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Junos® OS

CoS Capabilities Based on Hardware Platforms

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14.1

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Documentation and 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 ix 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 x 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**.

Documentation Feedback

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

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

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/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- 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

Hardware-Dependent CoS Capabilities

CoS Features and Limitations on MX Series Routers

Generally, the Layer 3 CoS hardware capabilities and limitations for Juniper Networks MX Series 3D Universal EdgeRouters are the same as for M Series Multiservice Edge Routers (M120 routers in particular).

In particular, the following scaling and performance parameters apply to MX Series routers:

- 32 classifiers of each type
- 32 rewrite tables of each type
- Eight queues per port
- 64 WRED profiles
- 100-ms queue buffering for interfaces 1 Gbps and above; 500 ms for all others
- Line-rate CoS features

For more information about MX Series router CoS capabilities, including software configuration, see *Configuring Hierarchical Schedulers for CoS* and *Enhanced Queuing DPC Hardware Properties*.

On MX Series routers, you can apply classifiers or rewrite rules to an integrated bridging and routing (IRB) interface at the **[edit class-of-service interfaces irb unit *logical-unit-number*]** level of the hierarchy. All types of classifiers and rewrite rules are allowed. These classifiers and rewrite rules are independent of others configured on an MX Series router.

```
[edit class-of-service interfaces]
irb {
  unit logical-unit-number {
    classifiers {
      type (classifier-name | default) family (mpls | all);
    }
    rewrite-rules {
      dscp (rewrite-name | default);
      dscp-ipv6 (rewrite-name | default);
      exp (rewrite-name | default)protocol protocol-types;
      ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
      inet-precedence (rewrite-name | default);
    }
  }
}
```

For IQ PICs, you can only configure one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.

The IRB classifiers and rewrite rules are applied only to the “routed” packets. For logical interfaces that are part of a bridge domain, only IEEE classifiers and IEEE rewrite rules are allowed. Only the listed options are available for rewrite rules on an IRB.

For dual-tagged bridge domain logical interfaces, you can configure classification based on the inner or outer VLAN tag’s IEEE 802.1p bits using the **vlan-tag** statement with the **inner** or **outer** option:

```
[edit class-of-service interfaces interface-name unit logical-unit-number]
classifiers {
  ieee-802.1 (classifier-name | default) vlan-tag (inner | outer);
}
```

Also, for dual-tagged bridge domain logical interfaces, you can configure rewrite rules to rewrite the outer or both outer and inner VLAN tag’s IEEE 802.1p bits using the **vlan-tag** statement with the **outer** or **outer-and-inner** option:

```
[edit class-of-service interfaces interface-name unit logical-unit-number]
rewrite-rules {
  ieee-802.1 (rewrite-rule-name | default) vlan-tag (outer | outer-and-inner);
}
```

CoS Features and Limitations on M Series and T Series Routers

Juniper Networks M320 Multiservice Edge Routers and T Series Core Routers, as well as M Series Multiservice Edge Routers with enhanced Flexible PIC Concentrators (FPCs), have more CoS capabilities than M Series routers that use other FPC models. Table 3 on page 5 lists some of these the differences.

To determine whether your M Series router is equipped with an enhanced FPC, issue the **show chassis hardware** command. The presence of an enhanced FPC is designated by the **E-FPC** description in the output.

```
user@host> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                31959             M7i
Midplane         REV 02   710-008761   CA0209            M7i Midplane
Power Supply 0   REV 04   740-008537   PD10272           AC Power Supply
Routing Engine   REV 01   740-008846   1000396803        RE-5.0
CFEB             REV 02   750-009492   CA0166            Internet Processor IIv1
FPC 0                                                   E-FPC
  PIC 0          REV 04   750-003163   HJ6416            1x G/E, 1000 BASE-SX
  PIC 1          REV 04   750-003163   HJ6423            1x G/E, 1000 BASE-SX
  PIC 2          REV 04   750-003163   HJ6421            1x G/E, 1000 BASE-SX
  PIC 3          REV 02   750-003163   HJ0425            1x G/E, 1000 BASE-SX
FPC 1                                                   E-FPC
  PIC 2          REV 01   750-009487   HM2275            ASP - Integrated
  PIC 3          REV 01   750-009098   CA0142            2x F/E, 100 BASE-TX
```

Many operations involving the DSCP bits depend on the router and PIC type. For example, some DSCP classification configurations for MPLS and Internet can only be performed on M120 routers, M320 routers with Enhanced Type III FPCs, and MX Series routers only.

Table 3 on page 5 summarizes CoS features and limitations on M Series and T Series routers.

NOTE: The T4000 router supports the lowest of the scaling numbers for classifiers, rewrite rules, and WRED associated with MX Series and T Series routers.

Table 3: CoS Features and Limitations on M Series and T Series Routers

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
Classifiers					

Table 3: CoS Features and Limitations on M Series and T Series Routers *(continued)*

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
Maximum number per FPC or PIC	1	8	64	64 or 58 total	On IQ2 and IQ2E PICs, the CoS classification and CoS rewrite processes are off-loaded from the FPC to the PIC, so the capabilities and limitations of these types of PICs must be taken into consideration. For M Series router FPCs, the one-classifier limit includes the default IP precedence classifier. If you create a new classifier and apply it to an interface, the new classifier does not override the default classifier for other interfaces on the same FPC. In general, the first classifier associated with a logical interface is used. The default classifier can be replaced only when a single interface is associated with the default classifier. Only 58 user-configurable BA classifiers can be attached to logical interfaces on Type-4 FPCs in T640, T1600, or T4000 routers, because six default classifiers are automatically attached to the interfaces. When interfaces on the FPC come up, three default classifiers are installed in the FPC ASIC table: IPv4 and IPv6, MPLS tagging, and multiservices. Next, three default BA classifiers are installed: DSCP IPv6 (9), and MPLS EXP (10), and IP precedence (13). For user-defined BA classifier types (**dscp**, **dscp-ipv6**, **ieee-802.1p**, **ieee-802.1ad**, **inet-precedence**, and **mpls-exp**), you can attach a maximum of 32 classifiers of the same type (including one default classifier) to a logical interface hosted on a Type-4 FPC in a T640, T1600, or T4000 router. You can attach a maximum of 8 user-configured BA classifiers of the same type to a logical interface hosted on an Enhanced Scaling FPC in a T640, T1600, or T4000 router.
dscp	No	Yes	Yes	Yes	On all routers, you cannot configure IP precedence and DiffServ code point (DSCP) classifiers on a single logical interface, because both apply to IPv4 packets.

Table 3: CoS Features and Limitations on M Series and T Series Routers *(continued)*

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
dscp-ipv6	No	Yes	Yes	Yes	For T Series routers, you can apply separate classifiers for IPv4 and IPv6 packets per logical interface. For M Series router enhanced FPCs, you cannot apply separate classifiers for IPv4 and IPv6 packets. Classifier assignment works as follows: • If you assign a DSCP classifier only, IPv4 and IPv6 packets are classified using the DSCP classifier. • If you assign an IP precedence classifier only, IPv4 and IPv6 packets are classified using the IP precedence classifier. The lower three bits of the DSCP field are ignored because IP precedence mapping requires the upper three bits only. • If you assign either the DSCP or the IP precedence classifier in conjunction with the DSCP IPv6 classifier, the commit fails. • If you assign a DSCP IPv6 classifier only, IPv4 and IPv6 packets are classified using the DSCP IPv6 classifier, but the commit displays a warning message.
ieee-802.1p	No	Yes	Yes	Yes	On M Series router enhanced FPCs and T Series routers, if you associate an IEEE 802.1p classifier with a logical interface, you cannot associate any other classifier with that logical interface. For most PICs, if you apply an IEEE 802.1p classifier to a logical interface, you cannot apply non-IEEE classifiers on other logical interfaces on the same physical interface. This restriction does not apply to Gigabit Ethernet IQ2 PICs.
inet-precedence	Yes	Yes	Yes	Yes	On all routers, you cannot assign IP precedence and DSCP classifiers to a single logical interface, because both apply to IPv4 packets.
mpls-exp	Yes	Yes	Yes	Yes	For M Series router FPCs, only the default MPLS EXP classifier is supported; the default MPLS EXP classifier takes the EXP bits 1 and 2 as the output queue number.
Loss priorities based on the Frame Relay discard eligible (DE) bit	No	No	No	No	–

Table 3: CoS Features and Limitations on M Series and T Series Routers *(continued)*

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
Drop Profiles					
Maximum number per FPC or PIC	2	16	32	32	–
Per queue	No	Yes	Yes	Yes	–
Per loss priority	Yes	Yes	Yes	Yes	–
Per Transmission Control Protocol (TCP) bit	No	Yes	Yes	Yes	–
Policing					
Adaptive shaping for Frame Relay traffic	No	No	No	No	–
Traffic policing	Yes	Yes	Yes	Yes	–
Two-rate tricolor marking (TCM)	No	No	Yes	Yes	Allows you to configure up to four loss priorities. Two-rate TCM is supported on T Series routers with Enhanced II FPCs and the T640 Core Router with Enhanced Scaling FPC4.
Virtual channels	No	No	No	No	–
Queuing					

Table 3: CoS Features and Limitations on M Series and T Series Routers *(continued)*

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
Priority	No	Yes	Yes	Yes	Gigabit Ethernet IQ2 PICs support only one queue in the scheduler map with **medium-high**, **high**, or **strict-high** priority. If more than one queue is configured with **high** or **strict-high** priority, the one that appears first in the configuration is implemented as **strict-high** priority. This queue receives unlimited transmission bandwidth. The remaining queues are implemented as **low** priority, which means they might be starved. On the IQE PIC, you can rate-limit the strict-high and high queues. Without this limiting, traffic that requires low latency (delay) such as voice can block the transmission of medium-priority and low-priority packets. Unless limited, high and strict-high traffic is always sent before lower priority traffic. Support for the **medium-low** and **medium-high** queuing priority mappings varies by FPC type.
Per-queue output statistics	No	Yes	Yes	Yes	Per-queue output statistics are shown in the output of the **show interfaces queue** command.
Rewrite Markers					
Maximum number per FPC or PIC	No maximum	No maximum	64	64	On IQ2 and IQ2E PICs, the CoS classification and CoS rewrite processes are off-loaded from the FPC to the PIC, so the capabilities and limitations of these types of PICs must be taken into consideration.
dscp	No	Yes	Yes	Yes	For M Series router Enhanced FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved. For M320 and T Series router non-IQ FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved. For M320 and T Series router FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For M320 and T Series router FPCs, Adaptive Services PIC link services IQ interfaces (**lsq-**) do not support DSCP rewrite markers.

Table 3: CoS Features and Limitations on M Series and T Series Routers *(continued)*

CoS Feature	Interface Hardware				Details
	FPCs in M120 Routers	Enhanced FPCs in M120 Routers	FPCs in M320 or T Series Routers	Type-4 or Enhanced Scaling FPCs in T Series Routers	
dscp-ipv6	No	Yes	Yes	Yes	For M Series router Enhanced FPCs and M320 and T Series router FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved. For M320 and T Series routers FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For M320 and T Series router FPCs, Adaptive Services PIC link services IQ interfaces (**lsq-**) do not support DSCP rewrite markers.
frame-relay-de	No	No	No	No	–
ieee-802.1	No	Yes	Yes	Yes	For M Series router enhanced FPCs and T Series router FPCs, fixed rewrite loss priority determines the value for bit 0; queue number (forwarding class) determines bits 1 and 2. For IQ PICs, you can only configure one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.
inet-precedence	Yes	Yes	Yes	Yes	For M Series router FPCs, bits 0 through 2 are rewritten, and bits 3 through 7 are preserved. For M Series router Enhanced FPCs, bits 0 through 2 are rewritten, bits 3 through 5 are cleared, and bits 6 through 7 are preserved. For M320 and T Series routers FPCs, bits 0 through 2 are rewritten and bits 3 through 7 are preserved. For M320 and T Series router FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value.
mpls-exp	Yes	Yes	Yes	Yes	For M320 and T Series router FPCs, you must decode the loss priority using the firewall filter before you can use loss priority to select the rewrite CoS value. For M Series routers FPCs, fixed rewrite loss priority determines the value for bit 0; queue number (forwarding class) determines bits 1 and 2.

Related Documentation

- *Applying Classifiers to Logical Interfaces*
- *Setting Packet Loss Priority*
- *Platform Support for Priority Scheduling*
- *CoS Capabilities and Limitations on IQ2 and IQ2E PICs (M Series and T Series Platforms)*
- *CoS Capabilities and Limitations on MIC and MPC Interfaces*

CoS Features and Limitations on M320 Routers with Enhanced II and III FPCs

On Juniper Networks M320 Multiservice Edge Routers, CoS features are supported on the following types of Flexible PIC Concentrators (FPCs):

- FPC2, Enhanced II FPC2, and Enhanced III FPC2—Rated at 16 Gbps full duplex
- FPC3, Enhanced II FPC3, and Enhanced III FPC3—Rated at 20 Gbps full duplex

The Enhanced III FPC2 and FPC3 provide different CoS functionality than the standard and Enhanced II FPC2 and FPC3. You can mix the FPC types in a single M320 router, but CoS processing for packets traveling between the Enhanced II FPCs and Enhanced III FPCs differ from the processing of packets traveling between FPCs of the same type. In cases of mixed FPC types, only the least common denominator of CoS functions is supported.

In particular, the drop priority classification behavior is different for packets traveling between Enhanced II and Enhanced III FPCs in an M320 router chassis. In the Enhanced III FPC, the packet is always classified into one of four packet drop priorities whether the **tri-color** statement is configured or not. However, depending on the presence or absence of the **tri-color** statement, the four colors might have a different meaning to the Enhanced II FPC. For more information about the **tri-color** statement, see *Enabling Tricolor Marking*.

When packets flow from an Enhanced III FPC to an Enhanced II FPC, the drop priority classification behavior is shown in Table 4 on page 11.

Table 4: Drop Priority Classification for Packet Sent from Enhanced III to Enhanced II FPC on M320 Routers

Enhanced III FPC Drop Priority	Enhanced II FPC Drop Priority (Without Tricolor Marking Enabled)	Enhanced II FPC Drop Priority (with Tricolor Marking Enabled)
low	low	low
medium-low	low	medium-low
medium-high	high	medium-high
high	high	high

When packets flow from an Enhanced II FPC without tricolor marking enabled to an Enhanced III FPC, the drop priority classification behavior is shown in Table 5 on page 12.

Table 5: Drop Priority Classification for Packet Sent from Enhanced II FPC Without Tricolor Marking to Enhanced III FPC on M320 Routers

Enhanced II FPC (Without Tricolor Marking Enabled)	Enhanced III FPC
low	low
high	medium-high

When packets flow from an Enhanced II FPC with tricolor marking enabled to an Enhanced III FPC, the drop priority classification behavior is shown in Table 6 on page 12.

Table 6: Drop Priority Classification for Packet Sent from Enhanced II FPC with Tricolor Marking to Enhanced III FPC on M320 Routers

Enhanced II FPC (With Tricolor Marking Enabled)	Enhanced III FPC
low	low
medium-low	medium-low
medium-high	medium-high
high	high

CoS Features and Limitations on PTX Series Packet Transport Routers

Table 7 on page 12 summarizes CoS features and limitations on PTX Series Packet Transport Routers.

Table 7: CoS Features and Limitations on PTX Series Routers

CoS Feature	Capacity	Comments
Classifiers		
Maximum number per PFE	64	L2 classifiers (sum of ieee-802.1 + ieee-802.1ad cannot exceed 32) DSCP and inet-precedence classifiers (sum of dscp + inet-precedence classifiers cannot exceed 32) dscp-ipv6 classifiers exp classifiers
dscp	Yes	DSCP and IP precedence classifiers cannot be configured on the same logical interface.
dscp-ipv6	Yes	Separate classifiers can be applied for IPv4 and IPv6 packets per logical interface.

Table 7: CoS Features and Limitations on PTX Series Routers *(continued)*

CoS Feature	Capacity	Comments
ieee-802.1p	Yes	You can associate ieee-802.1p with any other type of classifier on the same logical interface. For L3 packets, an L3 classifier takes precedence over an IEEE classifier.
inet-precedence	Yes	
mpls-exp	Yes	
Loss priorities based on the Frame Relay discard eligible (DE) bit	No	
Drop Profiles		
Maximum number	32	You can configure up to 32 drop profiles in the PTX chassis.
Per queue	Yes	
Per loss priority	Yes	
Per Transmission Control Protocol (TCP) bit	No	
Policing		
Traffic policing	Yes	
Two-rate tricolor marking (TCM)	Yes	
Queuing		
Priority	Yes (4)	
Per-queue output statistics	Yes	Red-dropped counters are not maintained per drop precedence. Also tail drop counters always show zero because packets are always dropped by the RED algorithm.
Rewrite Markers		
Maximum number per PFE	64	The sum of L2 and L3 rewrite rules cannot exceed 64.
dscp	Yes	
dscp-ipv6	Yes	
ieee-802.1	Yes	L2 and L3 rewrites can be applied to the same packet simultaneously.
inet-precedence	No	
mpls-exp	Yes	

COS Feature Differences Between PTX Series Packet Transport Routers and T Series Routers

This topic provides a list of Class of Service features available on PTX Series routers and compares them with Class of Service features on T Series routers.

Classifiers

- T Series routers support VRF table labels for Layer 3 VPNs. On PTX Series routers, this feature is not supported.
- On T Series routers, IEEE 802.1 classifiers cannot co-exist with Layer 3 classifiers. On PTX Series routers, these classifiers can co-exist.
- On T Series routers, IEEE classifiers are supported on Ethernet IQ, IQ2 and IQ2-E interfaces. These interfaces have the flexibility of classifying traffic based on inner or outer VLAN tags. On PTX Series routers, IEEE classification is always based on outer VLAN tags.

Rewrite

- PTX Series routers do not support rewrite of both **exp** and **inet-precedence** fields using:
  - exp protocol mpls-any
  - exp protocol mpls-inet-both
  - exp protocol mpls-inet-both-non-vpn
- On T Series routers, the DSCP and DSCP IPv6 rewrite for protocol MPLS is not supported. PTX Series routers support rewrite of both DSCP and DSCP IPv6 for protocol MPLS.
- PTX Series routers support layer 2 rewrite of 802.1p and 802.1ad, to either the outer vlan tag, or both outer and inner vlan tags.

Forwarding Class

- On T Series routers, you can override the default fabric priority queuing of egress traffic by including the **priority** statement at the following hierarchy level: .

  [class-of-service forwarding-classes queue *queue-number class-name*]
  priority (high |low);

  On PTX Series routers, fabric priority queuing is not supported; therefore, the **priority** statement for **forwarding-classes** is not supported.

Tri-color Marking

- On T Series routers, the **copy-plp-all** statement needs to be configured to support tricolor marking. On PTX Series routers, tricolor marking is enabled by default.

Schedulers

- T Series routers, which use egress queuing architecture, support chassis and fabric schedulers. Alternatively, PTX Series routers support a Virtual Output Queuing (VOQ) architecture that does not require fabric schedulers. With the VOQ architecture, packets are queued and dropped on ingress during congestion.
- On T Series routers, high priority queues have precedence to acquire excess bandwidth and may consume all excess bandwidth. On PTX Series routers, excess bandwidth is shared based on the ratio of the configured transfer rate. Therefore, all priority queues get a share of excess bandwidth.
- On T Series routers, strict-high priority queues and high priority queues are assigned the same hardware priority. On PTX Series routers, strict-high priority queues and high priority queues are assigned different hardware priorities.
- On T Series routers, if a strict-high priority queue is oversubscribed, it can block all other queues except high priority queues. On PTX Series routers, if a strict-high priority queue is oversubscribed, it can block all other queues including high priority queues.

  To restrict the bandwidth of strict-high priority queues, the **transmit-rate rate-limit** configuration statement has been implemented for PTX Series routers.
- On both T Series routers and PTX Series routers, if a strict-high priority queue is oversubscribed and results in oversubscription of the guaranteed bandwidth, the distribution of bandwidth that is not taken up by strict-high priority queues is undetermined. T Series routers and PTX Series routers distribute this unused bandwidth differently.

Buffer Size and Latency

- On T Series routers, memory allocation dynamic (MAD) is enabled by default and can be disabled. On PTX Series routers, MAD cannot be disabled.
- On T Series routers, the maximum delay bandwidth buffering configured per queue is 50 ms. On PTX Series routers, the maximum delay bandwidth buffering configured per queue is 100 ms.
- On T Series routers, the maximum latency associated with a packet is fairly consistent and independent of the number of sources sending the traffic to an interface. On PTX Series routers, over-provisioning is possible. When traffic is sent from multiple Packet Forwarding Engines, the latency is about 10% to 15% higher than when traffic is sent from one Packet Forwarding Engine.
- On T Series routers, a high priority queue has lower latency than a low priority queue with the same configured transfer rate and same offered load. On PTX Series routers, there is no latency difference.

Drop Profile

- The Queuing and Memory Interfaces ASIC does not support drop-profile assignments for a queue based on the protocol. As a consequence, the **protocol** option for the **drop-profile-map** configuration statement is treated as **protocol any**.

Interface Queue Statistics

- On T Series routers, transmitted byte counters are computed using Layer 3 packet length. On PTX Series routers, transmitted byte counters are computed using Layer 2 packet length (excluding CRC).
- On T Series routers, the tail-dropped counters and the RED-dropped counters are displayed separately in the **show interfaces queue** output. On the PTX Series routers, tail-dropped counters are always zero. All the packet drops will be shown as RED-dropped in the **show interfaces queue** output.

Related Documentation

- Understanding CoS CLI Configuration Statements on PTX Series Packet Transport Routers on page 16

Understanding CoS CLI Configuration Statements on PTX Series Packet Transport Routers

PTX Series Packet Transport Routers have no new Junos OS CLI configuration statements. However, some statements or statement options supported on other platforms are not supported or may not have effect on PTX Series devices. These exceptions are summarized here.

[edit chassis] Hierarchy Level

The following statement is not applicable to PTX Series Packet Transport Routers. There are always eight queues available. However, if there is a requirement to use only four of eight queues, you can do this by configuring the forwarding class to queue mapping, as appropriate.

```
[edit chassis fpc slot-number pic pic-number],
  max-queues-per-interface (4 | 8);
```

The following CLI is not applicable to PICs supported on PTX Series Packet Transport Routers:

```
[edit chassis fpc slot-number pic pic-number],
  q-pic-large-buffer {
  [large-scale | small-scale]
}
```

On PTX Series Packet Transport Routers, buffer occupancy is computed as weighted average. However, configuration of weight at the PIC level is not supported. The default weights are applied.

```
[edit chassis fpc slot-number pic pic-number],
red-buffer-occupancy {
  weighted-averaged [ instant-usage-weight-exponent ] weight-value;
```

```
}
```

The following CLI is not applicable to PICs supported on PTX Series Packet Transport Routers:

```
[edit chassis fpc slot-number pic pic-number],
traffic-manager {
  egress-shaping-overhead number;
  ingress-shaping-overhead number;
  mode session-shaping;
}
```

[edit class-of-service] Hierarchy Level

The following CLI is not applicable to PTX Series Packet Transport Routers because there are no separate fabric queues and egress queues:

```
fabric {
  scheduler-map {
    priority (high | low) scheduler scheduler-name;
  }
}
```

The following CLI does not support the **priority** and **policing-priority** options.

```
forwarding-classes {
  class queue-num queue-number priority (high | low);
  queue queue-number class-name priority (high | low) [ policing-priority (premium |
    normal) ];
}
```

The following statements are not supported on PTX Series Packet Transport Routers:

- **inet-precedence** rewrite
- Rewrite of both exp and inet-precedence fields for VPN and non-VPN traffic that use the **mpls-inet-both** and **mpls-inet-both-non-vpn** protocol types.
- **exp-push-push-push** and **exp-swap-push-push** rules
- **input-scheduler-map** and **input-shaping-rate**
- The physical interface scheduler is applied on the Packet Forwarding Engine, hence the **scheduler-map-chassis** statement is not applicable.

```
interfaces {
  interface-name {
    input-scheduler-map map-name;
    input-shaping-rate rate;
    scheduler-map-chassis map-name;
    unit logical-unit-number {
      rewrite-rules{
        inet-precedence (rewrite-name | default) protocol
        protocol-types;
        exp (write-name | default) protocol protocol-types;
        exp-push-push-push default;
        exp-swap-push-push default;
      }
```

```
    }
  }
}
```

In the following CLI, only the **inet-precedence** statement is not supported.

```
rewrite-rules {
  (dscp | dscp-ipv6 | exp | ieee-802.1 |ieee-802.1ad |inet-precedence) rewrite-name {
    import (rewrite-name | default);
    forwarding-class class-name {
      loss-priority level code-point (alias | bits);
    }
  }
}
```

Classifiers on routing instances are not supported on PTX Series Packet Transport Routers because L3VPN is not supported. Hence, the following CLI is not applicable.

```
[edit class-of-service]
routing-instances routing-instance-name {
  classifiers {
    exp (classifier-name | default);
    dscp (classifier-name | default);
    dscp-ipv6 (classifier-name | default);
  }
}
```

The following limitations apply to statements under **schedulers** on PTX Series Packet Transport Routers:

- **protocol** (non-tcp | tcp) is not supported for **drop-profile-map**. The **any** option is supported.
- **excess-priority** is not supported.
- **rate-limit** is supported for **transmit-rate**. It is applied only when schedulers are configured as **strict-high**.

```
schedulers (Class of Service) {
  scheduler-name {
    buffer-size (percent percentage | remainder | temporal microseconds);
    drop-profile-map loss-priority (any | low | medium-low | medium-high
    high) protocol (any ) drop-profile profile-name;
    priority priority-level;
    transmit-rate (rate | percent percentage | remainder) <exact | rate-limit>;
  }
}
```

NOTE: Configurations that are supported only on Gigabit Ethernet IQ PICs, channelized IQ PICs, and so forth are not applicable to PTX Series Packet Transport Routers. These PICs are not supported on this platform. Those CLIs are not listed here.

[edit firewall] Hierarchy Level

In the following CLI, the **dscp** clause is not supported.

```
family family-name {
filter filter-name {
   term term-name {
      from {
         match-conditions;
      }
      then {
         dscp 0;
         forwarding-class class-name;
         loss-priority (high | low);
         three-color-policer {
            (single-rate | two-rate) policer-name;
         }
      }
   }
}
```


CHAPTER 2

CoS Features of Router Hardware and Interface Families

CoS Features of the Router Hardware, PIC, MIC, and MPC Interface Families

Table 8 on page 21 compares the PIC families with regard to major CoS features. Note that this table reflects the ability to perform the CoS function *at the PIC , MIC, or MPC interface level* and not on the system as a whole.

Table 8: CoS Features of the Router Hardware and Interface Families Compared

Feature:	M320 and T Series	MIC and MPC Interfaces	IQ PICs	IQ2 PICs	IQ2E PICs	Enhanced IQ PICs
BA classification	Yes	Yes	–	–	–	Yes
ToS bit rewrites	Yes	Yes	Yes, for IEEE bits only	Yes, for IEEE bits only	Yes, for IEEE bits only	–
Ingress ToS bit rewrites	–	Yes, with firewall filter	–	–	–	Yes
Hierarchical policers	–	Yes	–	–	–	Yes

Scheduling on the Router Hardware, PIC, MIC, and MPC Interface Families

Table 9 on page 22 compares the PIC, MIC, and MPC interface families with regard to scheduling abilities or features. Note that this table reflects the ability to perform the function *at the PIC, MIC, or MPC interface level* and not necessarily on the system as a whole.

In this table, the OSE PICs refer to the 10-port 10-Gigabit OSE PICs (described in some guides as the 10-Gigabit Ethernet LAN/WAN PICs with SFP+).

Table 9: Scheduling on Router Hardware and Interface Families Compared

Scheduling Feature:	M320 and T Series	MIC and MPC Interfaces	IQ PICs	IQ2 PICs	IQ2E PICs	OSE PICs on T Series	Enhanced IQ PICs
Per–unit scheduling	–	Yes, for EQ MPC	Yes	Yes	Yes	–	Yes
Physical port and logical unit shaping	–	Yes	–	Yes	Yes	–	Yes
Guaranteed rate or peak rate support	–	Yes	–	Yes, supports both CIR and PIR on the same logical unit.	Yes	Yes, at the queue level	Yes, at the logical unit
Excess rate support	–	Yes	–	–	–	Yes	Yes, at the logical unit
Shared scheduler support	–	–	–	Yes	Yes	–	–

Schedulers on the Router Hardware, PIC, MIC, and MPC Families

Table 10 on page 23 compares the PIC, MIC, and MPC interface families with regard to scheduler statements or features. Note that this table reflects the ability to perform the scheduler function *at the PIC, MIC, or MPC interface level* and not necessarily on the system as a whole.

In this table, the OSE PICs refer to the 10-port 10-Gigabit OSE PICs (described in some guides as the 10-Gigabit Ethernet LAN/WAN PICs with SFP+).

Table 10: Schedulers on the Router Hardware and Interface Families Compared

Scheduler Statement or Feature:	M320 and T Series	MIC and MPC Interfaces	IQ PICs	IQ2 PICs	IQ2E PICs	OSE PICs on T Series	Enhanced IQ PICs
Exact transmit rate	Yes	Yes	Yes	–	–	Yes	Yes
Rate-limit transmit rate	–	Yes	–	Yes	Yes	Yes	Yes
More than one high-priority queue	Yes	Yes	Yes	–	Yes	–	Yes
Excess priority or sharing	–	Yes	–	–	–	–	Yes
Hierarchical Scheduling	–	Yes, for EQ MPC	–	–	Yes	–	–

Queuing Parameters for the Router Hardware, PIC, MIC, and MPC Interface Families

Table 11 on page 23 compares the PIC, MIC, and MPC interface families with regard to queuing parameters and features. In this table, the OSE PICs refer to the 10-port 10-Gigabit OSE PICs (described in some guides as the 10-Gigabit Ethernet LAN/WAN PICs with SFP+).

Table 11: Queue Parameters on the Router Hardware and Interface Families Compared

Queuing Statement or Feature:	M320 and T Series	MIC and MPC Interfaces	IQ PICs	IQ2 PICs	IQ2E PICs	OSE PICs on T Series	Enhanced IQ PICs
Maximum number of queues	8	8	8 on M320 or T Series routers, 4 on M7, M10, M20 routers	8	8	4 ingress, 8 egress	8
Maximum delay buffer bandwidth	80 ms: Type 1 and 2 FPC, 50 ms: Type 3 FPC	100 ms for 1 Gbps and up; 500 ms for others	100 ms	200 ms	200 ms	–	up to 4000 ms

Table 11: Queue Parameters on the Router Hardware and Interface Families Compared *(continued)*

Queuing Statement or Feature:	M320 and T Series	MIC and MPC Interfaces	IQ PICs	IQ2 PICs	IQ2E PICs	OSE PICs on T Series	Enhanced IQ PICs
Packet transmit priority level	3 and 3	3 and 2	2 and 2	2	3	2	3 and 2
Maximum number of drop profiles	32 (32 samples)	64	32 (32 samples)	32	32	–	64
Packet loss priority level	4	4	4	4	4	4	4

MX Series QoS FAQ Overview

The increased demand for sophisticated, media-rich services, the exponential growth of mobile sessions, and the emerging trend of cloud computing require a networking infrastructure that supports massive numbers of subscribers, service types and instances, and bandwidth. A number of features and methods have been developed to address these advanced network requirements, including quality of service (QoS). QoS is a set of mechanisms that helps maintain specified service levels for your network by optimizing and prioritizing network traffic so that demand for resources can meet requirements. Use QoS mechanisms to control the allocation of network attributes such as available bandwidth, latency, jitter, packet drop, and bit rate errors so that resources are managed to levels acceptable to your network customers and applications.

QoS on Juniper Networks MX Series 3D Universal Edge Routers

MX Series routers are available in a variety of configurations with robust features, including options that provide the level and granularity of the QoS support needed in your network. The MX Series hardware options currently include five models of Modular Port Concentrators (MPCs), using several different Modular Interface Cards (MICs), and three models of Dense Port Concentrators (DPCs). The MPCs and DPCs provide varying degrees of QoS support.

The MPCs are next-generation line modules for advanced Ethernet services edge and broadband edge networks using high capacity, modular Gigabit Ethernet, 10-Gigabit Ethernet, and 100-Gigabit Ethernet hardware. The MPCs house Packet Forwarding Engines that deliver comprehensive Layer 3 routing (IPv4 and IPv6), Layer 2 switching, inline services, and advanced hierarchical quality of service (H-QoS) per MX Series slot. The MPCs can also take advantage of the high performance Junos Trio chipset.

Key QoS features provided by the MPCs include extensive queue management, scheduler hierarchy, shaping, intelligent oversubscription, weighted round robin (WRR), random early detection (RED), and weighted random early detection (WRED).

The DPCs (DPCE-X, DPCE-R, and DPCE-Q) each provide multiple physical interfaces and Packet Forwarding Engines on a single board that performs packet processing and forwarding. Each Packet Forwarding Engine consists of one I-chip for Layer 3 processing and one network processor for Layer 2. DPCE-Qs offer enhanced queuing capabilities and the QoS features of WRR, RED, and WRED.

Related Documentation

- Juniper Networks Datasheet MX Series 3D Universal Edge Routers
- Juniper Networks Datasheet Modular Port Concentrators for the MX Series
- Juniper Networks Datasheet Dense Port Concentrators

PART 2

Configuration

CHAPTER 3

Configuration Statements

classifiers (Logical Interface)

Syntax

```
classifiers {
  type (classifier-name | default) family (mpls | inet);
}
```

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Apply a CoS aggregate behavior classifier to a logical interface. You can apply a default classifier or one that is previously defined.

Options ***classifier-name***—Name of the aggregate behavior classifier.

type—Traffic type.

Values: dscp, dscp-ipv6, exp, ieee-802.1, inet-precedence

NOTE: You can only specify a family for the dscp and dscp-ipv6 types.

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

Related Documentation

- *Default DSCP and DSCP IPv6 Classifier*
- *Applying Classifiers to Logical Interfaces*

dscp (Rewrite Rules)

Syntax dscp (*rewrite-name* | default) protocol mpls;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.

Description For IPv4 traffic, apply a Differentiated Services (DiffServ) code point (DSCP) rewrite rule.

Logical interfaces do not support multiple **dscp** rewrite rules for the same protocol.

DSCP and DSCP IPv6 rewrite rules are supported on M Series and T Series routers when non-queuing PICs are installed, but are disabled when queuing PICs are installed with the following exceptions:

- On M320 routers, DSCP rewrite is supported on IQ, IQ2, IQE, and IQ2E PICs when used with the Enhanced III FPC.
- On M120 routers, DSCP rewrite is supported on IQ, IQ2, IQE, and IQ2E PICs.

DSCP and DCSP IPv6 rewrite rules are supported on MIC and MPC interfaces on MX Series routers.

DSCP rewrite rules are not supported on T Series routers when IQ, IQ2, IQE, IQ2E, SONET/SDH OC48/STM16 IQE, or PD-5-10XGE-SFPP PICs are installed.

Options *rewrite-name*—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules dscp]** hierarchy level.

default—The default mapping.

protocol mpls—(Optional for ingress MPLS tunnel nodes) For interfaces on MX Series routers or hosted on Enhanced III FPCs in M120 or M320 routers only, rewrite the MPLS EXP bits in the MPLS header independently of the IPv4 DSCP value for IPv4 packets entering an MPLS tunnel.

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

Related Documentation

- *Configuring Rewrite Rules*
- *Applying Rewrite Rules to Output Logical Interfaces*
- protocol (Rewrite Rules) on page 38
- *Rewriting MPLS and IPv4 Packet Headers*
- *rewrite-rules (Definition)*

dscp-ipv6 (Class-of-Service)

Syntax dscp-ipv6 (*rewrite-name* | <default>) protocol mpls;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.
Support for **protocol mpls** option introduced in Junos OS Release 10.4R2.

Description For IPv6 traffic, apply a DSCP rewrite rule.

Logical interfaces do not support multiple **dscp-ipv6** rewrite rules for the same protocol.

DSCP and DSCP IPv6 rewrite rules are supported on M Series and T Series routers when non-queuing PICs are installed, but are disabled when queuing PICs are installed with the following exceptions:

- On M320 routers, DSCP rewrite is supported on IQ, IQ2, IQE, and IQ2E PICs when used with the Enhanced III FPC.
- On M120 routers, DSCP rewrite is supported on IQ, IQ2, IQE, and IQ2E PICs.

DSCP and DCSP IPv6 rewrite rules are supported on MIC and MPC interfaces on MX Series routers.

DSCP rewrite rules are not supported on T Series routers when IQ, IQ2, IQE, IQ2E, SONET/SDH OC48/STM16 IQE, or PD-5-10XGE-SFPP PICs are installed.

Options ***rewrite-name***—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules dscp-ipv6]** hierarchy level.

default—Default mapping.

protocol mpls—(Optional for ingress MPLS tunnel nodes) For interfaces on MX Series routers or hosted on Enhanced III FPCs in M120 or M320 routers only, rewrite the MPLS EXP bits in the MPLS header independently of the IPv6 DSCP value for IPv6 packets entering an MPLS tunnel.

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

Related Documentation

- *Configuring Rewrite Rules*
- protocol on page 38
- *Setting IPv6 DSCP and MPLS EXP Values Independently*
- *Configuring DSCP Values for IPv6 Packets Entering the MPLS Tunnel*
- *Applying Rewrite Rules to Output Logical Interfaces*
- *rewrite-rules (Definition)*

exp

Syntax exp (*rewrite-name* | default) protocol *protocol-types*;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced before Junos OS Release 12.2. for ACX series

Description Apply an MPLS experimental (EXP) rewrite rule.

Options ***rewrite-name***—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules exp]** hierarchy level.

default—The default mapping.

By default, IP precedence rewrite rules alter the first three bits on the type-of-service (ToS) byte while leaving the last three bits unchanged. This default behavior applies to rewrite rules you configure for MPLS packets with IPv4 payloads. You configure these types of rewrite rules by including the **mpls-inet-both** or **mpls-inet-both-non-vpn** option at the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number* rewrite-rules exp *rewrite-rule-name* protocol]** hierarchy level. The IP precedence rewrite rules explanation does not apply to ACX Series Universal Access routers.

On interfaces configured on Modular Port Concentrators (MPCs) and Modular Interface Cards (MICs) on MX Series 3D Universal Edge Routers and EX Series switches, we highly recommend that you configure the **default** option when you configure a behavior aggregate (BA) classifier that does not include a specific rewrite rule for MPLS packets. Doing so ensures that MPLS exp value is rewritten according to the BA classifier rules configured for forwarding or packet loss priority. This does not apply to ACX Series Universal Access routers.

protocol-types—Specify one or more protocol matching criteria:

- **mpls-any**—Apply to MPLS packets, write MPLS header only.
- **mpls-inet-both**—Apply to IPv4 MPLS packets, write MPLS and IPv4 header.
- **mpls-inet-both-non-vpn**—Apply to IPv4 MPLS packets, write MPLS and IPv4 header for only non VPN traffic.

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

Related Documentation

- *Configuring Rewrite Rules*
- *Rewriting the EXP Bits of All Three Labels of an Outgoing Packet*
- *Applying Rewrite Rules to Output Logical Interfaces*
- protocol (Rewrite Rules) on page 38

- *rewrite-rules (Definition)*

forwarding-class (Forwarding Policy)

Syntax

```
forwarding-class class-name {
  discard;
  lsp-next-hop [ lsp-regular-expression ];
  next-hop [ next-hop-name];
  non-lsp-next-hop;
}
```

Hierarchy Level [edit class-of-service forwarding-policy next-hop-map *map-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Define forwarding class name and associated next hops.

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

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

- *Overriding the Input Classification*
- *forwarding-class-default (Forwarding Policy)*

ieee-802.1 (Rewrite Rules on Logical Interface)

Syntax ieee-802.1 (*rewrite-name* | default) vlan-tag (outer | outer-and-inner);

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.
vlan-tag statement introduced in Junos OS Release 8.1.

Description Apply an IEEE-802.1 rewrite rule. For IQ PICs, you can only configure one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.

Options ***rewrite-name***—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules ieee-802.1]** hierarchy level.

default—The default mapping.

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

Related Documentation

- *Configuring Rewrite Rules*
- dscp (Rewrite Rules) on page 31
- dscp-ipv6 (Class-of-Service) on page 32
- exp on page 33
- *exp-push-push-push*
- *exp-swap-push-push*
- *ieee-802.1ad*
- inet-precedence on page 36
- *rewrite-rules (Definition)*

inet-precedence

Syntax inet-precedence (*rewrite-name* | default);

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules]

Release Information Statement introduced before Junos OS Release 7.4.

Description Apply a IPv4 precedence rewrite rule.

Options

rewrite-name—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules inet-precedence]** hierarchy level.

default—The default mapping. By default, IP precedence rewrite rules alter the first three bits on the type of service (ToS) byte while leaving the last three bits unchanged.

Required Privilege Level

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

Related Documentation

- *Configuring Rewrite Rules*
- *Applying Rewrite Rules to Output Logical Interfaces*
- protocol (Rewrite Rules) on page 38
- *rewrite-rules (Definition)*

irb

Syntax

```
irb {
  unit logical-unit-number {
    classifiers {
      type (classifier-name | default);
    }
    rewrite-rules {
      dscp (rewrite-name | default);
      dscp-ipv6 (rewrite-name | default);
      exp (rewrite-name | default)protocol protocol-types;
      ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
      inet-precedence (rewrite-name | default);
    }
  }
}
```

Hierarchy Level [edit class-of-service interfaces]

Release Information Statement introduced in Junos OS Release 8.4.

Description On the MX Series routers and EX Series switches, you can apply classifiers or rewrite rules to an integrated bridging and routing (IRB) interface. All types of classifiers and rewrite rules are allowed. These classifiers and rewrite rules are independent of others configured on the MX Series router and on EX Series switches.

The statements are explained separately.

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

Related Documentation

- CoS Features and Limitations on MX Series Routers on page 3

protocol (Rewrite Rules)

Syntax protocol *protocol-types*;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules exp *rewrite-name*],
[edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules dscp *rewrite-name*],
[edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules dscp-ipv6 *rewrite-name*],
[edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules inet-prec *rewrite-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Option for **dscp** and **inet-prec** introduced in Junos OS Release 8.4.
Option for **dscp-ipv6** introduced in Junos OS Release 10.4R2.

Description Apply a rewrite rule to MPLS packets only, and write the CoS value to MPLS headers only; or apply a rewrite rule to MPLS and IPv4 packets, and write the CoS value to MPLS and IPv4 headers.

Options ***protocol-types*** can be one of the following:

- **mpls**—Apply a rewrite rule to MPLS packets and write the CoS value to MPLS headers.
- **mpls-inet-both**—Apply a rewrite rule to VPN MPLS packets with IPv4 payloads. On M120, M320, MX Series, and T Series routers (except T4000 routers), and EX Series switches, write the CoS value to the MPLS and IPv4 headers. On M Series routers, initialize all ingress MPLS LSP packets with IPv4 payloads with 000 code points for the MPLS EXP value, and the configured rewrite code point for IP precedence.
- **mpls-inet-both-non-vpn**—Apply a rewrite rule to non-VPN MPLS packets with IPv4 payloads. On M120, M320, MX Series, T Series routers, and EX Series switches write the CoS value to the MPLS and IPv4 headers. On M Series routers, initialize all ingress MPLS LSP packets with IPv4 payloads with 000 code points for the MPLS EXP value, and the configured rewrite code point for IP precedence.

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

Related Documentation
- *Rewriting MPLS and IPv4 Packet Headers*

rewrite-rules (Interfaces)

Syntax

```
rewrite-rules {
  dscp (rewrite-name | default) protocol mpls;
  dscp-ipv6 (rewrite-name | default) protocol mpls;
  exp (rewrite-name | default) protocol protocol-types;
  exp-push-push-push default;
  exp-swap-push-push default;
  ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
  ieee-802.1ad (rewrite-name | default) vlan-tag (outer | outer-and-inner);
  inet-precedence (rewrite-name | default) protocol mpls;
}
```

Hierarchy Level

[edit class-of-service interfaces *interface-name*],
[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Associate a rewrite-rules configuration or default mapping with a specific interface.

The **[edit class-of-service interfaces *interface-name*]** hierarchy level is not supported on M Series routers.

The **[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]** hierarchy level is not supported on ACX Series routers.

On an MX Series router and on an EX Series switch, **exp-push-push-push**, **exp-swap-push-push**, and **frame-relay-de** are not supported on an integrated routing and bridging (IRB) interface.

On an ACX Series router, only the outer tag is supported for **dscp**, **inet-precedence**, and **ieee802.1**.

On M Series routers only, if you include the **control-word** statement at the **[edit protocols l2circuit neighbor *address* interface *interface-name*]** hierarchy level, the software cannot rewrite MPLS EXP bits.

For IQ PICs, you can configure only one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.

On M320 and T Series routers (except for T4000 routers with Type 5 FPCs), for a single interface, you cannot enable a rewrite rule on a subset of forwarding classes. You must assign a rewrite rule to either none of the forwarding classes or all of the forwarding classes. When you assign a rewrite rule to a subset of forwarding classes, the commit does not fail, and the subset of forwarding classes works as expected. However, the forwarding classes to which the rewrite rule is not assigned are rewritten to all zeros.

For example, if you configure a Differentiated Services code point (DSCP) rewrite rule, the bits in the forwarding classes to which you do not assign the rewrite rule are rewritten to 000000. If you configure an IP precedence rewrite rule, the bits in the forwarding classes to which you do not assign the rewrite rule are rewritten to 000.

Options

rewrite-name—Name of a **rewrite-rules** mapping configured at the **[edit class-of-service rewrite-rules]** hierarchy level.

default—The default mapping.

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 Rewrite Rules*
- *rewrite-rules (Definition)*
- *Applying Rewrite Rules to Output Logical Interfaces*

unit

Syntax

```
unit logical-unit-number {
  classifiers {
    type (classifier-name | default) family (mpls | all);
  }
  forwarding-class class-name;
  fragmentation-map map-name;
  input-traffic-control-profile profile-name shared-instance instance-name;
  output-traffic-control-profile profile-name shared-instance instance-name;
  per-session-scheduler;
  rewrite-rules {
    dscp (rewrite-name | default);
    dscp-ipv6 (rewrite-name | default);
    exp (rewrite-name | default)protocol protocol-types;
    exp-push-push-push default;
    exp-swap-push-push default;
    ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
    inet-precedence (rewrite-name | default);
  }
  scheduler-map map-name;
  shaping-rate rate;
}
```

Hierarchy Level [edit class-of-service interfaces *interface-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.

Options ***logical-unit-number***—Number of the logical unit.

Range: 0 through 16,384

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

- *Overview of BA Classifier Types*
- *Configuring Rewrite Rules*

vlan-tag

Syntax vlan-tag (outer | outer-and-inner);

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number* rewrite-rules ieee-802.1 (*rewrite-name* | default)]

Release Information Statement introduced in Junos OS Release 8.1.

Description For Gigabit Ethernet IQ2 PICs only, apply this IEEE-802.1 rewrite rule to the outer or outer and inner VLAN tags.

Default If you do not include this statement, the rewrite rule applies to the outer VLAN tag only.

Options **outer**—Apply the rewrite rule to the outer VLAN tag only.

outer-and-inner—Apply the rewrite rule to both the outer and inner VLAN tags.

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

Related Documentation

- *Applying IEEE 802.1p Rewrite Rules to Dual VLAN Tags*

PART 3

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