JUNIPER NETWORKS

Junos® OS

CoS Packet Classification Based on Multiple Fields Feature Guide for Routing Devices

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Documentation and Release Notes

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If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

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

- T Series
- M Series
- MX Series
- PTX Series

Using the Examples in This Manual

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.xsl;
       }
     }
   }
   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.xsl; }
   ```

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.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric** *metric***>;**
| (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.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [** *community-ids* **]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

GUI Conventions

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

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- 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/.
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- Find CSC offerings: http://www.juniper.net/customers/support/
- 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: http://kb.juniper.net/InfoCenter/
- 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

You can open a case with JTAC on the Web or by telephone.

- 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

CHAPTER 1

Overview

Multifield Classifier Overview

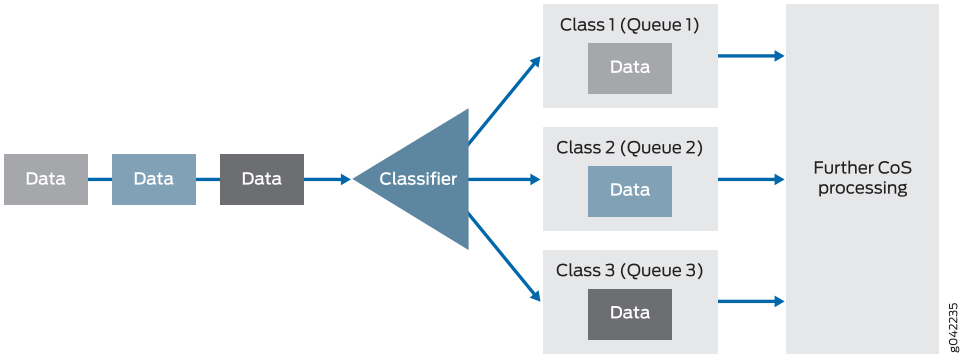
A multifield classifier is a method of classifying traffic flows. Devices that sit at the edge of a network usually classify packets according to codings that are located in multiple packet header fields. Multifield classification is normally performed at the network edge because of the general lack of DiffServ code point (DSCP) or IP precedence support in end-user applications.

In an edge router, a multifield classifier provides the filtering functionality that scans through a variety of packet fields to determine the forwarding class for a packet. Typically, a classifier performs matching operations on the selected fields against a configured value.

Unlike a behavior aggregate (BA), which classifies packets based on class-of-service (CoS) bits in the packet header, a multifield classifier can examine multiple fields in the packet header—for example, the source and destination address of the packet, and the source and destination port numbers of the packet. A multifield classifier typically matches one or more of the six packet header fields: destination address, source address, IP protocol, source port, destination port, and DSCP. Multifield classifiers are used when a simple BA classifier is insufficient to classify a packet.

Figure 1 on page 4 provides a high-level illustration of how a classifier works.

Figure 1: How a Classifier Works



In the Juniper Networks® Junos® operating system (Junos OS), you configure a multifield classifier with a firewall filter and its associated match conditions. This enables you to use any filter match criteria to locate packets that require classification. From a CoS perspective, multifield classifiers (or firewall filter rules) provide the following services:

- Classify packets to a forwarding class and loss priority. The forwarding class determines the output queue. The loss priority is used by schedulers in conjunction with the random early discard (RED) algorithm to control packet discard during periods of congestion.
- Police traffic to a specific bandwidth and burst size. Packets exceeding the policer limits can be discarded, or can be assigned to a different forwarding class, to a different loss priority, or to both.

NOTE: You *police* traffic on input to conform to established CoS parameters, setting loss handling and forwarding class assignments as needed. You *shape* traffic on output to make sure that router resources, especially bandwidth, are distributed fairly. However, input policing and output shaping are two different CoS processes, each with their own configuration statements.

Overview of Simple Filters

Simple filters are recommended for metropolitan Ethernet applications. They are supported on Gigabit Ethernet intelligent queuing 2 (IQ2) and Enhanced Queuing Dense Port Concentrator (DPC) interfaces only.

Unlike normal filters, simple filters are for IPv4 traffic only and have the following restrictions:

- The **next term** action is not supported.
- Qualifiers, such as the **except** and **protocol-except** statements, are not supported.
- Noncontiguous masks are not supported.
- Multiple source addresses and destination addresses in a single term are not supported. If you configure multiple addresses, only the last one is used.

- Ranges are only valid as source or destination ports. For example, **source-port 400-500** or **destination-port 600-700**.
- Output filters are not supported. You can apply a simple filter to ingress traffic only.
- Simple filters are not supported for interfaces in an aggregated-Ethernet bundle.
- Explicitly configurable terminating actions, such as **accept**, **reject**, and **discard**, are not supported. Simple filters always accept packets.

NOTE: On the MX Series routers with the Enhanced Queuing DPC, the forwarding class is not supported as a from match condition.

Two-Color Policers and Shaping Rate Changes

When you configure a change in shaping rate, it is important to consider the effect on the bandwidth limit. Whenever the shaping rate changes, the bandwidth limit is adjusted based on whether a logical interface (unit) or bandwidth percentage policer is configured.

When a logical interface bandwidth policer is configured, the order of priority for the shaping rate (if configured at that level) is:

- The shaping rate applied to the logical interface (unit).
- The shaping rate applied to the physical interface (port).
- The physical interface speed.

When a bandwidth percentage policer is configured, the order of priority for the shaping rate (if configured at that level) is:

- The shaping rate applied to the physical interface (port).
- The physical interface speed.

These guidelines must be kept in mind when calculating the logical link speed and link speed from the configured shaping rate, which determines the rate-limited bandwidth after the policer is applied.

Related Documentation

- Example: Two-Color Policers and Shaping Rate Changes on page 27

Understanding IEEE 802.1p Inheritance push and swap from a Transparent Tag

M320 router interfaces and MX Series router interfaces on Modular Interface Cards (MIC) or Modular Port Concentrators (MPCs) support configurable IEEE 802.1p inheritance of push and swap bits from the transparent tag of each incoming packet which allows you to classify incoming packets based on the IEEE 802.1p bits from the transparent tag.

During a tagging operation, Junos OS by default inherits the IEEE 802.1p bits from incoming tags in swap and push operations from the known tags configured on the interface.

It can be useful to override the default behavior by configuring Junos OS to inherit the IEEE 802.1p bits from a transparent tag, and to classify incoming packets based on the IEEE 802.1p bits of the incoming transparent tag. The configuration statements **swap-by-poppush** and **transparent** enable Junos OS to do this.

By default, during a swap operation, the IEEE 802.1p bits of the VLAN tag remain unchanged. When the **swap-by-poppush** operation is enabled on a logical interface, the swap operation is treated as a **pop** operation followed by **push** operation. The **pop** operation removes the existing tag and the associated IEEE 802.1p bits and the push operation copies the inner VLAN IEEE 802.1p bits to the IEEE bits of the VLAN or VLANs being pushed. As a result, the IEEE 802.1p bits are inherited from the incoming transparent tag.

To classify incoming packets based on the IEEE 802.1p bits from the transparent tag, include the **transparent** statement at the **[edit class-of-service interfaces** *interface-name* **unit** *logical-unit-number* **classifiers ieee-802.1 vlan-tag]** hierarchy level.

To configure Junos OS to inherit the IEEE 802.1p bits from the transparent tag, include the **swap-by-poppush** statement at the **[edit interfaces** ***interface-name*** **unit** ***logical-unit-number***] hierarchy level.

NOTE: IEEE 802.1p Inheritance push and swap is only supported on untagged and single-tagged logical interfaces, and is not supported on dual-tagged logical interfaces.

Related Documentation

- *swap-by-poppush*
- transparent on page 54
- *Understanding swap-by-poppush*
- Configuring IEEE 802.1p Inheritance push and swap from the Transparent Tag on page 10
- *Understanding Transparent Tag Operations and IEEE 802.1p Inheritance*

PART 2

Configuration

CHAPTER 2

Configuration Tasks

Configuring Multifield Classifiers

If you configure both a behavior aggregate (BA) classifier and a multifield classifier, BA classification is performed first; then multifield classification is performed. If they conflict, any BA classification result is overridden by the multifield classifier.

NOTE: For a specified interface, you can configure both a multifield classifier and a BA classifier without conflicts. Because the classifiers are always applied in sequential order, the BA classifier followed by the multifield classifier, any BA classification result is overridden by a multifield classifier if they conflict.

To activate a multifield classifier, you must configure it on a logical interface. There is no restriction on the number of multifield classifiers you can configure.

NOTE: For MX Series routers and EX Series switches, if you configure a firewall filter with a DSCP action or traffic-class action on a DPC, the commit does not fail, but a warning displays and an entry is made in the syslog.

For an L2TP LNS on MX Series routers, you can attach firewall for static LNS sessions by configuring these at logical interfaces directly on the inline services device (si-fpc/pic/port). RADIUS-configured firewall attachments are not supported.

To configure multifield classifiers, include the following statements at the **[edit firewall]** hierarchy level:

```
[edit firewall]
family family-name {
```

```
filter filter-name {
  term term-name {
    from {
      match-conditions;
    }
    then {
      dscp 0;
      forwarding-class class-name;
      loss-priority (high | low);
    }
  }
}
simple-filter filter-name {
  term term-name {
    from {
      match-conditions;
    }
    then {
      forwarding-class class-name;
      loss-priority (high | low | medium);
    }
  }
}
}
```

Configuring Logical Bandwidth Policers

When you configure a policer as a percentage (using the **bandwidth-percent** statement), the bandwidth is calculated as a percentage of either the physical interface media rate or the logical interface shaping rate. To specify that the bandwidth be calculated based on the logical interface shaping rate and not the physical interface media rate, include the **logical-bandwidth-policer** statement. If a shaping rate is not configured for the logical interface, the physical interface media rate is used, even if you include the **logical-bandwidth-policer** You can configure the shaping rate on the logical interface using class-of-service statements.

```
[edit firewall policer policer-name]
logical-bandwidth-policer;
```

Configuring IEEE 802.1p Inheritance push and swap from the Transparent Tag

To classify incoming packets based on the IEEE 802.1p bits from the transparent tag, include the **transparent** statement at the **[edit class-of-service interfaces** *interface-name* **unit** *logical-unit-number* **classifiers ieee-802.1 vlan-tag]** hierarchy level.

Tagged Interface Example

The following example configuration specifies the classification based on the transparent VLAN tag.

```
edit
class-of-service {
  interfaces {
    ge-3/0/1 {
      unit 0 {
        classifiers {
```

```
            ieee-802.1 default vlan-tag transparent;
          }
        }
      }
    }
  }
```

To configure Junos OS to inherit the IEEE 802.1p bits from the transparent tag, include the **swap-by-poppush** statement at the **[edit interfaces** *interface-name* **unit** *logical-unit-number***]** hierarchy level.

The following is a configuration to swap and push VLAN tags and allow inheritance of the IEEE 802.1p value from the transparent VLAN tag in incoming packets.

```
edit
  ge-3/0/0 {
  vlan-tagging;
  encapsulation vlan-ccc;
  unit 0 {
    encapsulation vlan-ccc;
    vlan-id 100;
    swap-by-poppush;
    input-vlan-map {
      swap-push;
      tag-protocol-id 0x9100;
      inner-tag-protocol-id 0x9100;
      vlan-id 500;
      inner-vlan-id 400;
    }
    output-vlan-map {
      pop-swap;
      inner-vlan-id 100;
      inner-tag-protocol-id 0x88a8;
    }
  }
}
```

The **swap-by-poppush** statement causes a swap operation to be done as a pop followed by a push operation. So for the outer tag, the incoming S-Tag is popped and a new tag is pushed. As a result, the S-Tag inherits the IEEE 802.1p bits from the transparent tag. The inner tag is then pushed, which results in the inner tag inheriting the IEEE 802.1p bits from the transparent tag.

Untagged Interface Example

The following is a configuration to push two VLAN tags and allow inheritance of the IEEE 802.1p value from the transparent VLAN tag in the incoming packet.

```
[edit]
ge-3/0/1 {
  encapsulation ccc;
  unit 0 {
    input-vlan-map {
      push-push;
      tag-protocol-id 0x9100;
      inner-tag-protocol-id 0x9100;
      vlan-id 500;
      inner-vlan-id 400;
```

```
        }
        output-vlan-map{
          pop-pop;
        }
      }
    }
```

No additional configuration is required to inherit the IEEE 802.1p value, as the **push** operation inherits the IEEE 802.1p values by default.

The following configuration specifies the classification based on the transparent VLAN tag.

```
[edit]
class-of-service {
  interfaces {
    ge-3/0/1 {
      unit 0 {
        classifiers {
          ieee-802.1 default vlan-tag transparent;
        }
      }
    }
  }
}
```

Related Documentation

- transparent on page 54
- *swap-by-poppush*
- Understanding IEEE 802.1p Inheritance push and swap from a Transparent Tag on page 5
- *Understanding swap-by-poppush*
- *Understanding Transparent Tag Operations and IEEE 802.1p Inheritance*

CHAPTER 3

Examples

Example: Configuring a Multifield Classifier

This example shows how to configure a firewall filter to classify traffic using a multifield classifier. The classifier detects packets of interest to class of service (CoS) as they arrive on an interface. Multifield classifiers are used when a simple behavior aggregate (BA) classifier is insufficient to classify a packet, when peering routers do not have CoS bits marked, or the peering router's marking is untrusted.

Requirements

To verify this procedure, this example uses a traffic generator. The traffic generator can be hardware-based or it can be software running on a server or host machine.

The functionality in this procedure is widely supported on devices that run Junos OS. The example shown here was tested and verified on MX Series routers running Junos OS Release 10.4.

Overview

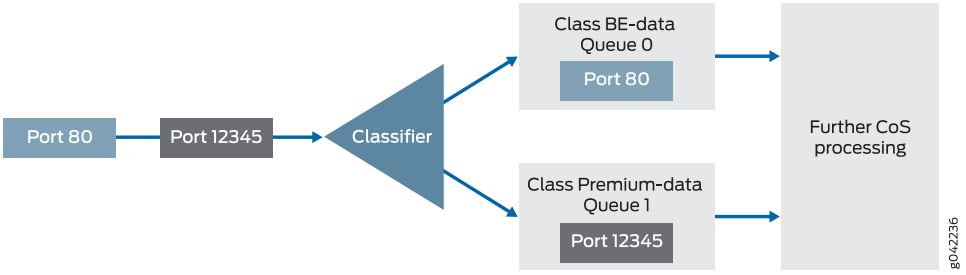
A classifier is a software operation that inspects a packet as it enters the router or switch. The packet header contents are examined, and this examination determines how the packet is treated when the network becomes too busy to handle all of the packets and you want your devices to drop packets intelligently, instead of dropping packets indiscriminately. One common way to detect packets of interest is by source port number. The TCP port numbers 80 and 12345 are used in this example, but many other matching criteria for packet detection are available to multifield classifiers, using firewall filter match conditions. The configuration in this example specifies that TCP packets with source port 80 are classified into the BE-data forwarding class and queue number 0. TCP packets with source port 12345 are classified into the Premium-data forwarding class and queue number 1.

Multifield classifiers are typically used at the network edge as packets enter an autonomous system (AS).

In this example, you configure the firewall filter mf-classifier and specify some custom forwarding classes on Device R1. In specifying the custom forwarding classes, you also associate each class with a queue.

The classifier operation is shown in Figure 2 on page 14.

Figure 2: Multifield Classifier Based on TCP Source Ports

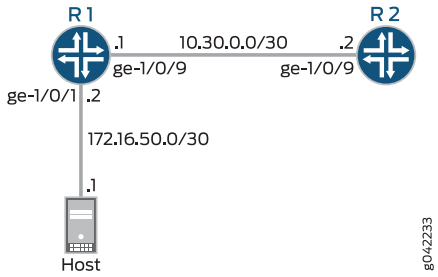


You apply the multifield classifier's firewall filter as an input filter on each customer-facing or host-facing interface that needs the filter. The incoming interface is ge-1/0/1 on Device R1. The classification and queue assignment are verified on the outgoing interface. The outgoing interface is Device R1's ge-1/0/9 interface.

Topology

Figure 3 on page 15 shows the sample network.

Figure 3: Multifield Classifier Scenario



"CLI Quick Configuration" on page 15 shows the configuration for all of the Juniper Networks devices in Figure 3 on page 15.

The section "Step-by-Step Procedure" on page 16 describes the steps on Device R1.

Classifiers are described in more detail in the following Juniper Networks Learning Byte video.

Video: Class of Service Basics, Part 2: Classification Learning Byte

Configuration

CLI Quick Configuration

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

Device R1

```
set interfaces ge-1/0/1 description to-host
set interfaces ge-1/0/1 unit 0 family inet filter input mf-classifier
set interfaces ge-1/0/1 unit 0 family inet address 172.16.50.2/30
set interfaces ge-1/0/9 description to-R2
set interfaces ge-1/0/9 unit 0 family inet address 10.30.0.1/30
set class-of-service forwarding-classes class BE-data queue-num 0
set class-of-service forwarding-classes class Premium-data queue-num 1
set class-of-service forwarding-classes class Voice queue-num 2
set class-of-service forwarding-classes class NC queue-num 3
set firewall family inet filter mf-classifier term BE-data from protocol tcp
set firewall family inet filter mf-classifier term BE-data from port 80
set firewall family inet filter mf-classifier term BE-data then forwarding-class BE-data
set firewall family inet filter mf-classifier term Premium-data from protocol tcp
set firewall family inet filter mf-classifier term Premium-data from port 12345
set firewall family inet filter mf-classifier term Premium-data then forwarding-class
    Premium-data
set firewall family inet filter mf-classifier term accept-all-else then accept
```

Device R2

```
set interfaces ge-1/0/9 description to-R1
set interfaces ge-1/0/9 unit 0 family inet address 10.30.0.2/30
```

Step-by-Step Procedure

The following example requires that you navigate various levels in the configuration hierarchy. For information about navigating the CLI, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure Device R1:

1. Configure the device interfaces.

```
[edit interfaces]
user@R1# set ge-1/0/1 description to-host
user@R1# set ge-1/0/1 unit 0 family inet address 172.16.50.2/30


user@R1# set ge-1/0/9 description to-R2
user@R1# set ge-1/0/9 unit 0 family inet address 10.30.0.1/30
```

2. Configure the custom forwarding classes and associated queue numbers.

```
[edit class-of-service forwarding-classes]
user@R1# set class BE-data queue-num 0
user@R1# set class Premium-data queue-num 1
user@R1# set class Voice queue-num 2
user@R1# set class NC queue-num 3
```

3. Configure the firewall filter term that places TCP traffic with a source port of 80 (HTTP traffic) into the BE-data forwarding class, associated with queue 0.

```
[edit firewall family inet filter mf-classifier]
user@R1# set term BE-data from protocol tcp
user@R1# set term BE-data from port 80
user@R1# set term BE-data then forwarding-class BE-data
```

4. Configure the firewall filter term that places TCP traffic with a source port of 12345 into the Premium-data forwarding class, associated with queue 1.

```
[edit firewall family inet filter mf-classifier]
user@R1# set term Premium-data from protocol tcp
user@R1# set term Premium-data from port 12345
user@R1# set term Premium-data then forwarding-class Premium-data
```

5. At the end of your firewall filter, configure a default term that accepts all other traffic.

   Otherwise, all traffic that arrives on the interface and is not explicitly accepted by the firewall filter is discarded.

```
[edit firewall family inet filter mf-classifier]
user@R1# set term accept-all-else then accept
```

6. Apply the firewall filter to the ge-1/0/1 interface as an input filter.

```
[edit interfaces]
user@R1# set ge-1/0/1 unit 0 family inet filter input mf-classifier
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces**, **show class-of-service**, and **show firewall** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@R1# show interfaces
```

```
ge-1/0/1 {
   description to-host;
   unit 0 {
      family inet {
         filter {
            input mf-classifier;
         }
         address 172.16.50.2/30;
      }
   }
}
ge-1/0/9 {
   description to-R2;
   unit 0 {
      family inet {
         address 10.30.0.1/30;
      }
   }
}
```

```
user@R1# show class-of-service
forwarding-classes {
   class BE-data queue-num 0;
   class Premium-data queue-num 1;
   class Voice queue-num 2;
   class NC queue-num 3;
}
```

```
user@R1# show firewall
family inet {
   filter mf-classifier {
      term BE-data {
         from {
            protocol tcp;
            port 80;
         }
         then forwarding-class BE-data;
      }
      term Premium-data {
         from {
            protocol tcp;
            port 12345;
         }
         then forwarding-class Premium-data;
      }
      term accept-all-else {
         then accept;
      }
   }
}
```

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

Verification

Confirm that the configuration is working properly.

Checking the CoS Settings

Purpose Confirm that the forwarding classes are configured correctly.

Action From Device R1, run the **show class-of-service forwardng-class** command.

```
user@R1> show class-of-service forwarding-class

Forwarding class                          ID      Queue  Restricted queue  Fabric
priority  Policing priority   SPU priority
  BE-data                                 0       0          0              low
            normal             low
  Premium-data                            1       1          1              low
            normal             low
  Voice                                   2       2          2              low
            normal             low
  NC                                      3       3          3              low
            normal             low
```

Meaning The output shows the configured custom classifier settings.

Sending TCP Traffic into the Network and Monitoring the Queue Placement

Purpose Make sure that the traffic of interest is sent out the expected queue.

Action

1. Clear the interface statistics on Device R1's outgoing interface.

   ```
   user@R1> clear interfaces statistics ge-1/0/9
   ```

2. Use a traffic generator to send 50 TCP port 80 packets to Device R2 or to some other downstream device.

   In the following hping command, the -c flag sets the number of packets to 50. The -x flag sets the port to 80. The -k flag causes the source port to remain steady at 80 instead of incrementing.

   The destination IP address of 172.16.60.1 represents a user that is downstream of Device R2. The user has requested a web page from the host (the web server emulated by the traffic generator), and the packets are sent in response to the request.

   ```
   [root@host]# hping 172.16.60.1 -c 50 -s 80 -k
   ```

3. On Device R1, check the queue counters.

   Notice that you check the queue counters on the downstream output interface, not on the incoming interface.

   ```
   user@R1> show interfaces extensive ge-1/0/9 | find "Queue counters"

   Queue counters:   Queued packets   Transmitted packets   Dropped packets
   ```

```
    0                    50                   50                   0
    1                     0                   57                   0
    2                     0                    0                   0
    3                     0                    0                   0
```

4. Use a traffic generator to send 50 TCP port 12345 packets to Device R2 or to some other downstream device.

   ```
   [root@host]#  hping 172.16.60.1 -c 50 -s 12345 -k
   ```

5. On Device R1, check the queue counters.

   ```
   user@R1>  show interfaces extensive ge-1/0/9 | find "Queue counters"

   Queue counters:   Queued packets   Transmitted packets   Dropped packets
       0                        50                    50                 0
       1                        50                    57                 0
       2                         0                     0                 0
       3                         0                     0                 0
   ```

Meaning The output shows that the packets are classified correctly. When port 80 is used in the TCP packets, queue 0 is incremented. When port 12345 is used, queue 1 is incremented.

Related Documentation

- *Junos OS Routing Protocols and Policies Configuration Guide for Security Devices*
- *Junos OS Firewall Filters and Traffic Policers Library for Routing Devices*
- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- *Example: Configuring a Two-Rate Three-Color Policer*

Example: Classifying Packets Based on Their Destination Address

Configure a multifield classifier that ensures that all IPv4 packets destined for the **10.10.10.0/24** network are placed into the **platinum** forwarding class. This assignment occurs regardless of the received CoS bit values in the packet. Apply this filter to the inbound interface **so-1/2/2.0**.

To verify that your configuration is attached to the correct interface, issue the **show interfaces filters** command.

```
[edit]
firewall {
  family inet {
    filter set-FC-to-platinum {
      term match-a-single-route {
        from {
          destination-address {
            10.10.10.0/24;
          }
        }
        then {
          forwarding-class platinum;
          accept;
        }
      }
```

```
        term accept-all {
          then accept;
        }
      }
    }
  }
  interfaces {
    so-1/2/2 {
      unit 0 {
        family inet {
          filter {
            input set-FC-to-platinum;
          }
        }
      }
    }
  }
```

Example: Configuring and Verifying a Complex Multifield Filter

In this example, SIP signaling (VoIP) messages use TCP/UDP, port 5060, and RTP media channels use UDP with port assignments from 16,384 through 32,767. See the following sections:

- Configuring a Complex Multifield Filter on page 20
- Verifying a Complex Multifield Filter on page 22

Configuring a Complex Multifield Filter

To configure the multifield filter, perform the following actions:

- Classify SIP signaling messages (VoIP network control traffic) as NC with a firewall filter.
- Classify VoIP traffic as EF with the same firewall filter.
- Police all remaining traffic with IP precedence **0** and make it BE.
- Police BE traffic to 1 Mbps with excess data marked with PLP high.
- Apply the firewall filter with policer to the interface.

The firewall filter called **classify** matches on the transport protocol and ports identified in the incoming packets and classifies packets into the forwarding classes specified by your criteria.

The first term, **sip**, classifies SIP signaling messages as network control messages. The **port** statement matches any source port or destination port (or both) that is coded to 5060.

Classifying SIP Signaling Messages

```
firewall {
  family inet {
    filter classify {
```

```
        interface-specific;
        term sip {
          from {
            protocol [ udp tcp ];
            port 5060;
          }
          then {
            forwarding-class network-control;
            accept;
          }
        }
      }
    }
  }
```

The second term, **rtp**, classifies VoIP media channels that use UDP-based transport.

Classifying VoIP Channels That Use UDP

```
term rtp {
  from {
    protocol udp;
    port 16384-32767;
  }
  then {
    forwarding-class expedited-forwarding;
    accept;
  }
}
```

The policer's burst tolerance is set to the recommended value for a low-speed interface, which is ten times the interface MTU. For a high-speed interface, the recommended burst size is the transmit rate of the interface times 3 to 5 milliseconds.

Configuring the Policer

```
policer be-policer {
  if-exceeding {
    bandwidth-limit 1m;
    burst-size-limit 15k;
  }
  then loss-priority high;
}
```

The third term, **be**, ensures that all remaining traffic is policed according to a bandwidth restriction.

Policing All Remaining Traffic

```
term be {
  then policer be-policer;
}
```

The **be** term does not include a **forwarding-class** action modifier. Furthermore, there is no explicit treatment of network control (NC) traffic provided in the **classify** filter. You can configure explicit classification of NC traffic and all remaining IP traffic, but you do

not need to, because the default IP precedence classifier correctly classifies the remaining traffic.

Apply the **classify** classifier to the **fe-0/0/2** interface:

Applying the Classifier

```
interfaces {
  fe-0/0/2 {
    unit 0 {
      family inet {
        filter {
          input classify;
        }
        address 10.12.0.13/30;
      }
    }
  }
}
```

Verifying a Complex Multifield Filter

Before the configuration is committed, display the default classifiers in effect on the interface using the **show class-of-service interface** ***interface-name*** command. The display confirms that the **ipprec-compatibility** classifier is in effect by default.

Verifying Default Classification

```
user@host> show class-of-service fe-0/0/2
Physical interface: fe-0/0/2, Index: 135
Queues supported: 8, Queues in use: 4
  Scheduler map: <default>, Index: 2032638653

  Logical interface: fe-0/0/2.0, Index: 68
    Shaping rate: 32000
    Object         Name                   Type                        Index
    Scheduler-map  <default>                                             27
    Rewrite        exp-default            exp                          21
    Classifier     exp-default            exp                           5
    Classifier     ipprec-compatibility   ip                            8
```

To view the default classifier mappings, use the **show class-of-service classifier name** ***name*** command. The highlighted output confirms that traffic with IP precedence setting of 0 is correctly classified as BE, and NC traffic, with precedence values of 6 or 7, is properly classified as NC.

Displaying Default Classifier Mappings

```
user@host> show class-of-service classifier name ipprec-compatibility
Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 12
  Code point          Forwarding class                    Loss priority
  000                 best-effort                         low
  001                 best-effort                         high
  010                 best-effort                         low
  011                 best-effort                         high
  100                 best-effort                         low
  101                 best-effort                         high
  110                 network-control                     low
  111                 network-control                     high
```

After your configuration is committed, verify that your multifield classifier is working correctly. You can monitor the queue counters for the router device's ***egress*** interface used when forwarding traffic received from the peer. Displaying the queue counters for the ingress interface (**fe-0/0/2**) does not allow you to check your ingress classification, because queuing generally occurs only at egress in the Junos OS. (Ingress queuing is supported on Gigabit Ethernet IQ2 PICs and Enhanced IQ2 PICs only.)

To verify the operation of the multifield filter:

1. To determine which egress interface is used for the traffic, use the **traceroute** command.
2. After you identify the egress interface, clear its associated queue counters by issuing the **clear interfaces statistics** ***interface-name*** command.
3. Confirm the default forwarding class-to-queue number assignment. This allows you to predict which queues are used by the VoIP, NC, and other traffic. To do this, issue the **show class-of-service forwarding-class** command.
4. Display the queue counts on the interface by issuing the **show interfaces queue** command.

Example: Writing Different DSCP and EXP Values in MPLS-Tagged IP Packets

On Juniper Networks M320 Multiservice Edge Routers and T Series Core Routers, you can selectively set the DSCP field of MPLS-tagged IPv4 and IPv6 packets to **000000**. In the same packets, you can set the MPLS EXP field according to a configured rewrite table, which is based on the forwarding classes that you set in incoming packets using a BA or multifield classifier.

Queue selection is based on the forwarding classes you assign in scheduler maps. This means that you can direct traffic to a single output queue, regardless of whether the DSCP field is unchanged or rewritten to **000000**. To do this, you must configure a multifield classifier that matches selected packets and modifies them with the **dscp 0** action.

Selective marking of DSCP fields to **0**, without affecting output queue assignment, can be useful. For example, suppose you need to use the MPLS EXP value to configure CoS applications for core provider routers. At the penultimate egress provider edge (PE) router where the MPLS labels are removed, the CoS bits need to be provided by another value, such as DSCP code points. This case illustrates why it is useful to mark both the DSCP and MPLS EXP fields in the packet. Furthermore, it is useful to be able to mark the two fields differently, because the CoS rules of the core provider router might differ from the CoS rules of the egress penultimate router. At egress, as always, you can use a rewrite table to rewrite the MPLS EXP values corresponding to the forwarding classes that you need to set.

NOTE: When both customer-facing and core-facing interfaces exist, you can derive the EXP value in the following precedence order, while adding the MPLS label:

1. EXP value provided by the CoS rewrite action.
2. EXP value derived from the top label of the stack (MPLS label stacking).
3. IPv4 or IPv6 precedence (Layer 3 VPN, Layer 2 VPN, and VPLS scenarios).

For IPv4 traffic, the **dscp 0** action modifier at the **[edit firewall family inet filter *filter-name* term *term-name* then]** hierarchy level is valid. However, for IPv6 traffic, you configure this feature by including the **traffic-class 0** action modifier at the **[edit firewall family inet6 filter *filter-name* term *term-name* then]** hierarchy level.

In the following IPv4 example, term **1** of the multifield classifier matches packets with DSCP **001100** code points coming from a certain VRF, rewrites the bits to DSCP **000000**, and sets the forwarding class to **best-effort**. In term **2**, the classifier matches packets with DSCP **010110** code points and sets the forwarding class to **best-effort**. Because term **2** does not include the **dscp 0** action modifier, the DSCP **010110** bits remain unchanged. Because the classifier sets the forwarding class for both code points to **best-effort**, both traffic types are directed to the same output queue.

NOTE: If you configure a bit string in a DSCP match condition in a firewall filter, then you must include the letter “b” in front of the string, or the match rule creation fails on commit.

```
[edit]
firewall {
  family inet {
    filter vrf-rewrite {
      term 1 {
        from {
          dscp b001100;
        }
        then {
          dscp 0;
          forwarding-class best-effort;
        }
      }
      term 2 {
        from {
          dscp b010110;
        }
        then {
          forwarding-class best-effort;
        }
      }
    }
  }
```

```
}
```

Applying the Multifield Classifier

Apply the filter to an input interface corresponding to the VRF:

```
[edit]
interfaces {
   so-0/1/0 {
      unit 0 {
         family inet {
            filter input vrf-rewrite;
         }
      }
   }
}
```

NOTE: The **dscp 0** action is supported in both input and output filters. You can use this action for non-MPLS packets as well as for IPv4 and IPv6 packets entering an MPLS network. All IPv4 and IPv6 firewall filter match conditions are supported with the **dscp 0** action.

The following limitations apply:

- You can use a multifield classifier to rewrite DSCP fields to value 0 only. Other values are not supported.
- If a packet matches a filter that has the **dscp 0** action, then the outgoing DSCP value of the packet is 0, even if the packet matches a rewrite rule, and the rewrite rule is configured to mark the packet to a non-zero value. The **dscp 0** action overrides any other rewrite rule actions configured on the router.
- Although you can use the **dscp 0** action on an input filter, the output filter and other classifiers do not see the packet as being marked **dscp 0**. Instead, they classify the packet based on its original incoming DSCP value. The DSCP value of the packet is set to 0 after all other classification actions have completed on the packet.

Example: Configuring a Simple Filter

This simple filter sets the loss priority to low for TCP traffic with source address **1.1.1.1**, sets the loss priority to high for HTTP (web) traffic with source addresses in the **4.0.0.0/8** range, and sets the loss priority to low for all traffic with destination address **6.6.6.6**. The simple filter is applied as an input filter (arriving packets are checking for destination address **6.6.6.6**, not queued output packets) on interface **ge-0/0/1.0**.

```
[edit]
firewall {
   family inet {
      simple-filter filter1 {
         term 1 {
            from {
               source-address {
```

```
                1.1.1.1/32;
              }
              protocol {
                tcp;
              }
            }
            then loss-priority low;
          }
          term 2 {
            from {
              source-address {
                4.0.0.0/8;
              }
              source-port {
                http;
              }
            }
            then loss-priority high;
          }
          term 3 {
            from {
              destination-address {
                6.6.6.6/32;
              }
            }
            then {
              loss-priority low;
              forwarding-class best-effort;
            }
          }
        }
      }
    }
    interfaces {
      ge-0/0/1 {
        unit 0 {
          family inet {
            simple-filter {
              input filter1;
            }
            address 10.1.2.3/30;
          }
        }
      }
    }
```

Example: Configuring a Logical Bandwidth Policer

This example applies a logical bandwidth policer rate to two logical interfaces on interface **ge-0/2/7**. The policed rate on **unit 0** is 2 Mbps (50 percent of 4 Mbps) and the policed rate on **unit 1** is 1 Mbps (50 percent of 2 Mbps).

```
[edit firewall]
policer Logical_Policer {
  logical-bandwidth-policer; # This applies the policer to logical interfaces
```

```
    if-exceeding {
      bandwidth-percent 50; # This applies 50 percent to the shaping-rate
      burst-size-limit 125k;
    }
    then discard;
}

[edit class-of-service]
interfaces {
    ge-0/2/7 {
        unit 0 {
            shaping-rate 4m # This establishes the rate to be policed on unit 0
        }
        unit 1 {
            shaping-rate 2m # This establishes the rate to be policed on unit 1
        }
    }
}
[edit interfaces ge-0/2/7]
per-unit-scheduler;
vlan-tagging;
unit 0 {
    vlan-id 100;
    family inet {
        policer {
            input Logical_Policer;
            output Logical_Policer;
        }
        address 172.1.1.1/30;
    }
}
unit 1 {
    vlan-id 200;
    family inet {
        policer {
            input Logical_Policer;
            output Logical_Policer;
        }
        address 172.2.1.1/30;
    }
}
```

Example: Two-Color Policers and Shaping Rate Changes

In this example, the shaping rate has been configured for the logical interface, but a bandwidth percentage policer is also configured. Therefore policing is based on the physical interface speed of 1 Gbps.

If both a shaping rate and a bandwidth percentage policer is configured on the same logical interface, the policing is based on the physical interface speed. Here is the example configuration:

```
[edit interfaces]
ge-0/1/0 {
    per-unit-scheduler;
```

```
    vlan-tagging;
    unit 0 {
      vlan-id 1;
      family inet {
        policer {
          output policer_test;
        }
        address 10.0.7.1/24;
      }
    }
}

[edit firewall]
policer policer_test {
    if-exceeding {
      bandwidth-percent 75;
      burst-size-limit 256k;
    }
    then discard;
}

[edit]
class-of-service {
    interfaces {
      ge-0/1/0 {
        unit 0 {
          shaping-rate 15m;
        }
      }
    }
}
```

Example: Limiting Inbound Traffic Within Your Network by Configuring an Ingress Single-Rate Two-Color Policer and Configuring Multifield Classifiers

This example shows how to limit customer traffic within your network using a single-rate two-color policer. Policers use a concept known as a token bucket to identify which traffic to drop. The policer enforces the class-of-service (CoS) strategy of in-contract and out-of-contract traffic at the interface level. You can apply a single-rate two-color policer to incoming packets, outgoing packets, or both. This example applies the policer as an input (ingress) policer for incoming traffic. The multifield classifier CoS queuing option places the traffic into the assigned queues which will help you manage resource utilization at the output interface level by applying scheduling and shaping at a later date.

A thorough explanation of the token bucket concept and its underlying algorithms is beyond the scope of this document. For more information about traffic policing, and CoS in general, refer to *QOS-Enabled Networks—Tools and Foundations* by Miguel Barreiros and Peter Lundqvist. This book is available at many online booksellers and at www.juniper.net/books .

- Requirements on page 29
- Overview on page 29

Requirements

To verify this procedure, this example uses a traffic generator. The traffic generator can be hardware-based or it can be software running on a server or host machine.

The functionality in this procedure is widely supported on devices that run Junos OS. The example shown here was tested and verified on MX Series routers running Junos OS Release 10.4.

Overview

Policing

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

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

  Burst size = bandwidth x allowable time for burst traffic / 8

  Or

  Burst size = interface mtu x 10

  For information about configuring the burst size, see *Determining Proper Burst Size for Traffic Policers*.

NOTE: **There is a finite buffer space for an interface. In general, the estimated total buffer depth for an interface is about 125 ms.**

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

For a traffic flow that exceeds the configured limits (categorized as red traffic), packets are handled according to the traffic-policing actions configured for the policer. This example discards packets that burst over the 15 KBps limit.

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

- Directly to a logical interface, at a specific protocol level.
- As the action of a standard stateless firewall filter that is applied to a logical interface, at a specific protocol level. This is the technique used in this example.

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

CAUTION: You can choose either bandwidth-limit or bandwidth percent within the policer, as they are mutually exclusive. You cannot configure a policer to use bandwidth percent for aggregate, tunnel, or software interfaces.

In this example, the host is a traffic generator emulating a webserver. Devices R1 and R2 are owned by a service provider. The webserver is accessed by users behind Device R2. The host will be sending traffic with a source port TCP HTTP port 80 and a source port 12345 to the users. A single-rate two-color policer is configured and applied to the interface on Device R1 that connects the host to Device R1. The policer enforces the contractual bandwidth availability made between the owner of the webserver (in this case emulated by the host) and the service provider that owns Device R1 for the web traffic that flows over the link that connects the host to Device R1.

In accordance with the contractual bandwidth availability made between the owner of the webserver and the service provider that owns Devices R1 and R2, the policer will limit the HTTP port 80 traffic and the port 12345 traffic originating from the host to using 700 Mbps (70 percent) of the available bandwidth with an allowable burst rate of 10 x the MTU size of the gigabit Ethernet interface between the host and Device R1.

NOTE: In a real-world scenario you would probably also rate-limit traffic for a variety of other ports such as FTP, SFTP, SSH, TELNET, SMTP, IMAP, and POP3 because they are often included as additional services with web hosting services.

NOTE: You need to leave some additional bandwidth available that is not rate-limited for network control protocols such as routing protocols, DNS, and any other protocols required to keep network connectivity operational. This is why the firewall filter has a final accept condition on it.

Topology

This example uses the topology in Figure 4 on page 31.

Figure 4: Single-Rate Two-Color Policer Scenario

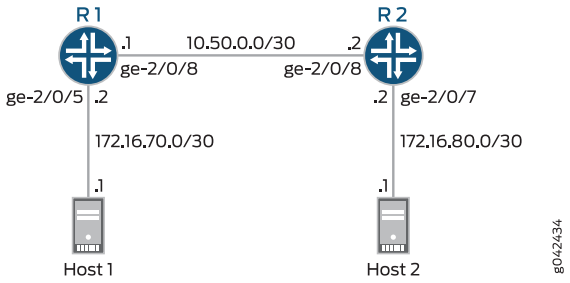
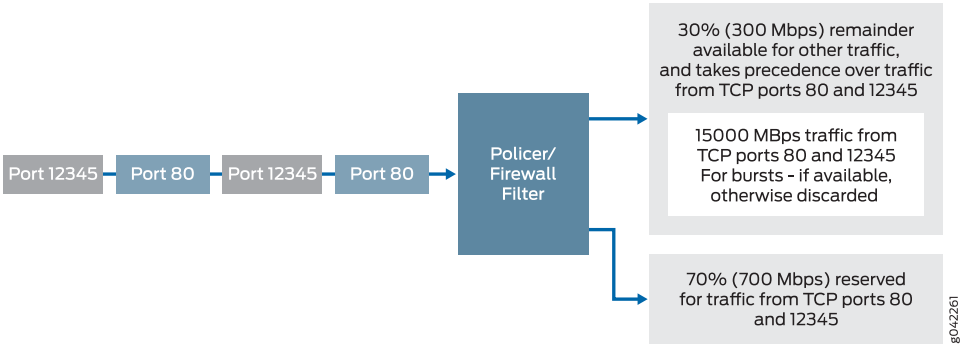


Figure 5 on page 31 shows the policing behavior.

Figure 5: Traffic Limiting in a Single-Rate Two-Color Policer Scenario



Multifield Classifying

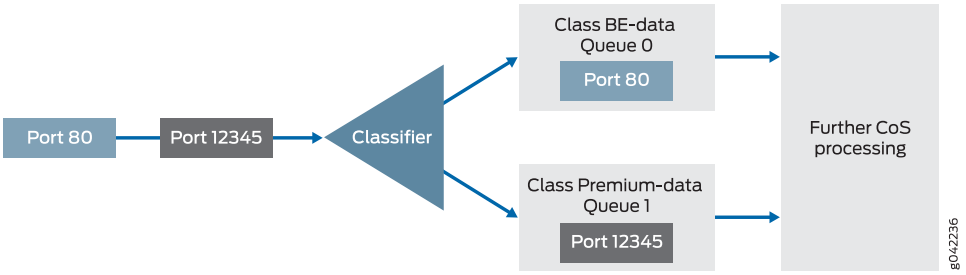
A classifier is a software operation that a router or switch uses to inspect and classify a packet after it has made it through any policing, if policing is configured. During classification, the packet header contents are examined, and this examination determines how the packet is treated when the outbound interface becomes too busy to handle all of the packets and you want your device to drop packets intelligently, instead of dropping packets indiscriminately. One common way to detect packets of interest is by source port number. The TCP source port numbers 80 and 12345 are used in this example, but many other matching criteria for packet detection are available to multifield classifiers, using firewall filter match conditions. The configuration in this example specifies that TCP packets with a source port 80 are classified into the BE-data forwarding class and queue number 0, and TCP packets with a source port 12345 are classified into the Premium-data forwarding class and queue number 1. Traffic from both port numbers is monitored by the policer first. If the traffic makes it through the policer, it is handed off to the outbound interface in the assigned queue for transmission.

Multifield classifiers are typically used at the network edge as packets enter an autonomous system (AS).

In this example, you configure the firewall filter mf-classifier and specify some custom forwarding classes on Device R1. In specifying the custom forwarding classes, you also associate each class with a queue.

The classifier operation is shown in Figure 2 on page 14.

Figure 6: Multifield Classifier Based on TCP Source Ports



You apply the multifield classifier's firewall filter as an input filter on each customer-facing or host-facing interface that needs the filter. In this example, the incoming interface ge-2/0/5 on Device R1 is used. You monitor the behavior of the queues on the interfaces that the traffic is transmitted over. In this example, to determine how the queues are being serviced, you examine the traffic statistics on interface ge-2/0/8 by using the **extensive** option in the **show interfaces** command.

Configuration

CLI Quick Configuration

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

Device R1

```
set interfaces ge-2/0/5 description to-Host
set interfaces ge-2/0/5 unit 0 family inet address 172.16.70.2/30
set interfaces ge-2/0/5 unit 0 family inet filter input mf-classifier
set interfaces ge-2/0/8 description to-R2
set interfaces ge-2/0/8 unit 0 family inet address 10.50.0.1/30
set interfaces lo0 unit 0 description looback-interface
set interfaces lo0 unit 0 family inet address 192.168.13.1/32
set firewall policer discard if-exceeding bandwidth-limit 700m
set firewall policer discard if-exceeding burst-size-limit 15k
set firewall policer discard then discard
set class-of-service forwarding-classes class BE-data queue-num 0
set class-of-service forwarding-classes class Premium-data queue-num 1
set class-of-service forwarding-classes class Voice queue-num 2
set class-of-service forwarding-classes class NC queue-num 3
set firewall family inet filter mf-classifier term BE-data from protocol tcp
set firewall family inet filter mf-classifier term BE-data from port http
set firewall family inet filter mf-classifier term BE-data then forwarding-class BE-data
set firewall family inet filter mf-classifier term BE-data then policer discard
set firewall family inet filter mf-classifier term Premium-data from protocol tcp
set firewall family inet filter mf-classifier term Premium-data from port 12345
set firewall family inet filter mf-classifier term Premium-data then forwarding-class
    Premium-data
```

```
set firewall family inet filter mf-classifier term Premium-data then policer discard
set firewall family inet filter mf-classifier term accept then accept
set protocols ospf area 0.0.0.0 interface ge-2/0/5.0 passive
set protocols ospf area 0.0.0.0 interface lo0.0 passive
set protocols ospf area 0.0.0.0 interface ge-2/0/8.0
```

Device R2

```
set interfaces ge-2/0/7 description to-Host
set interfaces ge-2/0/7 unit 0 family inet address 172.16.80.2/30
set interfaces ge-2/0/8 description to-R1
set interfaces ge-2/0/8 unit 0 family inet address 10.50.0.2/30
set interfaces lo0 unit 0 description looback-interface
set interfaces lo0 unit 0 family inet address 192.168.14.1/32
set protocols ospf area 0.0.0.0 interface ge-2/0/7.0 passive
set protocols ospf area 0.0.0.0 interface lo0.0 passive
set protocols ospf area 0.0.0.0 interface ge-2/0/8.0
```

Step-by-Step Procedure

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

To configure Device R1:

1. Configure the device interfaces.

   ```
   [edit interfaces]
   user@R1#set ge-2/0/5 description to-Host
   user@R1#set ge-2/0/5 unit 0 family inet address 172.16.70.2/30
   user@R1#set ge-2/0/8 description to-R2
   user@R1#set ge-2/0/8 unit 0 family inet address 10.50.0.1/30
   user@R1# set lo0 unit 0 description looback-interface
   user@R1#set lo0 unit 0 family inet address 192.168.13.1/32
   ```

2. Configure the policer to rate-limit to a bandwidth of 700 Mbps and a burst size of 15 KBps.

   ```
   [edit firewall policer discard]
   user@R1# set if-exceeding bandwidth-limit 700m
   user@R1# set if-exceeding burst-size-limit 15k
   ```

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

   ```
   [edit firewall policer discard]
   user@R1# set then discard
   ```

4. Configure the custom forwarding classes and associated queue numbers.

   ```
   [edit class-of-service forwarding-classes]
   user@R1# set class BE-data queue-num 0
   user@R1# set class Premium-data queue-num 1
   user@R1# set class Voice queue-num 2
   user@R1# set class NC queue-num 3
   ```

5. Configure the firewall filter term that places TCP traffic with a source port of 80 (HTTP traffic) into the BE-data forwarding class, associated with queue 0.

   ```
   [edit firewall family inet filter mf-classifier]
   user@R1# set term BE-data from protocol tcp
   user@R1# set term BE-data from port http
   ```

```
user@R1# set term BE-data then forwarding-class BE-data
user@R1# set term BE-data then policer discard
```

6. Configure the firewall filter term that places TCP traffic with a source port of 12345 into the Premium-data forwarding class, associated with queue 1.

```
[edit firewall family inet filter mf-classifier]
user@R1# set term Premium-data from protocol tcp
user@R1# set term Premium-data from port 12345
user@R1# set term Premium-data then forwarding-class Premium-data
user@R1# set term Premium-data then policer discard
```

7. At the end of your firewall filter, configure a default term that accepts all other traffic.

   Otherwise, all traffic that arrives on the interface and is not explicitly accepted by the firewall filter is discarded.

```
[edit firewall family inet filter mf-classifier]
user@R1# set term accept then accept
```

8. Apply the firewall filter to the ge-2/0/5 interface as an input filter.

```
[edit interfaces]
user@R1# set ge-2/0/5 unit 0 family inet filter input mf-classifier
```

9. Configure OSPF.

```
[edit protocols ospf]
user@R1# set area 0.0.0.0 interface ge-2/0/5.0 passive
user@R1# set area 0.0.0.0 interface lo0.0 passive
user@R1# set area 0.0.0.0 interface ge-2/0/8.0
```

Step-by-Step Procedure

To configure Device R2:

1. Configure the device interfaces.

```
[edit interfaces]
user@R2# set ge-2/0/7 description to-Host
user@R2# set ge-2/0/7 unit 0 family inet address 172.16.80.2/30
user@R2# set ge-2/0/8 description to-R1
user@R2# set ge-2/0/8 unit 0 family inet address 10.50.0.2/30
user@R2# set lo0 unit 0 description looback-interface
user@R2# set lo0 unit 0 family inet address 192.168.14.1/32
```

2. Configure OSPF.

```
[edit protocols ospf]
user@R2#  set area 0.0.0.0 interface ge-2/0/7.0 passive
user@R2#  set area 0.0.0.0 interface lo0.0 passive
user@R2#  set area 0.0.0.0 interface ge-2/0/8.0
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces**, **show class-of-service**, **show firewall**, and **show protocols ospf** commands. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@R1# show interfaces
```

```
ge-2/0/5 {
   description to-Host;
   unit 0 {
      family inet {
         filter {
            input mf-classifier;
         }
         address 172.16.70.2/30;
      }
   }
}
ge-2/0/8 {
   description to-R2;
   unit 0 {
      family inet {
         address 10.50.0.1/30;
      }
   }
}
lo0 {
   unit 0 {
      description looback-interface;
      family inet {
         address 192.168.13.1/32;
      }
   }
}
```

```
user@R1# show class-of-service
forwarding-classes {
   class BE-data queue-num 0;
   class Premium-data queue-num 1;
   class Voice queue-num 2;
   class NC queue-num 3;
}
```

```
user@R1# show firewall
family inet {
   filter mf-classifier {
      term BE-data {
         from {
            protocol tcp;
            port http;
         }
         then {
            policer discard;
            forwarding-class BE-data;
         }
      }
      term Premium-data {
         from {
            protocol tcp;
            port 12345;
         }
         then {
            policer discard;
            forwarding-class Premium-data;
```

```
        }
      }
      term accept {
        then accept;
      }
    }
  }
  policer discard {
    if-exceeding {
      bandwidth-limit 700m;
      burst-size-limit 15k;
    }
    then discard;
  }
```

```
user@R1# show protocols ospf
area 0.0.0.0 {
  interface ge-2/0/5.0 {
    passive;
  }
  interface lo0.0 {
    passive;
  }
  interface ge-2/0/8.0;
}
```

If you are done configuring Device R1, enter **commit** from configuration mode.

```
user@R2# show interfaces
ge-2/0/7 {
  description to-Host;
  unit 0 {
    family inet {
      address 172.16.80.2/30;
    }
  }
}
ge-2/0/8 {
  description to-R1;
  unit 0 {
    family inet {
      address 10.50.0.2/30;
    }
  }
}
lo0 {
  unit 0 {
    description looback-interface;
    family inet {
      address 192.168.14.1/32;
    }
  }
}
```

```
user@R2# show protocols ospf
area 0.0.0.0 {
  interface ge-2/0/7.0 {
```

```
    passive;
  }
  interface lo0.0 {
    passive;
  }
  interface ge-2/0/8.0;
}
```

If you are done configuring Device R2, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Checking the CoS Settings on page 37
- Clearing the Counters on page 37
- Sending Traffic into the Network from TCP HTTP Port 80 and Monitoring the Results on page 38
- Sending Traffic into the Network from TCP Port 12345 and Monitoring the Results on page 39

Checking the CoS Settings

Purpose Confirm that the forwarding classes are configured correctly.

Action From Device R1, run the **show class-of-service forwarding-class** command.

```
user@R1> show class-of-service forwarding-class

Forwarding class                          ID      Queue  Restricted queue  Fabric
priority  Policing priority   SPU priority
  BE-data                                 0       0          0              low
            normal            low
  Premium-data                            1       1          1              low
            normal            low
  Voice                                   2       2          2              low
            normal            low
  NC                                      3       3          3              low
            normal            low
```

Meaning The output shows the configured custom classifier settings.

Clearing the Counters

Purpose Confirm that the firewall and interface counters are cleared.

Action

- On Device R1, run the **clear firewall all** command to reset the firewall counters to 0.

  ```
  user@R1> clear firewall all
  ```

- On Device R1, run the **clear interface statistics ge-2/0/5** command to reset the interface counters to 0.

  ```
  user@R1> clear interface statistics ge-2/0/8
  ```

Sending Traffic into the Network from TCP HTTP Port 80 and Monitoring the Results

Purpose Send traffic that can monitored at the policer and custom queue level.

Action

1. Use a traffic generator to send 20 TCP packets with a source port of 80 into the network.

   The -s flag sets the source port. The -k flag causes the source port to remain steady at 80 instead of incrementing. The -c flag sets the number of packets to 20. The -d flag sets the packet size.

   NOTE: In this example the policer numbers are reduced to a bandwidth limit of 8 Kbps and a burst size limit of 1500 KBps to ensure that some packets are dropped.

   ```
   [User@host]#  hping 172.16.80.1 -c 20 -s 80 -k -d 300
   ```

   ```
   [root@host]# hping 172.16.80.1 -s 80 -k -c 20 -d 300
   HPING 172.16.80.1 (eth1 172.16.80.1): NO FLAGS are set, 40 headers + 300 data
    bytes
   len=46 ip=172.16.80.1 ttl=62 DF id=0 sport=0 flags=RA seq=0 win=0 rtt=1.4 ms
   .
   .
   .
   --- 172.16.80.1 hping statistic ---
   20 packets transmitted, 16 packets received, 20% packet loss
   round-trip min/avg/max = 1.4/8688.9/17002.3 ms
   ```

2. On Device R1, check the firewall counters by using the **show firewall** command.

   ```
   user@R1> show firewall
   ```

   ```
   Filter: mf-classifier
   Policers:
   Name                                                Bytes              Packets
   discard-BE-data                                      1360                    4
   discard-Premium-data                                    0                    0
   ```

   Notice that in the hping output that there was 20% packet loss (4 packets out of 20) and the same number of packets were dropped by the policer as shown in the output of the **show firewall** command. Also notice that the drops are associated with the queue BE-data as specified in the mf-classifier in the firewall configuration.

3. On Device R1, check the queue counters by using the **show interfaces extensive ge-2/0/8| find "Queue counters"** command.

   ```
   user@R1> show interfaces extensive ge-2/0/8| find "Queue counters"
   ```

   ```
     Queue counters:       Queued packets  Transmitted packets     Dropped packets

       0                             16                   16                   0
   ```

```
  1                          0                  0                  0
  2                          0                  0                  0
  3                          4                  4                  0
Queue number:         Mapped forwarding classes
  0                   BE-data
  1                   Premium-data
  2                   Voice
  3                   NC
```

Notice that 16 packets were transmitted out interface 2/0/8 using the queue BE-data as specified in the mf-classifier in the firewall configuration. The remaining 4 packets, were dropped by the policer, as shown above. The 4 packets sent to queue 3 are network control traffic. They are possibly routing protocol updates.

Meaning The output from both devices shows that 4 packets were discarded This means that there was at least 8 Kbps of green (in-contract HTTP port 80) traffic and that the 1500 KBps burst option for red out-of-contract HTTP port 80 traffic was exceeded. In Steps 2 and 3, you can see that the correct queues were used to transmit the remaining traffic out interface 2/0/8.

Sending Traffic into the Network from TCP Port 12345 and Monitoring the Results

Purpose Send traffic that can monitored at the policer and custom queue level.

Action

1. Clear the counters again as shown in section "Clearing the Counters" on page 37.
2. Use a traffic generator to send 20 TCP packets with a source port of 12345 into the network.

   The -s flag sets the source port. The -k flag causes the source port to remain steady at 12345 instead of incrementing. The -c flag sets the number of packets to 20. The -d flag sets the packet size.

   ```
   [User@host]#  hping 172.16.80.1 -c 20 -s 12345 -k -d 300
   ```

   ```
   [root@tp-host]# hping 172.16.80.1 -s 12345 -k -c 20 -d 300
   HPING 172.16.80.1 (eth1 172.16.80.1): NO FLAGS are set, 40 headers + 300 data
    bytes
   len=46 ip=172.16.80.1 ttl=62 DF id=0 sport=0 flags=RA seq=0 win=0 rtt=0.4 ms
   .
   .
   .
   --- 172.16.80.1 hping statistic ---
   20 packets transmitted, 16 packets received, 20% packet loss
   round-trip min/avg/max = 0.4/9126.3/18002.4 ms
   ```

3. On Device R1, check the firewall counters by using the **show firewall** command.

   ```
   user@R1> show firewall

   Filter: mf-classifier
   Policers:
   Name                                                Bytes              Packets
   discard-BE-data                                         0                    0
   discard-Premium-data                                 1360                    4
   ```

Notice that in the hping output that there was 20% packet loss (4 packets out of 20) and the same number of packets were dropped by the policer as shown in the output of the **show firewall** command. Also notice that the drops are associated with the queue Premium-data as specified in the mf-classifier in the firewall configuration.

4. On Device R1, check the queue counters by using the **show interfaces extensive ge-2/0/8| find "Queue counters"** command.

```
user@R1> show interfaces extensive ge-2/0/8| find "Queue counters"

  Queue counters:      Queued packets  Transmitted packets     Dropped packets

    0                             0                   0                   0
    1                            16                  16                   0
    2                             0                   0                   0
    3                            19                  19                   0
  Queue number:         Mapped forwarding classes
    0                   BE-data
    1                   Premium-data
    2                   Voice
    3                   NC
```

Notice that 16 packets were transmitted out interface 2/0/8 using the Premium-data queues as specified in the mf-classifier firewall configuration. The remaining 4 packets were dropped by the policer, as shown above. The 19 packets sent to queue 3 are network control traffic. They are possibly routing protocol updates.

Meaning The output from both devices shows that 4 packets were discarded. This means that there was at least 8 Kbps of green (in-contract HTTP port 80) traffic and that the 1500 KBps burst option for red out-of-contract HTTP port 80 traffic was exceeded. In Steps 3 and 4, you can see that the correct queues were used to transmit the remaining traffic out interface 2/0/8.

Related Documentation

- *Junos OS Routing Protocols and Policies Configuration Guide for Security Devices*
- *Junos OS Firewall Filters and Traffic Policers Library for Routing Devices*
- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- *Example: Configuring a Two-Rate Three-Color Policer*

Example: Multifield Classifier Limitation on M Series Routers

On M Series routers (except M120 routers), multifield classifiers are limited such that they cannot classify packets with an output filter match based on the ingress classification that is set with an input filter.

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

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

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

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

CHAPTER 4

Configuration Statements

dscp (Multifield Classifier)

Syntax dscp [0 | *value*];

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced in Junos OS Release 7.4.

Description For M320 and T Series routers, set the DSCP field of incoming or outgoing packets to **000000**. On the same packets, you can use a behavior aggregate (BA) classifier and a rewrite rule to rewrite the MPLS EXP field.

For MX Series routers with MPCs and EX Series switches, the DSCP field can be set from a numeric range.

For MX Series routers and EX Series switches, if you configure a firewall filter with a DSCP action or traffic-class action on a DPC, the commit does not fail, but the filter is not applied to the interface, a warning displays, and an entry is made in the syslog.

Options ***value***—For MX Series routers with MPCs, specify the field of incoming or outgoing packets in the range from **0** through **63**.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- *Applying Tricolor Marking Policers to Firewall Filters*

family (Multifield Classifier)

Syntax

```
family family-name {
  filter filter-name {
    term term-name {
      ... term_configuration ...
    }
  }
}
```

Hierarchy Level [edit firewall]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure a firewall filter for IP version 4 (IPv4) or IP version 6 (IPv6) traffic.

Options *family-name*—Protocol family:

- **ccc**—Circuit cross-connect parameters
- **inet**—IPv4 parameters
- **inet6**—IPv6 protocol parameters
- **iso**—OSI ISO protocol parameters
- **mlppp**—Multilink PPP protocol parameters
- **mpls**—MPLS protocol parameters
- **tcc**—Translational cross-connect parameters
- **vpls**—Virtual private LAN service parameters.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Multifield Classifiers on page 9

filter (Applying to an Interface)

Syntax

```
filter {
    input filter-name;
    output filter-name;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family *family*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Apply a filter to an interface. You can also use filters for encrypted traffic. When you configure filters, you can configure the family **inet**, **inet6**, **mpls**, or **vpls** only.

Options

input *filter-name*—Name of one filter to evaluate when packets are received on the interface.

output *filter-name*—Name of one filter to evaluate when packets are transmitted on the interface.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- simple-filter on page 51
- *Applying Firewall Filter Tricolor Marking Policers to Interfaces*
- Example: Classifying Packets Based on Their Destination Address on page 19
- Example: Configuring and Verifying a Complex Multifield Filter on page 20
- Example: Writing Different DSCP and EXP Values in MPLS-Tagged IP Packets on page 23
- Example: Configuring a Simple Filter on page 25
- Example: Configuring a Logical Bandwidth Policer on page 26
- Example: Two-Color Policers and Shaping Rate Changes on page 27

filter (Applying to a Logical Interface)

Syntax

```
filter {
  group filter-group-number;
  input filter-name;
  input-list [ filter-names ];
  output filter-name;
  output-list [ filter-names ];
}
```

Hierarchy Level

Protocol-independent firewall filter on MX Series router logical interface:

[edit interfaces *interface-name* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

All other standard firewall filters on all other devices:

[edit interfaces *interface-name* unit *logical-unit-number* family *family*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

Apply a stateless firewall filter to a logical interface at a specific protocol level.

Options

group *filter-group-number*—Number of the group to which the interface belongs. Range: 1 through 255

input *filter-name*—Name of one filter to evaluate when packets are received on the interface.

input-list [*filter-names*]—Names of filters to evaluate when packets are received on the interface. Up to 16 filters can be included in a filter input list.

output *filter-name*—Name of one filter to evaluate when packets are transmitted on the interface.

output-list [*filter-names*]—Names of filters to evaluate when packets are transmitted on the interface. Up to 16 filters can be included in a filter output list.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Guidelines for Configuring Firewall Filters*
- *Guidelines for Applying Firewall Filters*

filter (Configuring)

Syntax

```
filter filter-name {
  accounting-profile name;
  enhanced-mode;
  interface-shared;
  interface-specific;
  physical-interface-filter;
  term term-name {
    ... term configuration ...
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* firewall family *family-name*],
[edit firewall family *family-name*],
[edit logical-systems *logical-system-name* firewall family *family-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
physical-interface-filter statement introduced in Junos OS Release 9.6.
Support at the **[edit dynamic-profiles ... family family-name]** hierarchy level introduced in Junos OS Release 11.4.
Support for the **interface-shared**> statement introduced in Junos OS Release 12.2.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

Configure firewall filters.

Options

filter-name—Name that identifies the filter. This must be a non-reserved string of not more than 64 characters. To include spaces in the name, enclose it in quotation marks (" "). In Junos OS Release 9.0 and later, you can no longer use special characters within the name of a firewall filter. Firewall filter names are restricted from having the form **__.*__** (beginning and ending with underscores) or **__.*** (beginning with an underscore.

The remaining statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- *Guidelines for Configuring Firewall Filters*
- *Guidelines for Applying Firewall Filters*
- Configuring Multifield Classifiers on page 9
- *Using Multifield Classifiers to Set PLP*
- simple-filter (Configuring) on page 52

firewall

Syntax

```
firewall {
  atm-policer atm-policer-name {
    ... atm-policer-configuration ...
  }
  family protocol-family-name {
    ... protocol-family-configuration ...
  }
  filter ipv4-filter-name {
    ... ipv4-filter-configuration ...
  }
  hierarchical-policer hierarchical-policer-name {
    ... hierarchical-policer-configuration ...
  }
  interface-set interface-set-name {
    ... interface-set-configuration ...
  }
  policer two-color-policer-name {
    ... two-color-policer-configuration ...
  }
  three-color-policer three-color-policer-name {
    ... three-color-policer-configuration ...
  }
}
```

Hierarchy Level

[edit],
[edit logical-systems *logical-system-name*]
[edit dynamic-profiles *profile-name*],

Release Information

Statement introduced before Junos OS Release 7.4.
Logical systems support introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

Configure firewall filters.

The statements are explained separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- *Guidelines for Configuring Firewall Filters*
- *Guidelines for Configuring Service Filters*
- *Guidelines for Configuring Simple Filters*
- Configuring Multifield Classifiers on page 9
- *Using Multifield Classifiers to Set PLP*

forwarding-class (Multifield Classifiers)

Syntax forwarding-class *class-name*;

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.

Description Set the forwarding class of incoming packets.

Options ***class-name***—Name of the forwarding class.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Multifield Classifiers on page 9

loss-priority (Normal Filter)

Syntax loss-priority (high | low);

Hierarchy Level [edit firewall family *family-name* filter *filter-name* term *term-name* then]

Release Information Statement introduced before Junos OS Release 7.4.

Description Set the loss priority of incoming packets.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Multifield Classifiers on page 9

loss-priority (Simple Filter)

Syntax loss-priority (high | low | medium);

Hierarchy Level [edit firewall family *family-name* simple-filter *filter-name* term *term-name* then]

Release Information Statement introduced in Junos OS Release 7.6.

Description Set the loss priority of incoming packets.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Multifield Classifiers on page 9

simple-filter (Applying to an Interface)

Syntax

```
simple-filter {
    input filter-name;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

Release Information

Statement introduced in Junos OS Release 7.6.

Description

Apply a simple filter to an interface. You can apply simple filters to the family **inet** only, and only in the input direction.

Options

input *filter-name*—Name of one filter to evaluate when packets are received on the interface.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Multifield Classifiers on page 9
- filter (Applying to an Interface) on page 46

simple-filter (Configuring)

Syntax

```
simple-filter filter-name {
  term term-name {
    from {
      match-conditions;
    }
    then {
      forwarding-class class-name;
      loss-priority (high | low | medium);
    }
  }
}
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 7.6.
Logical systems support introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

Configure simple filters.

Options

filter-name—Name that identifies the simple filter. The name must be a non-reserved string of not more than 64 characters. No special characters are restricted. To include spaces in the name, enclose them in quotation marks (“ ”).

from—Match packet fields to values. If the **from** option is not included, all packets are considered to match and the actions and action modifiers in the **then** statement are taken.

match-conditions—One or more conditions to use to make a match.

term *term-name*—Define a simple-filter term. The name that identifies the term can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose them in quotation marks (“ ”).

then—Actions to take on matching packets. If the **then** option is not included and a packet matches all the conditions in the **from** statement, the packet is accepted.

NOTE: Only **forwarding-class** and **loss-priority** are valid actions in a simple filter configuration.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- simple-filter (Applying to an Interface) on page 51
- *Simple Filter Overview*

- *How Simple Filters Evaluate Packets*
- *Guidelines for Configuring Simple Filters*
- *Guidelines for Applying Simple Filters*

term (Simple Filter)

Syntax

```
term term-name {
  from {
    match-conditions;
  }
  then {
    forwarding-class class-name;
    loss-priority (high | low | medium);
  }
}
```

Hierarchy Level [edit firewall family inet simple-filter *filter-name*]

Release Information Statement introduced in Junos OS Release 7.6.

Description Define a simple filter term.

Options

from—Match packet fields to values. If the **from** option is not included, all packets are considered to match and the actions and action modifiers in the **then** statement are taken.

match-conditions—One or more conditions to use to make a match.

term-name—Name that identifies the term. The name can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (“ ”).

then—Actions to take on matching packets. If the **then** option is not included and a packet matches all the conditions in the **from** statement, the packet is accepted. For CoS, only the actions listed are allowed. These statements are explained separately.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

Related Documentation

- *Multifield Classification*
- *Simple Filter Overview*
- *Firewall Filter Match Conditions for IPv4 Traffic*
- *Standard Firewall Filter Match Conditions for IPv6 Traffic*

transparent

Syntax transparent;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers ieee802.1 vlan-tag]

Release Information Statement introduced in Junos OS Release 11.2

Description Packet classification based on the transparent VLAN tag.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

PART 3

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