JUNIPER NETWORKS

# Junos® OS

## CoS Capabilities Based on Hardware Platforms

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# Table of Contents

# List of Tables

# About the Documentation



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## Supported Platforms

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

- T Series
- M Series
- MX Series
- J 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. |

Table 2 on page ix 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:<br>user@host> **configure** |
| `Fixed-width text like this` | Represents output that appears on the terminal screen. | `user@host>` **show chassis alarms**<br>`No alarms currently active` |

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

| Convention | Description | Examples |
|---|---|---|
| *Italic text like this* | • Introduces or emphasizes important new terms.<br>• Identifies book names.<br>• Identifies RFC and Internet draft titles. | • A policy *term* is a named structure that defines match conditions and actions.<br>• *Junos OS System Basics Configuration Guide*<br>• 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:<br>[edit]<br>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.<br>• The console port is labeled **CONSOLE**. |
| < > (angle brackets) | Enclose 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**<br>**(*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) | Enclose a variable for which you can substitute one or more values. | **community name members [** ***community-ids*** **]** |
| Indention and braces ( { } ) | Identify a level in the configuration hierarchy. | [edit]<br>routing-options {<br>  static {<br>  route default {<br>  nexthop *address*;<br>  retain;<br>  }<br>  }<br>} |
| ; (semicolon) | Identifies a leaf statement at a configuration hierarchy level. | |
| J-Web GUI Conventions | | |
| **Bold text like this** | Represents J-Web graphical user interface (GUI) items you click or select. | • In the Logical Interfaces box, select **All Interfaces**.<br>• To cancel the configuration, click **Cancel**. |
| **>** (bold right angle bracket) | Separates levels in a hierarchy of J-Web selections. | In the configuration editor hierarchy, select **Protocols>Ospf**. |

## Documentation Feedback

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- 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.

### Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

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

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

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

## Opening a Case with JTAC

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



## Hardware Capabilities and Limitations

For basic MX Series router architecture information, see Packet Flow on MX Series 3D Universal Edge Routers. For CoS hardware capabilities about other routers, see these sections:



### CoS Hardware Capabilities and Limitations on J Series, M Series, and T Series Routers

Juniper Networks J Series Services Routers, 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 4 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
```

J Series Services Routers do not use FPCs. Instead, they use Physical Interface Modules (PIMs), which are architecturally like FPCs but functionally like PICs. Both PIMs and PICs provide the interfaces to the routers.

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 MX, M120, and M320 routers with Enhanced Type III FPCs only. For examples of these possibilities, see Applying Classifiers to Logical Interfaces.

In Table 3 on page 4, the information in the column titled "M320 and T Series FPCs" is valid for all M320 and T Series router FPCs, including Enhanced II FPCs.

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: Comparison of CoS Hardware Capabilities and Limitations

| Feature | J Series PIMs | M Series FPCs | M Series Enhanced FPCs | M320 and T Series FPCs | Comments |
|---|---|---|---|---|---|
| **Classifiers** | | | | | |
| Maximum number per FPC, PIC, or PIM | 64 | 1 | 8 | 64 | 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. For more information, see Applying Classifiers to Logical Interfaces. |
| NOTE: On IQ2 and IQ2E PICs, the CoS classification and CoS rewrite processes are offloaded from the FPC to the PIC, thus the capabilities and limitations of these types of PIC must be taken into consideration. For information about CoS classifiers and rewrite rules limitations on IQ2 and IQ2E PICs, see CoS Capabilities and Limitations on IQ2 and IQ2E PICs (M Series and T Series Platforms).<br><br>NOTE: For information about CoS classifiers and rewrite rules on MIC or MPC interfaces, see CoS Capabilities and Limitations on MIC and MPC Interfaces | | | | | |
| **dscp** | Yes | No | 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. For more information, see Applying Classifiers to Logical Interfaces. |

Table 3: Comparison of CoS Hardware Capabilities and Limitations *(continued)*

| Feature | J Series PIMs | M Series FPCs | M Series Enhanced FPCs | M320 and T Series FPCs | Comments |
|---|---|---|---|---|---|
| **dscp-ipv6** | Yes | No | Yes | Yes | For T Series routers, you can apply separate classifiers for IPv4 and IPv6 packets per logical interface.<br><br>For M Series router enhanced FPCs, you cannot apply separate classifiers for IPv4 and IPv6 packets. Classifier assignment works as follows:<br><br>• If you assign a DSCP classifier only, IPv4 and IPv6 packets are classified using the DSCP classifier.<br>• 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.<br>• If you assign either the DSCP or the IP precedence classifier in conjunction with the DSCP IPv6 classifier, the commit fails.<br>• 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.<br><br>For more information, see Applying Classifiers to Logical Interfaces. |
| **ieee-802.1p** | Yes | No | 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 more information, see Applying Classifiers to Logical Interfaces.<br><br>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. For more information, see Applying Classifiers to Logical Interfaces. |
| **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 | Yes | No | No | No | – |

## Table 3: Comparison of CoS Hardware Capabilities and Limitations *(continued)*

| Feature | J Series PIMs | M Series FPCs | M Series Enhanced FPCs | M320 and T Series FPCs | Comments |
|---|---|---|---|---|---|
| **Drop Profiles** | | | | | |
| Maximum number per FPC, PIC, or PIM | 32 | 2 | 16 | 32 | – |
| Per queue | Yes | No | Yes | Yes | – |
| Per loss priority | Yes | Yes | Yes | Yes | – |
| Per Transmission Control Protocol (TCP) bit | Yes | No | Yes | Yes | – |
| **Policing** | | | | | |
| Adaptive shaping for Frame Relay traffic | Yes | No | No | No | – |
| Traffic policing | Yes | Yes | Yes | Yes | – |
| Two-rate tricolor marking (TCM) | No | No | No | 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 | Yes | No | No | No | – |
| **Queuing** | | | | | 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.<br><br>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. |

Table 3: Comparison of CoS Hardware Capabilities and Limitations *(continued)*

| Feature | J Series PIMs | M Series FPCs | M Series Enhanced FPCs | M320 and T Series FPCs | Comments |
|---|---|---|---|---|---|
| Priority | Yes | No | Yes | Yes | Support for the **medium-low** and **medium-high** queuing priority mappings varies by FPC type. For more information, see Platform Support for Priority Scheduling. |
| Per-queue output statistics | Yes | No | Yes | Yes | Per-queue output statistics are shown in the output of the **show interfaces queue** command. |
| Rewrite Markers | | | | | |
| Maximum number per FPC, PIC, or PIM | 64 | No maximum | No maximum | 64 | – |
| NOTE: On IQ2 and IQ2E PICs, the CoS classification and CoS rewrite processes are offloaded from the FPC to the PIC, thus the capabilities and limitations of these types of PIC must be taken into consideration. For information about CoS classifiers and rewrite rules limitations on IQ2 and IQ2E PICs, see CoS Capabilities and Limitations on IQ2 and IQ2E PICs (M Series and T Series Platforms).<br><br>For information about CoS classifiers and rewrite rules on MIC and MPC interfaces, see CoS Capabilities and Limitations on MIC and MPC Interfaces | | | | | |
| **dscp** | Yes | No | Yes | Yes | For J Series router PIMs and M Series Enhanced FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved.<br><br>For M320 and T Series router non-IQ FPCs, bits 0 through 5 are rewritten, and bits 6 through 7 are preserved.<br><br>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 more information, see Setting Packet Loss Priority.<br><br>For M320 and T Series router FPCs, Adaptive Services PIC link services IQ interfaces (**lsq-**) do not support DSCP rewrite markers. |
| **dscp-ipv6** | Yes | No | Yes | Yes | For J Series router PIMs, 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.<br><br>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 more information, see Setting Packet Loss Priority.<br><br>For M320 and T Series router FPCs, Adaptive Services PIC link services IQ interfaces (**lsq-**) do not support DSCP rewrite markers. |
| **frame-relay-de** | Yes | No | No | No | – |

Table 3: Comparison of CoS Hardware Capabilities and Limitations *(continued)*

| Feature | J Series PIMs | M Series FPCs | M Series Enhanced FPCs | M320 and T Series FPCs | Comments |
|---|---|---|---|---|---|
| **ieee-802.1** | Yes | No | 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 J Series router PIMs, bits 0 through 2 are rewritten, and bits 3 through 7 are preserved.<br><br>For M Series router FPCs, bits 0 through 2 are rewritten, and bits 3 through 7 are preserved.<br><br>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.<br><br>For M320 and T Series routers FPCs, bits 0 through 2 are rewritten and bits 3 through 7 are preserved.<br><br>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 more information, see Setting Packet Loss Priority. |
| **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 more information, see Setting Packet Loss Priority.<br><br>For M Series routers FPCs, fixed rewrite loss priority determines the value for bit 0; queue number (forwarding class) determines bits 1 and 2. |

## CoS Hardware Capabilities and Limitations on PTX Series Packet Transport Switches

Table 4: CoS Hardware Capabilities and Limitations on PTX Series Packet Transport Switches

| Feature | PTX Series | Comments |
|---|---|---|
| Classifiers | | |

Table 4: CoS Hardware Capabilities and Limitations on PTX Series Packet Transport Switches *(continued)*

| Feature | PTX Series | Comments |
|---|---|---|
| Maximum number per PFE | 64 | L2 classifiers (sum of ieee-802.1 + ieee-802.1ad cannot exceed 32)<br><br>DSCP and inet-precedence classifiers (sum of dscp + inet-precedence classifiers cannot exceed 32)<br><br>dscp-ipv6 classifiers<br><br>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. |
| **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 | |

Table 4: CoS Hardware Capabilities and Limitations on PTX Series Packet Transport Switches *(continued)*

| Feature | PTX Series | Comments |
|---|---|---|
| **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 | |

## M320 Routers FPCs and CoS

On Juniper Networks M320 Multiservice Edge Routers, CoS is supported with two types of FPCs: the Enhanced II FPC and the Enhanced III FPC. The Enhanced III FPC provides different CoS functionality than the standard and Enhanced II FPCs. You can mix the FPC

types in a single M320 router, but CoS processing for packets traveling between the Enhanced II 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 5 on page 11.

### Table 5: 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 6 on page 11.

### Table 6: 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 7 on page 11.

### Table 7: 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 |

**Table 7: Drop Priority Classification for Packet Sent from Enhanced II FPC with Tricolor Marking to Enhanced III FPC on M320 Routers *(continued)***

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

## MX Series Router CoS Hardware Capabilities and Limitations

Generally, the Layer 3 CoS hardware capabilities and limitations for Juniper Networks MX Series Ethernet Service Routers 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);
}
```

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 15 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 16 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 17 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 17 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
- Dense Port Concentrators FAQs
- Junos Trio Chipset on MX Series FAQs

PART 2

# Configuration

CHAPTER 3

# Configuration Statements



## [edit class-of-service] Hierarchy Level

This topic shows the complete configuration for class of service (CoS) statements for the **[edit class-of-service]** hierarchy level, listing all possible configuration statements and showing their level in the configuration hierarchy. When you are configuring Junos OS, your current hierarchy level is shown in the banner on the line preceding the **user@host#** prompt.

For a complete list of the Junos OS configuration statements, see the *Junos OS Hierarchy and RFC Reference*.

```
[edit class-of-service]
adjustment-control-profiles {
   profile-name {
      application {
         ancp;
         radius-coa;
         pppoe-tags;
         }
      }
   }
classifiers {
   (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) classifier-name {
      import (classifier-name | default);
      forwarding-class class-name {
         loss-priority level code-points [ aliases ] [ bit-patterns ];
      }
   }
}
code-point-aliases {
   (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) {
      alias-name bits;
   }
}
copy-plp-all;
drop-profiles {
   profile-name {
      fill-level percentage drop-probability percentage;
      interpolate {
```

```
        drop-probability [ values ];
        fill-level [ values ];
      }
    }
  }
  fabric {
    scheduler-map {
      priority (high | low) scheduler scheduler-name;
    }
  }
  forwarding-classes {
    class class-name queue-num queue-number priority (high | low);
    queue queue-number class-name priority (high | low) [ policing-priority (premium |
      normal) ];
  }
  forwarding-class-map  forwarding-class-map-name {
    class class-name queue-num queue-number [ restricted-queue queue-number ];
  }
  forwarding-policy {
    next-hop-map map-name {
      forwarding-class class-name {
        next-hop [ next-hop-name ];
        lsp-next-hop [ lsp-regular-expression ];
        non-lsp-next-hop;
        discard;
      }
    }
    class class-name {
      classification-override {
        forwarding-class class-name;
      }
    }
  }
  fragmentation-maps {
    map-name {
      forwarding-class class-name {
        drop-timeout milliseconds;
        fragment-threshold bytes;
        multilink-class number;
        no-fragmentation;
      }
    }
  }
  host-outbound-traffic {
    dscp-code-point value;
    forwarding-class class-name;
    ieee-802.1 {
      default value;
      rewrite-rules;
    }
  }
  interfaces {
    interface-name {
      classifiers {
        dscp (classifier-name | default);
        ieee-802.1 (classifier-name | default)  vlan-tag (inner | outer | classifier-name);
```

```
    inet-precedence (classifier-name | default);
  }
  input-scheduler-map map-name;
  input-shaping-rate rate;
  irb {
    unit logical-unit-number {
      classifiers {
        dscp (classifier-name | default) {
          family [ inet mpls ];
      }
        dscp-ipv6 (classifier-name | default) {
          family [ inet mpls ];
        exp (classifier-name | default);
        ieee-802.1 (classifier-name | default)  vlan-tag (inner | outer | transparent);
      }
      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);
      }
    }
  }
  output-forwarding-class-map forwarding-class-map-name;
  member-link-scheduler (replicate | scale);
  rewrite-rules {
    dscp (rewrite-name | default);
    ieee-802.1 (rewrite-name | default) vlan-tag (outer);
    inet-precedence (rewrite-name | default);
    }
  }
  scheduler-map map-name;
  scheduler-map-chassis map-name;
  shaping-rate rate;
  unit logical-unit-number {
    classifiers {
      (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) (classifier-name | default)
        family (mpls | inet);
    }
    forwarding-class class-name;
    fragmentation-map map-name;
    input-scheduler-map map-name;
    input-shaping-rate (percent percentage | rate);
    input-traffic-control-profile profile-name shared-instance instance-name;
    loss-priority-maps {
      frame-relay-de (name | default);
    }
    loss-priority-rewrites {
      frame-relay-de (name | default);
    }
    output-traffic-control-profile profile-name shared-instance instance-name;
    per-session-scheduler;
    rewrite-rules {
      dscp (rewrite-name | default)protocol protocol-types;
      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)protocol protocol-types;
          }
          scheduler-map map-name;
          shaping-rate rate;
          translation-table (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 |
            to-exp-from-exp | to-inet-precedence-from-inet-precedence) table-name;
        }
      }
    }
    loss-priority-maps {
      frame-relay-de (Defining Loss Priority Maps)name {
      loss-priority levelcode-points [alias | bits ];
      }
    }
    loss-priority-rewrites {
      frame-relay-de (Defining Loss Priority Maps)name {
      loss-priority levelcode-point (alias | bits );
      }
    }
    restricted-queues {
      forwarding-class class-name queue queue-number;
    }
    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);
        }
      }
    }
    routing-instances routing-instance-name {
      classifiers {
        exp (classifier-name | default);
        dscp (classifier-name | default);
        dscp-ipv6 (classifier-name | default);
      }
    }
    scheduler-maps {
      map-name {
        forwarding-class class-name scheduler scheduler-name;
      }
    }
    schedulers {
      scheduler-name {
        buffer-size (percent percentage | remainder | temporal microseconds);
        drop-profile-map loss-priority (any | low | medium-low | medium-high | high)protocol
          (any | non-tcp | tcp) drop-profile profile-name;
        excess-priority (low | high);
        excess-rate percent percentage;
        excess-rate (percent percentage | proportion value);
        priority priority-level;
        transmit-rate (rate | percent percentage | remainder) <exact | rate-limit>;
```

```
    }
  }
  system-defaults {
    classifiers (classifier-name | exp)
  traffic-control-profiles profile-name {
    delay-buffer-rate (percent percentage | rate);
    excess-rate (percent percentage | proportion value);
    guaranteed-rate (percent percentage | rate);
    overhead-accounting (frame-mode | cell-mode) <bytes byte-value>;
    scheduler-map map-name;
    shaping-rate (percent percentage | rate);
  }
  translation-table {
    (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 | to-exp-from-exp |
      to-inet-precedence-from-inet-precedence) table-name {
      to-code-point value from-code-points (* | [ values ]);
    }
  }
  tri-color;
```

On Juniper Networks MX Series 3D Universal Edge Routers with Enhanced Queuing DPCs, you can configure the following CoS statements at the **[edit class-of-service interfaces]** hierarchy level:

```
  interface-set interface-set-name {
    excess-bandwidth-share (proportional value | equal);
    internal-node;
    traffic-control-profiles profile-name;
    output-traffic-control-profile-remaining profile-name;
  }
```

## classifiers (Application)

**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**

- Applying Classifiers to Logical Interfaces

## dscp (Rewrite Rules)

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

**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.

**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-ipv6 (Class-of-Service) on page 30
- exp on page 31
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1 (Rewrite Rules on Logical Interface) on page 33
- ieee-802.1ad
- inet-precedence on page 34
- 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.

**Description** For IPv6 traffic, apply a DSCP rewrite rule.

**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.

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
- dscp (Rewrite Rules) on page 29
- exp on page 31
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1 (Rewrite Rules on Logical Interface) on page 33
- ieee-802.1ad
- inet-precedence on page 34
- 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, 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.

The remaining statement is explained separately.

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

**Related Documentation**

- Rewriting the EXP Bits of All Three Labels of an Outgoing Packet
- dscp (Rewrite Rules) on page 29
- dscp-ipv6 (Class-of-Service) on page 30
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1 (Rewrite Rules on Logical Interface) on page 33
- ieee-802.1ad
- inet-precedence on page 34

- rewrite-rules (Definition)

## forwarding-class (Forwarding Policy)

**Syntax**

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

**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 statement is 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

## 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
- Example: Configuring CoS for a PBB Network on MX Series Routers
- dscp (Rewrite Rules) on page 29
- dscp-ipv6 (Class-of-Service) on page 30
- exp on page 31
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1ad
- inet-precedence on page 34
- 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
- dscp (Rewrite Rules) on page 29
- dscp-ipv6 (Class-of-Service) on page 30
- exp on page 31
- exp-push-push-push
- exp-swap-push-push
- ieee-802.1 (Rewrite Rules on Logical Interface) on page 33
- ieee-802.1ad
- 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, 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.

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**

- MX Series Router CoS Hardware Capabilities and Limitations on page 12

## 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 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.

**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), 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, and T Series routers, 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);
  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);
  ieee-802.1ad (rewrite-name | default) vlan-tag (outer | outer-and-inner);
  inet-precedence (rewrite-name | default);
}
```

**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, **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**.

**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

## 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

# Index

# Index