwarding-class [ class-names ] | forwarding-class-except [ class-names ] );  
          (interface-group [ group-names ] | interface-group-except [ group-names ] );  
          (learn-vlan-1p-priority [ priorities ] | learn-vlan-1p-priority [ priorities ] );  
          (loss-priority [ priorities ] | loss-priority-except [ priorities ] );  
          (user-vlan-1p-priority [ priorities ] | user-vlan-1p-priority [ priorities ] );  
        }  
        then {  
          ... statements in Common Firewall Actions on page 33 PLUS ...  
          (accept | discard);  
          port-mirror-instance instance-name;  
        }  
      }  
    }  
  }  
}
```

```
firewall {  
  family ethernet-switching {  
    filter filter-name {  
      interface-specific;  
      term term-name {  
        from {  
          destination-address {  
            ip-prefix</prefix-length>;  
          }  
          destination-mac-address {  
            mac-address;  
          }  
          destination-port [ port-names ];  
          destination-prefix-list {  
            list-name;  
          }  
          dot1q-tag [ tag-values ];  
          dot1q-user-priority [ priority-values ];  
          dscp [ code-point-values ];  
          ether-type [ protocol-names ];  
          fragment-flags flag;  
          icmp-code [ codes ];  
          icmp-type [ types ];  
          interface interface-name;  
          is-fragment;  
        }  
      }  
    }  
  }  
}
```

```

precedence [ precedence-names ];
protocol [ protocol-names ];
source-address {
    ip-prefix</prefix-length>;
}
source-mac-address {
    mac-address;
}
source-port [ port-names ];
source-prefix-list {
    list-name;
}
tcp-established;
tcp-flags flag;
tcp-initial;
vlan [ vlan-names ];
}
then {
    (accept | discard);
    analyzer analyzer-name;
    count counter-name;
    forwarding-class class-name;
    interface interface-name;
    log;
    loss-priority (high | low);
    policer policer-name;
    syslog;
    vlan vlan-name;
}
}
}
}
}

firewall {
    family inet {
        dialer-filter filter-name {
            accounting-profile [ profile-names ];
            term term-name {
                from {
                    ... statements in Common IP Firewall Match Conditions on page 35 AND
                    statements in Common IPv4 Firewall Match Conditions on page 36 EXCEPT
                    FOR ...
                    (ah-spi [ values ] | ah-spi-except [ values ]); # NOT valid at this level
                    (destination-class [ class-names ] |
                     destination-class-except [ class-names ]); # NOT valid at this level
                    interface interface-name; # NOT valid at this level
                    (loss-priority [ priorities ] | loss-priority-except [ priorities ]); # NOT valid at
                     this level
                    service-filter-hit; # NOT valid at this level
                    (source-class [ class-names ] | source-class-except [ class-names ]); # NOT
                     valid at this level
                }
            }
            then {
                (ignore | note);
                log;
            }
        }
    }
}

```

```
        sample;
        syslog;
    }
}
filter filter-name {
    accounting-profile [ profile-names ];
    interface-specific;
    term term-name {
        filter filter-name;
        from {
            ... statements in Common IP Firewall Match Conditions on page 35 AND
               statements in Common IPv4 Firewall Match Conditions on page 36 ...
        }
        then {
            ... statements in Common Firewall Actions on page 33 AND
               statements in Common IP Firewall Actions on page 34 AND
               statements in Common IPv4 Firewall Actions on page 34 ...
        }
    }
}
prefix-action name {
    count;
    destination-prefix-length prefix-length;
    filter-specific;
    policer policer-name;
    source-prefix-length prefix-length;
    subnet-prefix-length prefix-length;
}
service-filter filter-name {
    term term-name {
        from {
            address {
                ip-prefix</prefix-length>;
            }
            (ah-spi [ values ] | ah-spi-except [ values ]);
            destination-address {
                ip-prefix</prefix-length>;
            }
            (destination-port [ port-names ] | destination-port-except [ port-names ]);
            destination-prefix-list {
                list-name;
            }
            (esp-spi [ values ] | esp-spi-except [ values ]);
            first-fragment;
            fragment-flags flag;
            (fragment-offset [ offsets ] | fragment-offset-except [ offsets ]);
            (interface-group [ group-names ] | interface-group-except [ group-names ]);
            (ip-options [ option-names ] | ip-options-except [ option-names ]);
            is-fragment;
            (loss-priority [ priorities ] | loss-priority-except [ priorities ]);
            (port [ port-names ] | port-except [ port-names ]);
            prefix-list {
                list-name;
            }
            (protocol [ protocol-names ] | protocol-except [ protocol-names ]);
```

```

        source-address {
            ip-prefix</prefix-length>;
        }
        (source-port [ port-names ] | source-port-except [ port-names ]);
        source-prefix-list {
            list-name;
        }
        tcp-flags flag-name;
    }
    then {
        count counter-name;
        log;
        port-mirror;
        sample;
        (service | skip);
    }
}
}
simple-filter filter-name {
    term term-name {
        from {
            destination-address ip-prefix</prefix-length>;
            destination-port port-name;
            forwarding-class [ class-names ];
            protocol protocol-name;
            source-address ip-prefix</prefix-length>;
            source-port port-name;
        }
        then {
            forwarding-class class-name;
            loss-priority (high | low | medium-high | medium-low);
            policer policer-name;
        }
    }
}
}
}
}
firewall {
    family inet6 {
        dialer-filter filter-name {
            accounting-profile [ profile-names ];
            term term-name {
                from {
                    ... statements in Common IP Firewall Match Conditions on page 35 PLUS ...
                    (next-header [ protocol-types ] | next-header-except [ protocol-types ]);
                    ... BUT NOT ...
                    (destination-class [ class-names ] |
                     destination-class-except [ class-names ]); # NOT valid at this level
                    (forwarding-class [ class-names ] |
                     forwarding-class-except [ class-names ]); # NOT valid at this level
                    interface interface-name; # NOT valid at this level
                    (interface-group [ group-names ] | interface-group-except [ group-names ]); #
                     NOT valid at this level
                    (loss-priority [ priorities ] | loss-priority-except [ priorities ]); # NOT valid at
                     this level
                }
            }
        }
    }
}

```

```
        service-filter-hit; # NOT valid at this level
        (source-class [ class-names ] | source-class-except [ class-names ]); # NOT
            valid at this level
        tcp-established; # NOT valid at this level
        tcp-flags flag; # NOT valid at this level
        tcp-initial; # NOT valid at this level
    }
    then {
        (ignore | note);
        log;
        sample;
        syslog;
    }
}
}
filter filter-name {
    accounting-profile [ profile-names ];
    interface-specific;
    term term-name {
        filter filter-name;
        from {
            ... statements in Common IP Firewall Match Conditions on page 35 PLUS ...
            (next-header [ protocol-types ] | next-header-except [ protocol-types ]);
            (traffic-class [ code-point-values ] | traffic-class-except [ code-point-values ]);
        }
        then {
            ... statements in Common Firewall Actions on page 33 AND
            statements in Common IP Firewall Actions on page 34 PLUS ...
            (accept | discard | reject <address-unreachable | administratively-prohibited |
            beyond-scope | fragmentation-needed | no-route | port-unreachable |
            tcp-reset>);
        }
    }
}
service-filter filter-name {
    term term-name {
        from {
            address {
                ip-prefix</prefix-length>;
            }
            (ah-spi [ values ] | ah-spi-except [ values ]);
            destination-address {
                ip-prefix</prefix-length>;
            }
            (destination-port [ port-names ] | destination-port-except [ port-names ]);
            destination-prefix-list {
                list-name;
            }
            (esp-spi [ values ] | esp-spi-except [ values ]);
            (interface-group [ group-names ] | interface-group-except [ group-names ]);
            (next-header [ protocol-types ] | next-header-except [ protocol-types ]);
            (port [ port-names ] | port-except [ port-names ]);
            prefix-list {
                list-name;
            }
            source-address {
```

```

        ip-prefix </prefix-length>;
    }
    (source-port [ port-names ] | source-port-except [ port-names ]);
    source-prefix-list {
        list-name;
    }
    tcp-flags flag-name;
}
then {
    count counter-name;
    log;
    port-mirror;
    sample;
    (service | skip);
}
}
}
}
}

firewall {
    family mpls {
        filter filter-name {
            accounting-profile [ profile-names ];
            interface-specific;
            physical-interface-filter;
            term term-name {
                from {
                    (exp [ exp-bits ] | exp-except [ exp-bits ]);
                }
                then {
                    (ignore | note);
                    log;
                    sample;
                    syslog;
                }
            }
        }
    }
    filter filter-name {
        accounting-profile [ profile-names ];
        interface-specific;
        physical-interface-filter;
        term term-name {
            filter filter-name;
            from {
                (exp [ exp-bits ] | exp-except [ exp-bits ]);
                (forwarding-class [ class-names ] | forwarding-class-except [ class-names ]);
                interface interface-name;
                interface-set set-name;
                (loss-priority [ priorities ] | loss-priority-except [ priorities ]);
            }
            then {
                ... statements in Common Firewall Actions on page 33 PLUS ...
                (accept | discard);
                sample;
            }
        }
    }
}

```

```
    }
  }
}

firewall {
  family vpls {
    filter filter-name {
      accounting-profile [ profile-names ];
      interface-specific;
      term term-name {
        filter filter-name;
        from {
          ... statements in Common Layer 2 Firewall Match Conditions on page 36 ...
        }
        then {
          ... statements in Common Firewall Actions on page 33 PLUS ...
          (accept | discard);
          port-mirror;
          port-mirror-instance instance-name;
        }
      }
    }
  }
}
```

**Related Documentation**

- [Notational Conventions Used in Junos OS Configuration Hierarchies](#)

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## [edit interfaces] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

```
interfaces {
  interface-name {
    ... the "interface-name" subhierarchy appears after the main [edit interfaces] hierarchy level ...
  }
  interface-set interface-set-name {
    interface interface-name {
      (unit unit-number | vlan-tags-outer vlan-tag);
    }
  }
  irb (Interfaces) {
    accounting-profile name;
    description text;
    disable;

    (gratuitous-arp-reply | no-gratuitous-arp-reply);
    hold-time up milliseconds down milliseconds;
    mtu bytes;
    no-gratuitous-arp-request;
```

```

traceoptions {
    flag flag;
}
(traps | no-traps);
unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    encapsulation type;
    family inet {
        accounting {
            destination-class-usage;
            source-class-usage {
                input;
                output;
            }
        }
    }
    address ipv4-address {
        arp ip-address (mac | multicast-mac) mac-address <publish>;
        broadcast address;
        preferred;
        primary;
        vrrp-group group-id {
            (accept-data | no-accept-data);
            advertise-interval seconds;
            advertisements-threshold number;
            authentication-key key;
            authentication-type authentication;
            fast-interval milliseconds;
            (preempt | no-preempt) {
                hold-time seconds;
            }
            priority number;
            track {
                interface interface-name {
                    bandwidth-threshold bits-per-second priority-cost priority;
                    priority-cost priority;
                }
                priority-hold-time seconds;
                route prefix/prefix-length routing-instance instance-name priority-cost priority;
            }
            virtual-address [ addresses ];
            vrrp-inherit-from vrrp-group;
        }
    }
    filter {
        input filter-name;
        output filter-name;
    }
    mtu bytes;
    no-neighbor-learn;
    no-redirects;
    primary;
    rpf-check {
        fail-filter filter-name;
    }
}

```

```
mode {  
    loose;  
}  
}  
targeted-broadcast {  
    forward-and-send-to-re;  
    forward-only;  
}  
}  
family inet6 {  
    accounting {  
        destination-class-usage;  
        source-class-usage {  
            input;  
            output;  
        }  
    }  
}  
address address {  
    eui-64;  
    ndp ip-address (mac | multicast-mac) mac-address <publish>;  
    preferred;  
    primary;  
    vrrp-inet6-group group-id {  
        accept-data | no-accept-data;  
        advertisements-threshold number;  
        authentication-key key;  
        authentication-type authentication;  
        fast-interval milliseconds;  
        inet6-advertise-interval milliseconds;  
        preempt | no-preempt {  
            hold-time seconds;  
        }  
        priority number;  
        track {  
            interface interface-name {  
                bandwidth-threshold bandwidth priority-cost number;  
                priority-cost number;  
            }  
            priority-hold-time seconds;  
            route ip-address/mask routing-instance instance-name priority-cost cost;  
        }  
        virtual-inet6-address [addresses];  
        virtual-link-local-address ipv6-address;  
        vrrp-inherit-from {  
            active-group group-number;  
            active-interface interface-name;  
        }  
    }  
}  
(dad-disable | no-dad-disable);  
filter {  
    input filter-name;  
    output filter-name;  
}  
mtu bytes;  
nd6-stale-time seconds;
```

```

no-neighbor-learn;
no-redirects;
policer {
    input policer-name;
    output policer-name;
}
rpf-check {
    fail-filter filter-name;
    mode {
        loose;
    }
}
}
family iso {
    address interface-address;
    mtu bytes;
}
family mpls {
    filter {
        input filter-name;
        output filter-name;
    }
    mtu bytes;
    policer {
        input policer-name;
        output policer-name;
    }
}
native-inner-vlan-id vlan-id;
proxy-arp (restricted | unrestricted);
(traps | no-traps);
vlan-id-list [vlan-id's];
vlan-id-range [vlan-id-range];
}
}
traceoptions {
    file <filename> <files number> <match regular-expression> <size maximum-file-size>
    <world-readable | no-world-readable>;
    flag flag <disable>;
    no-remote-trace;
}
}
interfaces {
    interface-name {
        disable;
        accounting-profile name;
        aggregated-ether-options {
            ethernet-switch-profile {
                tag-protocol-id [ hexadecimal-identifiers ];
            }
        }
        (flow-control | no-flow-control);
        lacp {
            (active | passive);
            admin-key key;
            fast-failover;

```

```
link-protection {
    disable;
    (revertive | non-revertive);
}
periodic (fast | slow);
system-id mac-address;
system-priority priority;
}
(link-protection | no-link-protection);
link-speed (100m | 1g | 8g | 10g | 40g | 50g | 80g | 100g | oc192);
logical-interface-fpc-redundancy;
(loopback | no-loopback);
mc-ae {
    chassis-id chassis-id;
    events {
        iccp-peer-down {
            force-icl-down;
            prefer-status-control-active;
        }
    }
    mc-ae-id mc-ae-id;
    mode (active-active | active-standby);
    redundancy-group group-id;
    status-control (active | standby);
}
minimum-links number;
rebalance-periodic {
    start-time time;
    interval number;
}
source-address-filter {
    mac-address;
}
(source-filtering | no-source-filtering);
}
auto-configure {
    remove-when-no-subscribers;
    stacked-vlan-ranges {
        access-profile profile-name;
        authentication {
            password password-string;
            username-include {
                circuit-type;
                delimiter delimiter-character;
                domain-name domain-name-string;
                interface-name;
                mac-address;
                option-82 ( circuit-id | remote-id);
                radius-realm radius-realm-string;
                user-prefix user-prefix-string;
            }
        }
    }
    dynamic-profile profile-name {
        accept (any | dhcp-v4 | dhcp-v6 | inet | inet6);
        ranges (any | low-tag-high-tag), (any | low-tag-high-tag);
    }
}
```

```

}
vlan-ranges {
  access-profile profile-name;
  authentication {
    password password-string;
    username-include {
      circuit-type;
      delimiter delimiter-character;
      domain-name domain-name-string;
      interface-name;
      mac-address;
      option-82;
      radius-realm radius-realm-string;
      user-prefix user-prefix-string;
    }
  }
  dynamic-profile profile-name {
    accept (any | dhcp-v4 | dhcp-v6 | inet | inet6);
    ranges (any | low-tag)–(any | high-tag);
  }
}
override tag vlan-tag dynamic-profile profile name;
}
encapsulation (ethernet-bridge | ethernet-vpls | extended-vlan-bridge |
  extended-vlan-vpls | flexible-ethernet-services | vlan-vpls);
ether-options {
  802.3ad {
    aex;
    (backup | primary);
    lacp {
      force-up;
      port-priority
    }
  }
}
asynchronous-notification;
(auto-negotiation | no-auto-negotiation);
ethernet-switch-profile {
  ethernet-policer-profile {
    input-priority-map {
      ieee802.1p premium [ values ];
    }
    output-priority-map {
      classifier {
        premium {
          forwarding-class class-name {
            loss-priority (high | low);
          }
        }
      }
    }
  }
}
policer cos-policer-name {
  aggregate {
    bandwidth-limit bps;
    burst-size-limit bytes;
  }
  premium {

```

```
        bandwidth-limit bps;
        burst-size-limit bytes;
    }
}
tag-protocol-id;
}
(mac-learn-enable | no-mac-learn-enable);
}
(flow-control | no-flow-control);
ignore-l3-incompletes;
link-mode (automatic | full-duplex | half-duplex);
(loopback | no-loopback);
keepalives <interval seconds> <down-count number> <up-count number>;
speed (1g | 10m | 100m | 10m-100m | auto-negotiation);
source-address-filter {
    mac-address;
}
source-filtering | no-source-filtering;
}
flexible-vlan-tagging;
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time (up milliseconds | down milliseconds);
interface-transmit-statistics;
(keepalives <down-count number> <interval seconds> <up-count number> |
 no-keepalives);
layer2-policer {
    apply-groups [ group-names ];
    apply-groups-except [ group-names ];
}
link-mode (automatic | full-duplex);
mac mac-address;
mtu bytes;
multi-chassis-protection peer-ip-address {
    interface interface-name;
}
native-vlan-id number;
no-gratuitous-arp-request;
optics-options {
    alarm low-light-alarm {
        (link-down | syslog);
    }
    warning low-light-warning {
        (link-down | syslog);
    }
}
wavelength nm;
}
passive-monitor-mode;
per-unit-scheduler;
speed (10m | 100m | 1g | auto | oc3 | oc12 | oc48);
stacked-vlan-tagging;
traceoptions {
    flag flag;
}
transmit-bucket {
    overflow discard;
    rate percentage;
```

```

        threshold bytes;
    }
    (traps | no-traps);
    unidirectional;
    vlan-tagging;
}

interface-name {
    unit logical-unit-number {
        disable;
        accept-source-mac {
            mac-address mac-address {
                policer {
                    input policer-name;
                    output policer-name;
                }
            }
        }
    }
    account-layer2-overhead (Interface Level) {
        value;
        egress bytes;
        ingress bytes;
    }
    accounting-profile name;
    advisory-options {
        downstream-rate rate;
        upstream-rate rate;
    }
    arp-resp (restricted|unrestricted);
    bandwidth rate;
    clear-dont-fragment-bit;
    copy-tos-to-outer-ip-header;
    demux-destination family;
    encapsulation (vlan-bridge | vlan-vpls);
    epd-threshold cells plp1 cells;
    filter filter-name;
    inner-vlan-id-range start start-id end end-id;
    input-vlan-map {
        (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
        inner-tag-protocol-id tpid;
        inner-vlan-id number;
        tag-protocol-id tpid;
        vlan-id number;
    }
    interface-shared-with psd numerical-index;
    layer2-policer {
        input-hierarchical-policer policer-name;
        input-policer policer-name;
        input-three-color policer-name;
        output-policer policer-name;
        output-three-color policer-name;
    }
    multi-chassis-protection peer-ip-address {
        interface interface-name;
    }
}

```

```
native-inner-vlan-id number;  
output-vlan-map {  
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);  
    inner-tag-protocol-id tpid;  
    inner-vlan-id number;  
    tag-protocol-id tpid;  
    vlan-id number;  
}  
peer-interface interface-name;  
peer-unit unit-number;  
plp-to-clp;  
proxy-arp <restricted | unrestricted>;  
rpm {  
    (client | server);  
    twamp-server;  
}  
swap-by-poppush;  
vlan-id number;  
vlan-id-list [ vlan-id vlan-id-vlan-id ];  
vlan-id-range number-number;  
vlan-tags (inner <tpid.>vlan-id | inner-list [ vlan-id vlan-id-vlan-id ] |  
    inner-range <tpid.>vlan-id-vlan-id) outer <tpid.>vlan-id;  
}  
  
unit logical-unit-number {  
    family ethernet-switching {  
        filter {  
            group filter-group-number;  
            (input filter-name | input-list [ filter-names ] );  
            (output filter-name | output-list [ filter-names ] );  
            (inner-vlan-id-list [ vlan-ids ] | vlan-id number | vlan-id-list [ number  
                number-number ] );  
            interface-mode (access | trunk);  
            policer {  
                input policer-name;  
                output policer-name;  
            }  
            vlan-rewrite {  
                translate old-vlan-id new-vlan-id;  
            }  
            vlan {  
                members [ all vlan-identifiers ];  
            }  
        }  
    }  
    family inet {  
        filter {  
            group filter-group-number;  
            (input filter-name | input-list [ filter-names ] );  
            (output filter-name | output-list [ filter-names ] );  
        }  
        input-hierarchical-policer policer-name;  
        mac-validate (loose | strict);  
        mtu bytes;  
        no-neighbor-learn;  
        no-redirects;  
        policer {
```

```

    arp policer-template-name;
    input policer-name;
    output policer-name;
}
primary;
receive-options-packets;
receive-ttl-exceeded;
rpf-check {
    fail-filter filter-name;
    mode loose;
}
sampling {
    (input | output | input output);
}
simple-filter {
    input filter-name;
}
targeted-broadcast {
    forward-and-send-to-re;
    forward-only;
}
}
unnumbered-address interface-name <destination address>
    <destination-profile profile-name> <preferred-source-address address>;
}

family inet6 {
    address ipv6-address {
        destination destination-address;
        eui-64;
        ndp ipv6-address <l2-interface interface-name> <(mac mac-address |
            multicast-mac multicast-mac-address) <publish>>;
        preferred;
        primary;
        vrrp-inet6-group group-number {
            (accept-data | no-accept-data);
            fast-interval milliseconds;
            inet6-advertise-interval seconds;
            (no-preempt; | ... the following preempt statement ...)
            preempt {
                hold-time seconds;
            }
            priority number;
            track {
                interface interface-name {
                    bandwidth-threshold bits-per-second priority-cost priority;
                    priority-cost priority;
                }
                priority-hold-time seconds;
                route ip-address-prefix/prefix-length routing-instance instance-name
                    priority-cost priority;
            }
        }
        virtual-inet6-address [ addresses ];
        virtual-link-local-address ipv6-address;
        vrrp-inherit-from {
            active-group group-number;

```

```
        active-interface interface-name;
    }
}
(dad-disable | no-dad-disable);
filter {
    group filter-group-number;
    (input filter-name | input-list [ filter-names ]);
    (output filter-name | output-list [ filter-names ]);
}
input-hierarchical-policer policer-name;
mtu bytes;
nd6-stale-time seconds;
no-neighbor-learn;
policer {
    input policer-name;
    output policer-name;
}
rpf-check {
    fail-filter filter-name;
    mode loose;
}
sampling {
    (input | output | input output);
}
unnumbered-address interface-name preferred-source-address address;

}

family iso {
    address iso-address;
    mtu bytes;
}

family mlfr-end-to-end {
    bundle logical-interface-name;
}

family mpls {
    filter {
        group filter-group-number;
        (input filter-name | input-list [ filter-names ]);
        (output filter-name | output-list [ filter-names ]);
    }
    input-hierarchical-policer policer-name;
    maximum-labels maximum-labels;
    mtu bytes;
    policer {
        input policer-name;
        output policer-name;
    }
}
```

```
family vpls {  
  core-facing;  
  filter {  
    group filter-group-number;  
    (input filter-name | input-list [ filter-names ]);  
    (output filter-name | output-list [ filter-names ]);  
  }  
  policer {  
    input policer-name;  
    output policer-name;  
  }  
}  
}  
}
```

**Related Documentation** • [Notational Conventions Used in Junos OS Configuration Hierarchies](#)

