



Junos[®] OS

CoS Packet Classification Based on Behavior Aggregates

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Junos® OS CoS Packet Classification Based on Behavior Aggregates

13.1

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Table of Contents

	About the Documentation	ix
	Documentation and Release Notes	ix
	Supported Platforms	ix
	Using the Examples in This Manual	ix
	Merging a Full Example	x
	Merging a Snippet	x
	Documentation Conventions	xi
	Documentation Feedback	xiii
	Requesting Technical Support	xiii
	Self-Help Online Tools and Resources	xiii
	Opening a Case with JTAC	xiv
Part 1	Overview	
Chapter 1	Behavior Aggregate Classifier	3
	BA Classifier Overview	3
	Overview of BA Classifier Types	5
	Default Behavior Aggregate Classification Overview	5
	Understanding DSCP Classification for VPLS	6
	BA Classifiers and ToS Translation Tables	7
	Classifiers and Rewrite Rules at the Global and Physical Interface Levels	
	Overview	7
Chapter 2	BA Classifier Default Values	9
	Default CoS Values	9
	Default IP Precedence Classifier (ipprec-compatibility)	11
	Default MPLS EXP Classifier	12
	Default Code-Point Alias Overview	13
	Default DSCP and DSCP IPv6 Classifier	13
	Default IEEE 802.1p Classifier	15
	Default IEEE 802.1ad Classifier	15
	Default IP Precedence Classifier (ipprec-default)	16
Part 2	Configuration	
Chapter 3	Configuration Tasks for Classifiers	21
	Defining Classifiers	21
	Importing a Classifier	22
	Defining Code Point Aliases for Bit Patterns	22
	Applying Classifiers to Logical Interfaces	24
	DSCP Classifier Configuration Examples	28

	Setting Packet Loss Priority	30
	Example: Overriding the Default PLP on M320 Routers	30
Chapter 4	Configuration Tasks for BA Classifiers	33
	Configuring BA Classifiers for Bridged Ethernet	33
	Example: Configuring DSCP Classification for VPLS	34
	Example: DSCP IPv6 Rewrites and Forwarding Class Maps	35
	Tunneling and BA Classifiers	36
	Configuring Classifiers and Rewrite Rules at the Global and Physical Interface Levels	37
Chapter 5	Configuration Task for DSCP IPv6 Classifiers	39
	Applying DSCP IPv6 Classifiers	39
Chapter 6	Configuration Tasks for MPLS EXP Classifiers	41
	Applying MPLS EXP Classifiers to Routing Instances	41
	Configuring Global Classifiers and Wildcard Routing Instances	42
	Examples: Applying MPLS EXP Classifiers to Routing Instances	43
	Applying MPLS EXP Classifiers for Explicit-Null Labels	45
Chapter 7	Configuration Task for IEEE 802.1ad Classifiers	47
	Configuring and Applying IEEE 802.1ad Classifiers	47
	Defining Custom IEEE 802.1ad Maps	47
	Applying Custom IEEE 802.1ad Maps	47
	Verifying Custom IEEE 802.1ad Map Configuration	48
Chapter 8	Configuration Statements	49
	BA Classifier Configuration Hierarchy	49
	classifiers (Application)	50
	classifiers (Application for Routing Instances)	51
	classifiers (Definition)	52
	classifiers (Physical Interface)	53
	code-point-aliases	53
	code-points	54
	copy-plp-all	54
	dscp (AS PIC Classifiers)	55
	dscp (Classifier on Physical Interface)	55
	dscp (Rewrite Rules)	56
	dscp-ipv6 (Class-of-Service)	57
	dscp-ipv6 (Class-of-Service)	58
	exp	59
	forwarding-class (BA Classifiers)	60
	ieee-802.1 (Classifier on Physical Interface)	60
	ieee-802.1 (Rewrite Rules on Logical Interface)	61
	ieee-802.1ad	62
	import (Classifiers)	63
	inet-precedence	64
	inet-precedence (Classifier on Physical Interface)	65
	interfaces	66
	loss-priority (BA Classifiers)	68
	routing-instances (Class of Service)	69

	system-defaults	70
	unit	71
Part 3	Index	
	Index	75

List of Tables

	About the Documentation	ix
	Table 1: Notice Icons	xi
	Table 2: Text and Syntax Conventions	xi
Part 1	Overview	
Chapter 2	BA Classifier Default Values	9
	Table 3: Default CoS Values	9
	Table 4: Default IP Precedence Classifier	11
	Table 5: Default MPLS Classifier	12
	Table 6: Default DSCP Classifier	14
	Table 7: Default IEEE 802.1p Classifier	15
	Table 8: Default IEEE 802.1ad Classifier	16
	Table 9: Default IP Precedence (ipprec-default) Classifier	17
Part 2	Configuration	
Chapter 3	Configuration Tasks for Classifiers	21
	Table 10: Logical Interface Classifier Combinations	25
Chapter 6	Configuration Tasks for MPLS EXP Classifiers	41
	Table 11: Default MPLS EXP Classification Table	41

About the Documentation

- [Documentation and Release Notes on page ix](#)
- [Supported Platforms on page ix](#)
- [Using the Examples in This Manual on page ix](#)
- [Documentation Conventions on page xi](#)
- [Documentation Feedback on page xiii](#)
- [Requesting Technical Support on page xiii](#)

Documentation and Release Notes

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

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Supported Platforms

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

- [T Series](#)
- [M Series](#)
- [MX Series](#)
- [ACX 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.xml; }
```

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

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

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

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

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

Documentation Conventions

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

Table 1: Notice Icons

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

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
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

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

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> 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)	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 <i>(string1 string2 string3)</i>
# (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]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. 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)

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- 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 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

- [Behavior Aggregate Classifier on page 3](#)
- [BA Classifier Default Values on page 9](#)

CHAPTER 1

Behavior Aggregate Classifier

- [BA Classifier Overview on page 3](#)
- [Overview of BA Classifier Types on page 5](#)
- [Default Behavior Aggregate Classification Overview on page 5](#)
- [Understanding DSCP Classification for VPLS on page 6](#)
- [BA Classifiers and ToS Translation Tables on page 7](#)
- [Classifiers and Rewrite Rules at the Global and Physical Interface Levels Overview on page 7](#)

BA Classifier Overview

The behavior aggregate (BA) classifier maps a class-of-service (CoS) value to a forwarding class and loss priority. The forwarding class determines the output queue. The loss priority is used by schedulers in conjunction with the random early discard (RED) algorithm to control packet discard during periods of congestion.

The types of BA classifiers are based on which part of the incoming packet the classifier examines:

- Differentiated Services code point (DSCP) for IP DiffServ
- DSCP for IPv6 DiffServ
- IP precedence bits
- MPLS EXP bits
- IEEE 802.1p CoS bits
- IEEE 802.1ad drop eligible indicator (DEI) bit

Unlike multifield classifiers (which are discussed in [Multifield Classifier Overview](#)), BA classifiers are based on fixed-length fields, which makes them computationally more efficient than multifield classifiers. For this reason, core devices are normally configured to perform BA classification, because of the higher traffic volumes they handle.

In most cases, you need to rewrite a given marker (IP precedence, DSCP, IEEE 802.1p, IEEE 802.1ad, or MPLS EXP settings) at the ingress node to accommodate BA classification by core and egress devices. For more information about rewrite markers, see [Rewriting Packet Header Information Overview](#).

For Juniper Networks M Series Multiservice Edge Routers, four classes can forward traffic independently. For M320 Multiservice Edge Routers and Juniper Networks T Series Core Routers, eight classes can forward traffic independently. Therefore, you must configure additional classes to be aggregated into one of these classes. You use the BA classifier to configure class aggregation.

For Juniper Networks MX Series 3D Universal Edge Routers and Intelligent Queuing 2 (IQ2) PICs, the following restrictions apply:

- You cannot use BA classifiers for IPv4 DSCP bits for Layer 2 VPNs.
- You cannot use BA classifiers for IPv6 DSCP bits for VPLS.
- You cannot use BA classifiers for IPv6 DSCP bits for Layer 2 VPNs.

For the 10-port 10-Gigabit Oversubscribed Ethernet (OSE) PICs, the following restrictions on BA classifiers apply:

- Multiple classifiers can be configured to a single logical interface. However, there are some restrictions on which the classifiers can coexist.

For example, the DSCP and IP precedence classifiers cannot be configured on the same logical interface. The DSCP and IP precedence classifiers can coexist with the DSCP IPv6 classifier on the same logical interface. An IEEE 802.1 classifier can coexist with other classifiers and is applicable only if a packet does not match any of the configured classifiers. For information about the supported combinations, see [“Applying Classifiers to Logical Interfaces” on page 24](#).

- If the classifiers are not defined explicitly, then the default classifiers are applied as follows:
 - All MPLS packets are classified using the MPLS (EXP) classifier. If there is no explicit MPLS (EXP) classifier, then the default MPLS (EXP) classifier is applied.
 - All IPv4 packets are classified using the IP precedence and DSCP classifiers. If there is no explicit IP precedence or DSCP classifier, then the default IP precedence classifier is applied.
 - All IPv6 packets are classified using a DSCP IPv6 classifier. If there is no explicit DSCP IPv6 classifier, then the default DSCP IPv6 classifier is applied.
 - If the IEEE 802.1p classifier is configured and a packet does not match any explicitly configured classifier, then the IEEE 802.1p classifier is applied.



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

Overview of BA Classifier Types

The idea behind class of service (CoS) is that packets are not treated identically by the routers on the network. In order to selectively apply service classes to specific packets, the packets of interest must be classified in some fashion.

The simplest way to classify a packet is to use behavior aggregate classification. The DSCP, DSCP IPv6, or IP precedence bits of the IP header convey the behavior aggregate class information. The information might also be found in the MPLS EXP bits, IEEE 802.1ad, or IEEE 802.1p CoS bits.

You can configure the following classifier types:

- DSCP, DSCP IPv6, or IP precedence—IP packet classification (Layer 3 headers)
- MPLS EXP—MPLS packet classification (Layer 2 headers)
- IEEE 802.1p—Packet classification (Layer 2 headers)
- IEEE 802.1ad—Packet classification for IEEE 802.1ad formats (including DEI bit)

If you apply an IEEE 802.1 classifier to a logical interface, this classifier takes precedence and is not compatible with any other classifier type. On Juniper Networks MX Series 3D Universal Edge Routers using IEEE 802.1ad frame formats, you can apply classification on the basis of the IEEE 802.1p bits (three bits in either the inner virtual LAN (VLAN) tag or the outer VLAN tag) and the drop eligible indicator (DEI) bit. On routers with IQ2 PICs using IEEE 802.1ad frame format, you can apply classification based on the IEEE 802.1p bits and the DEI bit. Classifiers for IP (DSCP or IP precedence) and MPLS (EXP) can coexist on a logical interface if the hardware requirements are met. (See [“Applying Classifiers to Logical Interfaces”](#) on page 24.)

The Enhanced Queuing DPC (EQ DPC) does not support BA classification for packets received from a Layer 3 routing interface or a virtual routing and forwarding (VRF) interface and routed to an integrated routing and bridging interface (IRB) to reach the remote end of a pseudowire connection. The EQ DPC also does not support BA classification for Layer 2 frames received from a Virtual Private LAN Service (VPLS) pseudowire connection from a remote site and routed to a Layer 3 routing interface through an IRB interface.

Default Behavior Aggregate Classification Overview

The software automatically assigns an implicit default IP precedence classifier to all logical interfaces.



NOTE: Only the IEEE 802.1p classifier is supported in Layer 2 interfaces. You must explicitly apply this classifier to the interface as shown in [“Default IEEE 802.1p Classifier”](#) on page 15.

If you enable the MPLS protocol family on a logical interface, a default MPLS EXP classifier is automatically applied to that logical interface.

Other default classifiers (such as those for IEEE 802.1p bits and DSCP) require that you explicitly associate a default classification table with a logical interface. When you explicitly associate a default classifier with a logical interface, you are in effect overriding the implicit default classifier with an explicit default classifier.



NOTE: Although several code points map to the expedited-forwarding (ef) and assured-forwarding (af) classes, by default no resources are assigned to these forwarding classes. All af classes other than af1x are mapped to best-effort, because RFC 2597, *Assured Forwarding PHB Group*, prohibits a node from aggregating classes.

You can apply IEEE 802.1p classifiers to interfaces that are part of VPLS routing instances.

**Related
Documentation**

- [Default IP Precedence Classifier \(ipprec-compatibility\) on page 11](#)
- [Default MPLS EXP Classifier on page 12](#)
- [Default DSCP and DSCP IPv6 Classifier on page 13](#)
- [Default IEEE 802.1p Classifier on page 15](#)
- [Default IEEE 802.1ad Classifier on page 15](#)
- [Default IP Precedence Classifier \(ipprec-default\) on page 16](#)

Understanding DSCP Classification for VPLS

You can perform Differentiated Services Code Point (DSCP) classification for IPv4 packets on Ethernet interfaces that are part of a virtual private LAN service (VPLS) routing instance on the ingress provider edge (PE) router. This is supported on the M320 router with Enhanced type III FPC and the M120 router. On the ATM II IQ PIC, the **ether-vpls-over-atm-llc** encapsulation statement is required. On the Intelligent Queuing 2 (IQ2) or Intelligent Queuing 2 Enhanced (IQ2E) PICs, the **vlan-vpls** encapsulation statement is required. DSCP for IPv6 and Internet precedence for IPv6 are not supported.

In order to perform DSCP classification for IPv4 packets on Ethernet interfaces that are part of a VPLS routing instance on the ingress PE router, you must make sure of the following:

- The correct encapsulation statement based on PIC type is configured for the interface.
- The DSCP classifier is defined (default is allowed) at the **[edit class-of-service classifiers]** hierarchy level.
- The defined DSCP classifier is applied to the interface.
- The interface is included in the VPLS routing instance on the ingress of the PE router.

**Related
Documentation**

- [BA Classifier Overview on page 3](#)

BA Classifiers and ToS Translation Tables

On some PICs, the behavior aggregate (BA) translation tables are included for every logical interface (unit) protocol family configured on the logical interface. The proper default translation table is active even if you do not include any explicit translation tables. You can display the current translation table values with the **show class-of-service classifiers** command.

On Juniper Networks M40e, M120, M320 Multiservice Edge Routers, and T Series Core Routers with Enhanced IQ (IQE) PICs, or on any router with IQ2 or Enhanced IQ2 (IQ2E) PICs, you can replace the type-of-service (ToS) bit value on the incoming packet header on a logical interface with a user-defined value. The new ToS value is used for all class-of-service processing and is applied before any other class-of-service or firewall treatment of the packet. The PIC uses the **translation-table** statement to determine the new ToS bit values.

You can configure a physical interface (port) or logical interface (unit) with up to three translation tables. For example, you can configure a port or unit with BA classification for IPv4 DSCP, IPv6 DSCP, and MPLS EXP. The number of frame relay data-link connection identifiers (DLCIs) (units) that you can configure on each PIC varies based on the number and type of BA classification tables configured on the interfaces.

For more information on configuring ToS translation tables, along with examples, see *Configuring ToS Translation Tables*.

Classifiers and Rewrite Rules at the Global and Physical Interface Levels Overview

On ACX Series Universal Access Routers, CoS supports classification and rewrite at the global level and physical interface levels.

At a global level, you can define EXP classification.

At a physical interface level, you can define the following features:

- DSCP and inet-precedence classifiers
- DSCP and inet-precedence rewrites
- ieee-802.1 classifiers (inner and outer)
- ieee-802.1 rewrites (outer)

At a logical interface level, you can define the fixed classification and EXP rewrites.

To configure global EXP classifiers, include the **classifiers exp classifier-name** statement at the **[edit class-of-service] system-defaults** hierarchy level.

To configure classifiers or rewrite rules at the physical interface, include either the **classifiers** statement or the **rewrite-rules** statement at the **[edit class-of-service] interfaces interface-name]** hierarchy level.

To display classifiers configured under **system-defaults**, enter the **show class-of-service system-defaults** command.

To display classifiers and rewrite rules bound to physical interfaces, enter the **show class-of-service interfaces *interface-name*** command.

**Related
Documentation**

- [Configuring Classifiers and Rewrite Rules at the Global and Physical Interface Levels on page 37](#)

CHAPTER 2

BA Classifier Default Values

- [Default CoS Values on page 9](#)
- [Default IP Precedence Classifier \(ipprec-compatibility\) on page 11](#)
- [Default MPLS EXP Classifier on page 12](#)
- [Default Code-Point Alias Overview on page 13](#)
- [Default DSCP and DSCP IPv6 Classifier on page 13](#)
- [Default IEEE 802.1p Classifier on page 15](#)
- [Default IEEE 802.1ad Classifier on page 15](#)
- [Default IP Precedence Classifier \(ipprec-default\) on page 16](#)

Default CoS Values

[Table 3 on page 9](#) shows the default mappings between the bit values and standard aliases. For example, it is widely accepted that the alias for DSCP 101110 is **ef** (expedited forwarding).

Table 3: Default CoS Values

CoS Value Types	Mapping
DSCP and DSCP IPv6 CoS Values	
ef	101110
af11	001010
af12	001100
af13	001110
af21	010010
af22	010100
af23	010110
af31	011010

Table 3: Default CoS Values (*continued*)

CoS Value Types	Mapping
af32	011100
af33	011110
af41	100010
af42	100100
af43	100110
be	000000
cs1	001000
cs2	010000
cs3	011000
cs4	100000
cs5	101000
nc1/cs6	110000
nc2/cs7	111000
MPLS EXP CoS Values	
be	000
be1	001
ef	010
ef1	011
af11	100
af12	101
nc1/cs6	110
nc2/cs7	111
IEEE 802.1 CoS Values	
be	000

Table 3: Default CoS Values (*continued*)

CoS Value Types	Mapping
be1	001
ef	010
ef1	011
af11	100
af12	101
nc1/cs6	110
nc2/cs7	111
Legacy IP Precedence CoS Values	
be	000
be1	001
ef	010
ef1	011
af11	100
af12	101
nc1/cs6	110
nc2/cs7	111

Default IP Precedence Classifier (ipprec-compatibility)

By default, all logical interfaces are automatically assigned an implicit IP precedence classifier called **ipprec-compatibility**. The **ipprec-compatibility** IP precedence classifier maps IP precedence bits to forwarding classes and loss priorities, as shown in [Table 4 on page 11](#).

Table 4: Default IP Precedence Classifier

IP Precedence CoS Values	Forwarding Class	Loss Priority
000	best-effort	low
001	best-effort	high

Table 4: Default IP Precedence Classifier (*continued*)

IP Precedence CoS Values	Forwarding Class	Loss Priority
010	best-effort	low
011	best-effort	high
100	best-effort	low
101	best-effort	high
110	network-control	low
111	network-control	high

Default MPLS EXP Classifier

For all PICs except PICs mounted on Juniper Networks M Series Multiservice Edge Router standard (nonenhanced) FPCs, if you enable the MPLS protocol family on a logical interface, the default MPLS EXP classifier is automatically applied to that logical interface. The default MPLS classifier maps EXP bits to forwarding classes and loss priorities, as shown in [Table 5 on page 12](#).

Table 5: Default MPLS Classifier

Code Point	Forwarding Class	Loss Priority
000	best-effort	low
001	best-effort	high
010	expedited-forwarding	low
011	expedited-forwarding	high
100	assured-forwarding	low
101	assured-forwarding	high
110	network-control	low
111	network-control	high

Default Code-Point Alias Overview

Behavior aggregate (BA) classifiers use class-of-service (CoS) values such as Differentiated Services code points (DSCPs), DSCP IPv6, IP precedence, IEEE 802.1 and MPLS experimental (EXP) bits to associate incoming packets with a particular CoS servicing level. On a Services Router, you can assign a meaningful name or alias to the CoS values and use this alias instead of bits when configuring CoS components. These aliases are not part of the specifications but are well known through usage. For example, the alias for DSCP 101110 is widely accepted as **ef** (expedited forwarding).



NOTE: The code point aliases must begin with a letter and can be up to 64 characters long.

When you configure classes and define classifiers, you can refer to the markers by alias names. You can configure user-defined classifiers in terms of alias names. If the value of an alias changes, it alters the behavior of any classifier that references it.

To configure class-of-service (CoS) code point aliases, include the **code-point-aliases** statement at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
code-point-aliases {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) {
    alias-name bits;
  }
}
```

Related Documentation • [code-point-aliases on page 53](#)

Default DSCP and DSCP IPv6 Classifier

[Table 6 on page 14](#) shows the forwarding class and packet loss priority (PLP) that are assigned to each well-known DSCP when you apply the explicit default DSCP or DSCP IPv6 classifier. To do this, include the **default** statement at the **[edit class-of-service interfaces interface-name unit logical-unit-number classifiers (dscp | dscp-ipv6)]** hierarchy level:

```
[edit class-of-service interfaces interface-name unit logical-unit-number classifiers (dscp
| dscp-ipv6)]
default;
```



NOTE: If you deactivate or delete **dscp-ipv6** statement from the configuration, the default IPv6 classifier is not activated on the on the M5, M10, M7i, M10i, M20, M40, M40e, and M160 routing platforms. As a workaround, explicitly specify the default option to the **dscp-ipv6** statement.

Table 6: Default DSCP Classifier

DSCP and DSCP IPv6	Forwarding Class	PLP
ef	expedited-forwarding	low
af11	assured-forwarding	low
af12	assured-forwarding	high
af13	assured-forwarding	high
af21	best-effort	low
af22	best-effort	low
af23	best-effort	low
af31	best-effort	low
af32	best-effort	low
af33	best-effort	low
af41	best-effort	low
af42	best-effort	low
af43	best-effort	low
be	best-effort	low
cs1	best-effort	low
cs2	best-effort	low
cs3	best-effort	low
cs4	best-effort	low
cs5	best-effort	low
nc1/cs6	network-control	low
nc2/cs7	network-control	low
other	best-effort	low

Default IEEE 802.1p Classifier

Table 7 on page 15 shows the forwarding class and PLP that are assigned to the IEEE 802.1p CoS bits when you apply the explicit default IEEE 802.1p classifier. To do this, include the **default** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers ieee-802.1]** hierarchy level:



NOTE: Only the IEEE 802.1p classifier is supported in Layer 2 interfaces. You must explicitly apply this classifier as shown.

```
[edit class-of-service interfaces interface-name unit logical-unit-number classifiers
  ieee-802.1]
  default;
```

Table 7: Default IEEE 802.1p Classifier

Code Point	Forwarding Class	PLP
000	best-effort	low
001	best-effort	high
010	expedited-forwarding	low
011	expedited-forwarding	high
100	assured-forwarding	low
101	assured-forwarding	high
110	network-control	low
111	network-control	high

Default IEEE 802.1ad Classifier

Table 8 on page 16 shows the code point, forwarding class alias, and PLP that are assigned to the IEEE 802.1ad bits when you apply the explicit default IEEE 802.1ad classifier. The table is very similar to the IEEE 802.1p default table, but the loss priority is determined by the DEI bit. To apply the default table, include the **default** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers ieee-802.1]** hierarchy level:

```
[edit class-of-service interfaces interface-name unit logical-unit-number classifiers
  ieee-802.1ad]
  default;
```

Table 8: Default IEEE 802.1ad Classifier

IEEE 802.1ad Code Point	Forwarding Class Alias	PLP
0000	be	low
0010	be1	low
0100	ef	low
0110	ef1	low
1000	af11	low
1010	af12	low
1100	nc1	low
1110	nc2	low
0001	be-dei	high
0011	be1-dei	high
0101	ef-dei	high
0111	ef1-dei	high
1001	af11-dei	high
1011	af12-dei	high
1101	nc1-dei	high
1111	nc2-dei	high

Default IP Precedence Classifier (ipprec-default)

There are two separate tables for default IP precedence classification. All logical interfaces are implicitly assigned the **ipprec-compatibility** classifier by default, as described in [Table 4 on page 11](#).

The other default IP precedence classifier (called **ipprec-default**) overrides the **ipprec-compatibility** classifier when you explicitly associate it with a logical interface. To do this, include the **default** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers inet-precedence]** hierarchy level:

```
[edit class-of-service interfaces interface-name unit logical-unit-number classifiers
  inet-precedence]
  default;
```

Table 9 on page 17 shows the forwarding class and PLP that are assigned to the IP precedence CoS bits when you apply the default IP precedence classifier.

Table 9: Default IP Precedence (ipprec-default) Classifier

Code Point	Forwarding Class	PLP
000	best-effort	low
001	assured-forwarding	low
010	best-effort	low
011	best-effort	low
100	best-effort	low
101	expedited-forwarding	low
110	network-control	low
111	network-control	high

PART 2

Configuration

- [Configuration Tasks for Classifiers on page 21](#)
- [Configuration Tasks for BA Classifiers on page 33](#)
- [Configuration Task for DSCP IPv6 Classifiers on page 39](#)
- [Configuration Tasks for MPLS EXP Classifiers on page 41](#)
- [Configuration Task for IEEE 802.1ad Classifiers on page 47](#)
- [Configuration Statements on page 49](#)

CHAPTER 3

Configuration Tasks for Classifiers

- [Defining Classifiers on page 21](#)
- [Defining Code Point Aliases for Bit Patterns on page 22](#)
- [Applying Classifiers to Logical Interfaces on page 24](#)
- [DSCP Classifier Configuration Examples on page 28](#)
- [Setting Packet Loss Priority on page 30](#)

Defining Classifiers

You can override the default IP precedence classifier by defining a classifier and applying it to a logical interface. To define new classifiers for all code point types, include the **classifiers** statement at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
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 ];
    }
  }
}
```

The map sets the forwarding class and PLP for a specific set of code-point aliases and bit patterns. The inputs of the map are code-point aliases and bit patterns. The outputs of the map are the forwarding class and the PLP. For more information about how CoS maps work, see [CoS Inputs and Outputs Overview](#).

The classifiers work as follows:

- **dscp**—Handles incoming IPv4 packets.
- **dscp-ipv6**—Handles incoming IPv6 packets. For more information, see [“Applying DSCP IPv6 Classifiers” on page 39](#).
- **exp**—Handles MPLS packets using Layer 2 headers.
- **ieee-802.1**—Handles Layer 2 CoS.
- **inet-precedence**—Handles incoming IPv4 packets. IP precedence mapping requires only the upper three bits of the DSCP field.

A classifier takes a specified bit pattern as either the literal pattern or as a defined alias and attempts to match it to the type of packet arriving on the interface. If the information in the packet's header matches the specified pattern, the packet is sent to the appropriate queue, defined by the forwarding class associated with the classifier.

The code-point aliases and bit patterns are the input for the map. The loss priority and forwarding class are outputs of the map. In other words, the map sets the PLP and forwarding class for a given set of code-point aliases and bit patterns.



NOTE: On M Series, MX Series, and T Series routers that do not have tricolor marking enabled, the loss priority can be configured only by setting the PLP within a multifield classifier. This setting can then be used by the appropriate drop profile map and rewrite rule. For more information, see [“Setting Packet Loss Priority” on page 30](#).

Importing a Classifier

You can use any table, including the default, in the definition of a new classifier by including the **import** statement. The imported classifier is used as a template and is not modified. Whenever you commit a configuration that assigns a new **class-name** and **loss-priority** value to a code-point alias or set of bits, it replaces that entry in the imported classifier template. As a result, you must explicitly specify every CoS value in every designation that requires modification.

To do this, include the **import default** statement at the **[edit class-of-service classifiers type classifier-name]** hierarchy level:

```
[edit class-of-service classifiers type classifier-name]
import default;
```

For instance, to import the default DSCP classifier, include the **dscp default** statement at the **[edit class-of-service classifiers dscp classifier-name]** hierarchy level:

```
[edit class-of-service classifiers dscp classifier-name]
import default;
```

Defining Code Point Aliases for Bit Patterns

To define a code-point alias, include the **code-point-aliases** statement at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
code-point-aliases {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence) {
    alias-name bit-pattern;
  }
}
```

The CoS marker types are as follows:

- **dscp**—Handles incoming IPv4 packets.
- **dscp-ipv6**—Handles incoming IPv6 packets.
- **exp**—Handles MPLS packets using Layer 2 headers.
- **ieee-802.1**—Handles Layer 2 CoS.
- **inet-precedence**—Handles incoming IPv4 packets. IP precedence mapping requires only the upper three bits of the DSCP field.

For example, you might configure the following aliases:

```
[edit class-of-service]
code-point-aliases {
  dscp {
    my1 110001;
    my2 101110;
    be 000001;
    cs7 110000;
  }
}
```

This configuration produces the following mapping:

```
user@host> show class-of-service code-point-aliases dscp
Code point type: dscp
```

Alias	Bit pattern
ef/my2	101110
af11	001010
af12	001100
af13	001110
af21	010010
af22	010100
af23	010110
af31	011010
af32	011100
af33	011110
af41	100010
af42	100100
af43	100110
be	000001
cs1	001000
cs2	010000
cs3	011000
cs4	100000
cs5	101000
nc1/cs6/cs7	110000

nc2	111000
my1	110001

The following notes explain certain results in the mapping:

- **my1 110001:**
 - 110001 was not mapped to anything before, and **my1** is a new alias.
 - Nothing in the default mapping table is changed by this statement.
- **my2 101110:**
 - 101110 is now mapped to **my2** as well as **ef**.
- **be 0000001:**
 - **be** is now mapped to 0000001.
 - The old value of **be**, 000000, is not associated with any alias. Packets with this DSCP value are now mapped to the default forwarding class.
- **cs7 110000:**
 - **cs7** is now mapped to 110000, as well as **nc1** and **cs6**.
 - The old value of **cs7**, 111000, is still mapped to **nc2**.

**Related
Documentation**

- [Applying DSCP IPv6 Classifiers on page 39](#)

Applying Classifiers to Logical Interfaces

To apply the classification map to a logical interface:

```
[edit class-of-service interfaces interface-name unit logical-unit-number]  
user@host#set classifiers (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence)  
      (classifier-name | default);
```

You can use interface wildcards for *interface-name* and *logical-unit-number*.

For most PICs, if you apply an IEEE 802.1p classifier to a logical interface, you cannot apply non-IEEE classifiers to other logical interfaces on the same physical interface. This restriction does not apply to Gigabit Ethernet IQ2 PICs.

There are some restrictions on applying multiple BA classifiers to a single logical interface. [Table 10 on page 25](#) shows the supported combinations. In this table, the OSE PICs refer to the 10-port 10-Gigabit OSE PICs.

Table 10: Logical Interface Classifier Combinations

Classifier Combinations	Gigabit Ethernet IQ2 PICs	OSE PICs	Other PICs on M320, MX Series, and T Series	Other M Series with Regular FPCs	Other M Series with Enhanced FPCs
dscp and inet-precedence	No	No	No	No	No
dscp-ipv6 and (dscp inet-precedence)	Yes	Yes	Yes	No	No
exp and ieee 802.1	Yes	Yes	No	No	No
ieee 802.1 and (dscp dscp-ipv6 exp inet-precedence)	Yes	Yes	No	No	Yes
exp and (dscp dscp-ipv6 inet-precedence)	Yes	Yes	Yes	No	Yes

For Gigabit Ethernet IQ2 and 10-port 10-Gigabit Oversubscribed Ethernet (OSE) interfaces, family-specific classifiers take precedence over IEEE 802.1p BA classifiers. For example, if you configure a logical interface to use both an MPLS EXP and an IEEE 802.1p classifier, the EXP classifier takes precedence. MPLS-labeled packets are evaluated by the EXP classifier, and all other packets are evaluated by the IEEE 802.1p classifier. The same is true about other classifiers when combined with IEEE 802.1p classifiers on the same logical interface.

In Junos OS Releases 9.6 and later, the DSCP and IPv6 DSCP classifiers are not compatible with older formats. You cannot directly replace the old classifier with the new one. You must first delete the old classifier and then apply the new one, although both steps can be done in one configuration session. Otherwise, the commit will fail.



NOTE: If an interface is mounted on an M Series router FPC, you can apply only the default exp classifier. If an interface is mounted on an enhanced FPC, you can create a new exp classifier and apply it to an interface.

On MX960, MX480, MX240, MX80, M120, and M320 routers with Enhanced Type III FPCs only, you can configure user-defined DSCP-based BA classification for MPLS interfaces (this feature is not available for IQE PICs or on MX Series routers when ingress queuing is used) or VPLS/L3VPN routing instances (LSI interfaces). The DSCP-based classification for MPLS packets for Layer 2 VPNs is not supported. To classify MPLS packets on the routing instance at the egress PE, include the **dscp** or **dscp-ipv6** statements at the **[edit class-of-service routing-instances routing-instance-name classifiers]** hierarchy level. To classify MPLS packets at the core-facing interface, apply the classifier at the **[edit class-of-service interface interface-name unit unit-name classifiers (dscp | dscp-ipv6) classifier-name family mpls]** hierarchy level.



NOTE: If you do not apply a DSCP classifier, the default EXP classifier is applied to MPLS traffic.

You can apply DSCP classification for MPLS traffic in the following usage scenarios:

- In a Layer 3 VPN (L3VPN) using an LSI routing instance.
 - Supported on the M120, M320, MX960, MX480, MX240, and MX80 routers.
 - DSCP classifier configured under **[edit class-of-service routing-instances]** on the egress PE router.
- In VPLS using an LSI routing instance.
 - Supported on the M120, M320, MX960, MX480, MX240, and MX80 routers.
 - DSCP classifier configured under **[edit class-of-service routing-instances]** on the egress PE router.
- In a Layer 3 VPN (L3VPN) using a VT routing instance.
 - Supported on the M120, M320, MX960, MX480, MX240, and MX80 routers.
 - DSCP classifier configured under **[edit class-of-service interfaces]** on the core-facing interface on the egress PE router.
- In VPLS using the VT routing instance.
- MPLS forwarding.
 - Supported on the M120, M320, MX960, MX480, MX240, and MX80 routers (not supported on IQE and MX when ingress queuing is enabled).
 - DSCP classifier configured under **[edit class-of-service interfaces]** on the ingress core-facing interface on the P or egress PE router.

MPLS forwarding when the label stacking is greater than 2 is not supported:

The following example configures a DSCP classifier for IPv4 named **dscp-ipv4-classifier** for the **fc-af11-class** forwarding class and a corresponding IPv6 DSCP classifier:

```
class-of-service {
  routing-instances routing-instance-one {
    classifiers {
      dscp dscp-ipv4-classifier {
        loss-priority low code-points 000100;
      }
      dscp dscp-ipv6-classifier {
        forwarding-class fc-af11-class {
          loss-priority low {
            code-points af11;
          }
        }
      }
    }
  }
}
```



```
}
.....
```



NOTE: This is not a complete configuration.

.....

This example applies the IPv4 classifier to MPLS traffic and the IPv6 classifier to Internet traffic on interface **ge-2/0/3.0**:

```
class-of-service {
  interfaces ge-2/0/3 {
    unit 0 {
      classifiers {
        dscp dscp-ipv4-classifier {
          family mpls;
        }
        dscp-ipv6 dscp-ipv6-classifier {
          family inet; # This is the default if not present.
        }
      }
    }
  }
}
```

.....



NOTE: This is not a complete configuration.

.....

This example applies the same classifier to both MPLS and IP traffic on interface **ge-2/2/0**.

```
[edit class-of-services interface ge-2/2/0]
unit 0 {
  classifiers {
    dscp dscp-mpls {
      family [ mpls inet ];
    }
  }
}
```

.....



NOTE: This is not a complete configuration.

.....



NOTE: You can apply DSCP and DSCP IPv6 classifiers to explicit null MPLS packets. The `family mpls` statement works the same on both explicit null and non-null MPLS labels.

.....

Related Documentation

- [DSCP Classifier Configuration Examples on page 28](#)

DSCP Classifier Configuration Examples

On MX960, MX480, MX240, MX80, M120, and M320 routers with Enhanced Type III FPCs only, you can configure user-defined DSCP-based BA classification for MPLS interfaces (this feature is not available for IQE PICs or on MX Series routers when ingress queuing is used) or VPLS/L3VPN routing instances (LSI interfaces). The following examples show how you can apply DSCP classifiers for MPLS traffic in these cases.

Applying a DSCP Classifier to MPLS Packets on the Core-facing Interface

Configure the core-facing interface and associated logical interfaces:

```
interfaces ge-5/3/1 {
  unit 0 {
    family inet {
      address 1.1.1.1/24;
    }
    family iso;
    family inet6 {
      address 2000::1/64;
    }
    family mpls
  }
}
```

Configure the DSCP classifier.

```
class-of-service {
  classifiers {
    dscp dscp11 {
      forwarding-class expedited-forwarding {
        loss-priority low code-points [ ef cs5 ];
      }
      forwarding-class assured-forwarding {
        loss-priority low code-points [ af21 af31 af41 cs4 ];
        loss-priority high code-points [ af23 af33 af43 cs2 af22 af32 af42 cs3 ];
      }
      forwarding-class best-effort {
        loss-priority low code-points [ af11 cs1 af12 ];
        loss-priority high code-points af13;
      }
      forwarding-class network-control {
        loss-priority low code-points [ cs6 cs7 ];
      }
    }
  }
}
```

Attach the classifier to the logical interface for the mpls family. You cannot configure more than one classifier per family.

```
class-of-service {
  interfaces {
    ge-5/3/1 {
      unit 0 {
        classifiers {
          dscp dscp11 {
            family mpls;
          }
        }
      }
    }
  }
}
```

```

    }
  }
}

```

The above classifiers are applicable on egress PE routers for VPLS and L3VPN cases. For plain interfaces (not VPLS/L3VPN (LSI) interfaces), these classifiers are applicable on P and egress PE routers on core facing interfaces.

Applying a DSCP Classifier to MPLS Traffic for L3VPN/VPLS

Configure routing instances of type either vrf or vpls.

```

routing-instances {
  vpls1 {
    instance-type vpls;
    interface ge-2/2/2.0; #customer facing interface for VPLS
    route-distinguisher 10.255.245.51:1;
    vrf-target target:1234:1;
    protocols {
      vpls {
        site-range 10;
        no-tunnel-services;
        site vpls-1-site-1 {
          site-identifier 1;
        }
      }
    }
  }
}

```

Configure the DSCP classifier.

```

class-of-service {
  classifiers {
    dscp dscp11 {
      forwarding-class expedited-forwarding {
        loss-priority low code-points [ ef cs5 ];
      }
      forwarding-class assured-forwarding {
        loss-priority low code-points [ af21 af31 af41 cs4 ];
        loss-priority high code-points [ af23 af33 af43 cs2 af22 af32 af42 cs3 ];
      }
      forwarding-class best-effort {
        loss-priority low code-points [ af11 cs1 af12 ];
        loss-priority high code-points af13;
      }
      forwarding-class network-control {
        loss-priority low code-points [ cs6 cs7 ];
      }
    }
  }
}

```

Attach the classifier to a routing instance. You cannot configure more than one classifier per routing instance.

```
class-of-service {
  routing-instances {
    vpls1 {
      classifiers {
        dscp dscp11;
      }
    }
  }
}
```

Related Documentation

- [Applying Classifiers to Logical Interfaces on page 24](#)

Setting Packet Loss Priority

By default, the least significant bit of the CoS value sets the packet loss priority (PLP) value. For example, CoS value 000 is associated with PLP **low**, and CoS value 001 is associated with PLP **high**. In general, you can change the PLP by configuring a behavior aggregate (BA) or multifield classifier, as discussed in “[Overview of BA Classifier Types](#)” on [page 5](#) and Multifield Classifier Overview.

However, on Juniper Networks M320 Multiservice Edge Routers, MX Series 3D Universal Edge Routers, and T Series Core Routers that do not have tricolor marking enabled, the loss priority can be configured by setting the PLP within a multifield classifier or by behavior aggregate (BA) classifier. This setting can then be used by the appropriate drop profile map and rewrite rule.

On M320 routers and T Series routers with Enhanced II Flexible PIC Concentrators (FPCs) and tricolor marking enabled, you can set the PLP with a BA or multifield classifier, as described in [Using BA Classifiers to Set PLP](#) and [Using Multifield Classifiers to Set PLP](#).

On T Series routers with different Packet Forwarding Engines (non-Enhanced Scaling and Enhanced Scaling FPCs), you can configure PLP bit copying for ingress and egress unicast and multicast traffic. To configure, include the [copy-plp-all](#) statement at the [\[edit class-of-service\]](#) hierarchy level.

Example: Overriding the Default PLP on M320 Routers

The following example shows a two-step procedure to override the default PLP settings on M320 routers:

1. The following example specifies that while the DSCP code points are 110, the loss priority is set to **high**; however, on M320 routers, overriding the default PLP this way has no effect.

```
class-of-service {
  classifiers {
    dscp ba-classifier {
      forwarding-class expedited-forwarding {
        loss-priority high code-points 110;
      }
    }
  }
}
```

```
}
```

2. For M320 routers, this multifield classifier sets the PLP.

```
firewall {  
  filter ef-filter {  
    term ef-multifield {  
      from {  
        precedence 6;  
      }  
      then {  
        loss-priority high;  
        forwarding-class expedited-forwarding;  
      }  
    }  
  }  
}
```


CHAPTER 4

Configuration Tasks for BA Classifiers

- [Configuring BA Classifiers for Bridged Ethernet on page 33](#)
- [Example: Configuring DSCP Classification for VPLS on page 34](#)
- [Example: DSCP IPv6 Rewrites and Forwarding Class Maps on page 35](#)
- [Tunneling and BA Classifiers on page 36](#)
- [Configuring Classifiers and Rewrite Rules at the Global and Physical Interface Levels on page 37](#)

Configuring BA Classifiers for Bridged Ethernet

On M120 and M320 routers equipped with IQ2 PICs, you can configure BA classification based on the IEEE 802.1 bits for bridged Ethernet over Asynchronous Transfer Mode (ATM), Point-to-Point Protocol (PPP), and frame relay for VPLS applications. The BA classification is applied to the first (outer) tag when tagged frames are received. Untagged frames are bypassed and a value of 000 for the classification IEEE 802.1p bits is assumed. There is no support for circuit cross-connect (CCC), and only port-mode VPLS is supported (in port-mode VPLS, only VLANs on a single physical port are included in the VPLS instance). There is no support for multilink PPP bonding with VPLS. For bridging over frame relay, only frames that do not preserve the frame check sequence (FCS) field are supported. Frames that preserve the FCS field are silently discarded.

The bridging over PPP function is restricted:

- There is no support for “tinygram” compression and expansion.
- Frames received with preserved FCS bits are silently discarded.
- Bridge control frames are also classified based on header bit values.
- Both tagged and untagged frames are classified and forwarded. The peer must discard frame types that are not supported.

This example applies an IEEE 802.1p classifier named **ppp-ether-vpls-classifier** to an interface (**so-1/2/3**) with Ethernet VPLS over PPP encapsulation. Note that the interface and CoS configuration must be consistent to support the feature. You must also configure the classifier and other CoS parameters such as forwarding classes.

```
[edit class-of-service]
interfaces {
  so-1/2/3 {
```

```
    unit 0 {
        classifiers {
            ieee-802.1 ppp-ether-vpls-classifier;
        }
    }
}
```

```
[edit interfaces]
s0-1/2/3 {
    encapsulation ether-vpls-over-ppp;
    unit 0 {
        family vpls;
    }
}
```

On routers with IQ2 or IQ2E PICs, you can perform BA classification based on the value of the inner VLAN tag in an Ethernet frame. To configure BA classification based on the inner VLAN tag value, include the **inner** option at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers ieee-802.1 classifier-name vlan-tag]** hierarchy level. You must configure the inner VLAN tag for the logical interface with the **inner** option at the **[edit interfaces *interface-name* unit *logical-interface-name* vlan-tag]** hierarchy level.

```
[edit class-of-service interfaces ge-2/2/2 unit 0]
classifiers ieee-802.1 inner-vlan-tag-ba-classifier {
    vlan-tag inner;
}
```

Example: Configuring DSCP Classification for VPLS

The following example configures DSCP classifier **dscp_vpls** on ATM interface **at-4/1/1** with **ether-vpls-over-atm-llc** encapsulation. The classifier **dscp_vpls** is applied to the interface and the interface is listed in the VPLS routing instance **vpls1** on the ingress PE router.

1. Configure the ATM interface **at-4/1/1.0** and the encapsulation as **ether-vpls-over-atm-llc**:

```
[edit]
interfaces {
    at-4/1/1 {
        mtu 9192;
        atm-options {
            vpi 10;
        }
        unit 0 {
            encapsulation ether-vpls-over-atm-llc;
            vci 10.128;
            family vpls;
        }
    }
}
```

2. Configure the DSCP classifier **dscp_vpls**:


```
[edit]
class-of-service {
  classifiers {
    dscp dscp_vpls {
      forwarding-class expedited-forwarding {
        loss-priority low code-points 000010;
      }
    }
  }
}
```

3. Apply the classifier **dscp_vpls** to the ATM interface **at-4/1/1.0**:

```
[edit]
interfaces {
  at-4/1/1 {
    unit 0 {
      classifiers {
        dscp dscp_vpls;
      }
    }
  }
}
```

4. Include the ATM interface virtual circuit **at-4/1/1.0** as part of the routing instance **vpls1** configuration:

```
[edit]
routing-instances {
  vpls1 {
    instance-type vpls;
    interface at-4/1/1.0;
    route-distinguisher 10.255.245.51:1;
    vrf-target target:1234:1;
    protocols {
      vpls {
        site-range 10;
        no-tunnel-services;
        site vpls-1-site-1 {
          site-identifier 1;
        }
      }
    }
  }
}
```

Related Documentation

- [Understanding DSCP Classification for VPLS on page 6](#)

Example: DSCP IPv6 Rewrites and Forwarding Class Maps

You cannot configure a DSCP IPv6 rewrite rule and output forwarding class map on the same logical interface (unit). These must be used on different logical interfaces. Although a warning is issued, there is nothing in the CLI that prevents this configuration. An error message appears when you attempt to commit the configuration.

This example shows the warning and error message that results when the default DSCP IPv6 rewrite rule is configured on logical interface **ge-1/0/4.0** with output forwarding class map **vg1**.

```
[edit class-of-service]
interfaces {
  ge-1/0/4 {
    unit 0 {
      ##
      ## Warning: DSCP-IPv6 rewrite and forwarding class map not allowed on same unit
      ##
      output-forwarding-class-map vg1;
      rewrite-rules {
        dscp-ipv6 default;
      }
    }
  }
}

user@router# commit
[edit class-of-service interfaces ge-1/0/4 unit 0 output-forwarding-class-map]
'output-forwarding-class-map vg1'
DSCP-IPv6 rewrite and forwarding class map not allowed on same unit
error: commit failed: (statements constraint check failed)
```

Related Documentation

- [Applying Forwarding Classes to Interfaces](#)

Tunneling and BA Classifiers

BA classifiers can be used with GRE and IP-IP tunnels on the following routers:

- M7i and M10i routers
- M Series routers with E-FPC or EP-FPC
- M120 routers
- M320 routers
- T Series routers

When a GRE or IP-IP tunnel is configured on an incoming (core-facing) interface, the queue number and PLP information are carried through the tunnel. At the egress (customer-facing) interface, the packet is queued and the CoS bits rewritten based on the information carried through the tunnel.

If no BA classifier is configured in the incoming interface, the default classifier is applied. If no rewrite rule is configured, the default rewrite rule is applied.

Configuring Classifiers and Rewrite Rules at the Global and Physical Interface Levels

On ACX Series Universal Access Routers, CoS supports classification and rewrite at the global and physical interface levels.

To configure the global EXP classifier, include the following statements at the **[edit class-of-service] system-defaults** hierarchy level.

```
[edit class-of-service]
{
  system-defaults
  {
    classifiers exp classifier-name
  }
}
```

CoS supports one global system default classifier of the EXP type, as shown in the following example:

```
[edit class-of-service]
{
  system-defaults {
    classifiers {
      exp exp-classf-core;
    }
  }
}
```

To configure classifiers and rewrite rules at the physical interface level, include the following statements at the **[edit class-of-service] interfaces** hierarchy level.

```
[edit class-of-service]
interfaces {
  interface-name
  classifiers dscp classifier-name
  classifiers inet-precedence classifier-name
  classifiers ieee-802.1 [vlan-tag (outer | inner)] classifier-name
  rewrite-rules dscp rewrite-name
  rewrite-rules inet-prec rewrite-name
  rewrite-rules ieee-802.1 rewrite-name
}
```

The following example shows classifiers and rewrite rules configured on physical interfaces:

```
ge-0/1/0 {
  unit 0 {
    rewrite-rules {
      exp custom-exp;
    }
  }
  classifiers {
    dscp d1;
    ieee-802.1 ci;
  }
}
```

```
rewrite-rules {  
  dscp default;  
}  
}  
ge-0/1/2 {  
  classifiers {  
    ieee-802.1 ci;  
  }  
  rewrite-rules {  
    ieee-802.1 ri;  
  }  
}  
ge-0/1/3 {  
  unit 0 {  
    rewrite-rules {  
      exp custom-exp2;  
    }  
  }  
}  
ge-0/1/7 {  
  classifiers {  
    dscp dl;  
  }  
}  
ge-0/1/8 {  
  classifiers {  
    dscp dl;  
  }  
}
```

Related Documentation • [Classifiers and Rewrite Rules at the Global and Physical Interface Levels Overview on page 7](#)

CHAPTER 5

Configuration Task for DSCP IPv6 Classifiers

- [Applying DSCP IPv6 Classifiers on page 39](#)

Applying DSCP IPv6 Classifiers

For M320 and T Series routers, you can apply separate classifiers for IPv4 and IPv6 packets per logical interface by including the **classifiers** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]** hierarchy level and specifying the **dscp** and **dscp-ipv6** classifier types:

```
[edit class-of-service interfaces interface-name unit logical-unit-number]  
  classifiers dscp (classifier-name | default) family (mpls | inet);  
  classifiers dscp-ipv6 (classifier-name | default) family (mpls | inet));
```

For M Series router enhanced FPCs, you cannot apply separate classifiers for IPv4 and IPv6 packets on a single logical interface. Instead, 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. In this case, 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.

For more information, see [“Applying Classifiers to Logical Interfaces” on page 24](#). For a complex configuration example, see the Junos OS Feature Guides.

CHAPTER 6

Configuration Tasks for MPLS EXP Classifiers

- [Applying MPLS EXP Classifiers to Routing Instances on page 41](#)
- [Applying MPLS EXP Classifiers for Explicit-Null Labels on page 45](#)

Applying MPLS EXP Classifiers to Routing Instances

When you enable VRF table labels and you do not explicitly apply a classifier configuration to the routing instance, the default MPLS EXP classifier is applied to the routing instance. For detailed information about VRF table labels, see the Junos OS VPNs Configuration Guide.

The default MPLS EXP classification table contents are shown in [Table 11 on page 41](#).

Table 11: Default MPLS EXP Classification Table

Forwarding Class	Loss Priority	CoS Value
best-effort	low	000
best-effort	high	001
expedited-forwarding	low	010
expedited-forwarding	high	011
assured-forwarding	low	100
assured-forwarding	high	101
network-control	low	110
network-control	high	111

For PICs that are installed on enhanced FPCs, you can override the default MPLS EXP classifier and apply a custom classifier to the routing instance. To do this, perform the following configuration tasks:

1. Filter traffic based on the IP header by including the **vrf-table-label** statement at the **[edit routing-instances *routing-instance-name*]** hierarchy level:

```
[edit routing-instances routing-instance-name]  
vrf-table-label;
```

2. Configure a custom MPLS EXP classifier by including the following statements at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]  
classifiers {  
  exp classifier-name {  
    import (classifier-name | default);  
    forwarding-class class-name {  
      loss-priority level code-points [ aliases ] [ bit-patterns ];  
    }  
  }  
}  
forwarding-classes {  
  queue queue-number class-name priority (high | low);  
}
```

3. Configure the routing instance to use the custom MPLS EXP classifier by including the **exp** statement at the **[edit class-of-service routing-instances *routing-instance-name* classifiers]** hierarchy level:

```
[edit class-of-service routing-instances routing-instance-name classifiers]  
exp classifier-name;
```

To display the MPLS EXP classifiers associated with all routing instances, issue the **show class-of-service routing-instances** command.



NOTE: The following caveats apply to custom MPLS EXP classifiers for routing instances:

- An enhanced FPC is required.
 - Logical systems are not supported.
-

For more details, see the following sections:

- [Configuring Global Classifiers and Wildcard Routing Instances on page 42](#)
- [Examples: Applying MPLS EXP Classifiers to Routing Instances on page 43](#)

Configuring Global Classifiers and Wildcard Routing Instances

To configure a global routing instance classifier, include the **all** statement at the **[edit class-of-service routing-instances]** hierarchy level:

```
[edit class-of-service routing-instances]  
all {  
  classifiers {  
    exp classifier-name;  
  }  
}
```



```
}
```

For routing instances associated with specific classifiers, the global configuration is ignored.

To use a wildcard in the routing instance classifier configuration, include an asterisk (*) in the name of the routing instance:

```
[edit class-of-service routing-instances]
routing-instance-name* {
  classifiers {
    exp classifier-name;
  }
}
```

The wildcard configuration follows the longest match. If there is a specific configuration, it is given precedence over the wildcard configuration.



NOTE: Wildcards and the `all` keyword are supported at the `[edit class-of-service routing-instances]` hierarchy level but not at the `[edit routing-instances]` hierarchy level.

If you configure a routing instance at the `[edit routing-instances]` hierarchy level with, for example, the name `vpn*`, the Junos OS treats `vpn*` as a valid and distinct routing instance name. If you then try to apply a classifier to the `vpn*` routing instance at the `[edit class-of-service routing-instances]` hierarchy level, the Junos OS treats the `vpn*` routing instance name as a wildcard, and all the routing instances that start with `vpn` and do not have a specific classifier applied receive the classifier associated with `vpn*`. This same behavior applies with the `all` keyword.

Examples: Applying MPLS EXP Classifiers to Routing Instances

Configure a global classifier for all routing instances and override the global classifier for a specific routing instance. In this example, there are three routing instances: `vpn1`, `vpn2`, and `vpn3`, each with VRF table label enabled. The classifier `exp-classifier-global` is applied to `vpn1` and `vpn2` (that is, all but `vpn3`, which is listed separately). The classifier `exp-classifier-3` is applied to `vpn3`.

Configuring a Global Classifier

```
[edit routing-instances]
vpn1 {
  vrf-table-label;
}
vpn2 {
  vrf-table-label;
}
vpn3 {
  vrf-table-label;
}

[edit class-of-service routing-instances]
all {
```

```
classifiers {
    exp exp-classifier-global;
}
}
vpn3 {
    classifiers {
        exp exp-classifier-3;
    }
}
```

Configure a wildcard routing instance and override the wildcard with a specific routing instance. In this example, there are three routing instances: **vpn-red**, **vpn-yellow**, and **vpn-green**, each with VRF table label enabled. The classifier **exp-class-wildcard** is applied to **vpn-yellow** and **vpn-green**. The classifier **exp-class-red** is applied to **vpn-red**.

Configuring a Wildcard Routing Instance

```
[edit routing-instances]
vpn-red {
    vrf-table-label;
}
vpn-yellow {
    vrf-table-label;
}
vpn-green {
    vrf-table-label;
}

[edit class-of-service routing-instances]
vpn* {
    classifiers {
        exp exp-class-wildcard;
    }
}
vpn-red {
    classifiers {
        exp exp-class-red;
    }
}
```

Display the MPLS EXP classifiers associated with two routing instances:

Monitoring a Configuration

```
[edit class-of-service routing-instances]
vpn1 {
    classifiers {
        exp default;
    }
}
vpn2 {
    classifiers {
        exp class2;
    }
}
```

```
user@host> show class-of-service routing-instances
```

Routing Instance : vpn1			
Object	Name	Type	Index
Classifier	exp-default	exp	8

Routing Instance :	vpn2		
Object	Name	Type	Index
Classifier	class2	exp	57507

Applying MPLS EXP Classifiers for Explicit-Null Labels

When you configure MPLS explicit-null labels, label 0 is advertised to the egress router of an LSP. When label 0 is advertised, the egress router (instead of the penultimate router) removes the label. Ultimate-hop popping ensures that any packets traversing an MPLS network include a label. For more information about explicit-null labels and ultimate-hop popping, see the Junos OS MPLS Applications Configuration Guide.

On M320 and T Series routers, when you configure MPLS explicit-null labels with an MPLS EXP classifier, the MPLS EXP classifier can be different from an IPv4 or IPv6 classifier configured on the same logical interface. In other words, you can apply separate classifiers for MPLS EXP, IPv4, and IPv6 packets per logical interface. To combine an EXP classifier with a distinct IPv6 classifier, the PIC must be mounted on an Enhanced FPC.



NOTE: For J Series routers and other M Series routers, MPLS explicit-null labels with MPLS EXP classification are supported if you set the same classifier for EXP and IPv4 traffic, or EXP and IPv6 traffic.

For more information about how IPv4 and IPv6 packet classification is handled, see [“Applying DSCP IPv6 Classifiers” on page 39](#).

To configure an MPLS EXP classifiers for explicit-null labels, include the **exp** statement at the **[edit class-of-service classifiers]** and **[edit class-of-service interfaces *interface-name* unit *logical-unit-number* classifiers]** hierarchy levels:

```
[edit class-of-service classifiers]
exp classifier-name {
  import (classifier-name | default);
  forwarding-class class-name {
    loss-priority level code-points [ aliases ] [ bit-patterns ];
  }
}
[edit class-of-service interfaces interface-name unit logical-unit-number classifiers]
exp (classifier-name | default);
```


CHAPTER 7

Configuration Task for IEEE 802.1ad Classifiers

- [Configuring and Applying IEEE 802.1ad Classifiers on page 47](#)

Configuring and Applying IEEE 802.1ad Classifiers

For Juniper Network MX Series 3D Universal Edge Router interfaces or IQ2 PICs with IEEE 802.1ad frame formats, you can set the forwarding class and loss priority for traffic on the basis of the three IEEE 802.1p bits and the DEI bit. You can apply the default map or customize one or more of the default values.

You then apply the classifier to the interface on which you configure IEEE 802.1ad frame formats.

Defining Custom IEEE 802.1ad Maps

You can customize the default IEEE 802.1ad map by defining values for IEEE 802.1ad code points.

```
class-of-service {
  classifiers {
    ieee-802.1ad dot1p_dei_class {
      forwarding-class best-effort {
        loss-priority low code-points [ 0000 1101 ];
      }
    }
  }
}
```

Applying Custom IEEE 802.1ad Maps

You then apply the classifier map to the logical interface:

```
interfaces {
  ge-2/0/0 {
    unit 0 {
      classifiers {
        ieee-802.1ad dot1p_dei_class;
      }
    }
  }
}
```

}

Verifying Custom IEEE 802.1ad Map Configuration

To verify your configuration, you can issue the following operational mode commands:

- **show class-of-service forwarding-table loss-priority-map**
- **show class-of-service forwarding-table loss-priority-map mapping**
- **show chassis forwarding**
- **show pfe fwdd**

CHAPTER 8

Configuration Statements


- BA Classifier Configuration Hierarchy on page 49

BA Classifier Configuration Hierarchy

To configure BA classifiers, include the following statements at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
classifiers {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | ieee-802.1ad | inet-precedence) classifier-name {
    import (classifier-name | default);
    forwarding-class class-name {
      loss-priority level code-points [ aliases ] [ bit-patterns ];
    }
  }
}
interfaces {
  interface-name {
    unit logical-unit-number {
      classifiers {
        (dscp | dscp-ipv6 | exp | ieee-802.1 | ieee-802.1ad | inet-precedence)
        (classifier-name | default);
      }
    }
  }
}
routing-instances routing-instance-name {
  classifiers {
    exp (classifier-name | default);
  }
}
```


classifiers (Application)

Syntax	<pre>classifiers { type (classifier-name default) family (mpls inet); }</pre>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
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	<p>classifier-name—Name of the aggregate behavior classifier.</p> <p>type—Traffic type.</p> <p>Values: dscp, dscp-ipv6, exp, ieee-802.1, inet-precedence</p>
	<div> NOTE: You can only specify a family for the dscp and dscp-ipv6 types.</div>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Applying Classifiers to Logical Interfaces on page 24

classifiers (Application for Routing Instances)

Syntax	<pre> classifiers { exp (classifier-name default); dscp (classifier-name default); dscp-ipv6 (classifier-name default); } </pre>
Hierarchy Level	[edit class-of-service routing-instances <i>routing-instance-name</i>]
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>dscp and dscp-ipv6 support introduced in Junos OS Release 9.6.</p>
Description	For routing instances with VRF table labels enabled, apply a custom Multiprotocol Label Switching (MPLS) EXP classifier or DSCP classifier to the routing instance. You can apply the default classifier or one that is previously defined.
Options	classifier-name —Name of the behavior aggregate MPLS EXP or DSCP classifier.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Applying MPLS EXP Classifiers to Routing Instances on page 41 • Applying Classifiers to Logical Interfaces on page 24

classifiers (Definition)

Syntax	<pre>classifiers { type classifier-name { import (classifier-name default); forwarding-class class-name { loss-priority level code-points [aliases] [bit-patterns]; } } }</pre>
Hierarchy Level	[edit class-of-service], [edit class-of-service routing-instances <i>routing-instance-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. ieee-802.1ad option introduced in Junos OS Release 9.2.
Description	Define a CoS behavior aggregate (BA) classifier for classifying packets. You can associate the classifier with a forwarding class or code-point mapping, and import a default classifier or one that is previously defined.
	<div> NOTE: The [edit class-of-service routing-instances <i>routing-instance-name</i>] hierarchy level and the dscp-ipv6 and ieee-802.1ad classifier types are not supported on ACX Series routers.</div>
Options	classifier-name —Name of the aggregate behavior classifier. type —Traffic type: dscp , dscp-ipv6 , exp , ieee-802.1 , ieee-802.1ad , inet-precedence .
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Overview of BA Classifier Types on page 5• Example: Configuring CoS for a PBB Network on MX Series Routers• Configuring CoS on ACX Series Universal Access Routers

classifiers (Physical Interface)

Syntax	<pre>classifiers { type (classifier-name default) ; }</pre>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.
Description	Apply a CoS aggregate behavior classifier to a physical interface. You can apply a default classifier or one that is previously defined.
Options	<p>classifier-name—Name of the aggregate behavior classifier.</p> <p>type—Traffic type.</p> <p>Values: dscp, ieee-802.1, and inet-precedence</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

code-point-aliases

Syntax	<pre>code-point-aliases { type { alias-name bits; } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Define an alias for a CoS marker.
Options	<p>alias-name—Name of the code-point alias.</p> <p>bits—6-bit value of the code-point bits, in decimal form.</p> <p>type—CoS marker type.</p> <p>Values: dscp, dscp-ipv6, exp, ieee-802.1, inet-precedence</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Defining Code Point Aliases for Bit Patterns on page 22

code-points

Syntax	<code>code-points ([<i>aliases</i>] [<i>bit-patterns</i>]);</code>
Hierarchy Level	[edit class-of-service classifiers <i>type classifier-name</i> forwarding-class <i>class-name</i> loss-priority <i>level</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 8.5 for J Series devices. Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Description	Specify one or more DSCP code-point aliases or bit sets for association with a forwarding class.
Options	<i>aliases</i> —Name of the DSCP alias. <i>bit-patterns</i> —Value of the code-point bits, in six-bit binary form.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Overview of BA Classifier Types on page 5• Example: Configuring CoS for a PBB Network on MX Series Routers• Example: Configuring Behavior Aggregate Classifiers• Example: Configuring Forwarding Classes

copy-plp-all

Syntax	<code>copy-plp-all;</code>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced in Junos OS Release 10.3 on T series platforms.
Description	Enable PLP bit copying for ingress and egress for unicast and multicast traffic when traffic is ingressing one FPC and egressing the other.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• CoS Packet Classification Based on Behavior Aggregates• Packet Loss Priority Configuration Overview• Setting Packet Loss Priority on page 30

dscp (AS PIC Classifiers)

Syntax	<code>dscp (<i>alias</i> <i>bits</i>);</code>
Hierarchy Level	[edit services cos application-profile <i>profile-name</i> (ftp sip) (data video voice)], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then], [edit services cos rule <i>rule-name</i> term <i>term-name</i> then (reflexive reverse)]
Release Information	Statement introduced in Junos OS Release 8.1.
Description	Define the Differentiated Services code point (DSCP) mapping that is applied to the packets.
Options	<i>alias</i> —Name assigned to a set of CoS markers. <i>bits</i> —Mapping value in the packet header.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring Actions in a CoS Rule

dscp (Classifier on Physical Interface)

Syntax	<code>dscp (<i>classifier-name</i> default);</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> classifiers]
Release Information	Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.
Description	For ACX Series Universal Access routers, map the DSCP field of the incoming packet to the forwarding class and packet loss priority based on the specified DSCP classifier.
Options	<i>classifier-name</i> —Name of the previously defined DSCP behavior aggregate classifier. default —Default DSCP behavior aggregate classifier.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

dscp (Rewrite Rules)

Syntax	<code>dscp (rewrite-name default);</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> 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	<p>rewrite-name—Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules dscp] hierarchy level.</p> <p>default—The default mapping.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Rewrite Rules• dscp-ipv6 (Class-of-Service) on page 57• exp on page 59• exp-push-push-push• exp-swap-push-push• ieee-802.1 (Rewrite Rules on Logical Interface) on page 61• ieee-802.1ad on page 62• inet-precedence on page 64• rewrite-rules (Definition)

dscp-ipv6 (Class-of-Service)

Syntax	<code>dscp-ipv6 (<i>rewrite-name</i> <default>) { protocol mpls }</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> rewrite-rules]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For IPv6 traffic, apply a DSCP rewrite rule.
Options	<p><i>rewrite-name</i>—Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules dscp-ipv6] hierarchy level.</p> <p>default— Default mapping.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring Rewrite Rules dscp (Rewrite Rules) on page 56 exp on page 59 exp-push-push-push exp-swap-push-push ieee-802.1 (Rewrite Rules on Logical Interface) on page 61 ieee-802.1ad on page 62 inet-precedence on page 64 rewrite-rules (Definition)

dscp-ipv6 (Class-of-Service)

Syntax	<code>dscp-ipv6 (<i>rewrite-name</i> <default>) { protocol mpls }</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> rewrite-rules]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For IPv6 traffic, apply a DSCP rewrite rule.
Options	<p><i>rewrite-name</i>—Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules dscp-ipv6] hierarchy level.</p> <p>default— Default mapping.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Rewrite Rules• dscp (Rewrite Rules) on page 56• exp on page 59• exp-push-push-push• exp-swap-push-push• ieee-802.1 (Rewrite Rules on Logical Interface) on page 61• ieee-802.1ad on page 62• inet-precedence on page 64• rewrite-rules (Definition)

exp

Syntax	<code>exp (rewrite-name default) protocol protocol-types;</code>
Hierarchy Level	<code>[edit class-of-service interfaces interface-name unit logical-unit-number rewrite-rules]</code>
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	<p>rewrite-name—Name of a rewrite-rules mapping configured at the <code>[edit class-of-service rewrite-rules exp]</code> hierarchy level.</p> <p>default—The default mapping.</p> <p>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 <code>[edit class-of-service interfaces interface interface-name unit logical-unit-number rewrite-rules exp rewrite-rule-name protocol]</code> hierarchy level. The IP precedence rewrite rules explanation does not apply to ACX Series Universal Access routers.</p> <p>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.</p> <p>The remaining statement is explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Rewriting the EXP Bits of All Three Labels of an Outgoing Packet • dscp (Rewrite Rules) on page 56 • dscp-ipv6 (Class-of-Service) on page 57 • exp-push-push-push • exp-swap-push-push • ieee-802.1 (Rewrite Rules on Logical Interface) on page 61 • ieee-802.1ad on page 62 • inet-precedence on page 64

- [rewrite-rules \(Definition\)](#)

[forwarding-class \(BA Classifiers\)](#)

Syntax	<code>forwarding-class <i>class-name</i> { <code>loss-priority level code-points</code> [<i>aliases</i>] [<i>bit-patterns</i>]; }</code>
Hierarchy Level	<code>[edit class-of-service classifiers <i>type classifier-name</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Define forwarding class name and option values.
Options	<i>class-name</i> —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	<ul style="list-style-type: none">• Defining Classifiers on page 21• Example: Configuring CoS for a PBB Network on MX Series Routers

[ieee-802.1 \(Classifier on Physical Interface\)](#)

Syntax	<code>ieee-802.1 (<i>classifier-name</i> default) vlan-tag (inner outer);</code>
Hierarchy Level	<code>[edit class-of-service interfaces <i>interface-name</i><code>classifiers</code>]</code>
Release Information	Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.
Description	For ACX Series Universal Access routers, map the ieee-802.1p field of the incoming packet to the forwarding class and packet loss priority based on the specified 802.1p classifier. In the case of double tagged packets, you can configure whether to use the 802.1p of the outer or inner VLAN tag.
Options	<i>vlan-tag inner</i> —In the case of double tagged packets, classify based on the 802.1p of the inner VLAN tag. <i>vlan-tag outer</i> —Classify based on the 802.1p of the outermost VLAN tag. <i>classifier-name</i> —Name of the previously defined ieee-802.1p behavior aggregate classifier. <i>default</i> —Default ieee-802.1p behavior aggregate classifier.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.

ieee-802.1 (Rewrite Rules on Logical Interface)

Syntax	<code>ieee-802.1 (<i>rewrite-name</i> default) vlan-tag (outer outer-and-inner);</code>
Hierarchy Level	<code>[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> rewrite-rules]</code>
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	<p><i>rewrite-name</i>—Name of a rewrite-rules mapping configured at the <code>[edit class-of-service rewrite-rules ieee-802.1]</code> hierarchy level.</p> <p>default—The default mapping.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring Rewrite Rules Example: Configuring CoS for a PBB Network on MX Series Routers dscp (Rewrite Rules) on page 56 dscp-ipv6 (Class-of-Service) on page 57 exp on page 59 exp-push-push-push exp-swap-push-push ieee-802.1ad on page 62 inet-precedence on page 64 rewrite-rules (Definition)

ieee-802.1ad

Syntax	ieee-802.1ad (<i>rewrite-name</i> default) vlan-tag (outer outer-and-inner);
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> rewrite-rules]
Release Information	Statement introduced in Junos OS Release 9.2.
Description	Apply a IEEE-802.1ad rewrite rule.
Options	<p>rewrite-name—Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules ieee-802.1ad] hierarchy level.</p> <p>default—The default rewrite bit mapping.</p> <p>vlan-tag—The rewrite rule is applied to the outer or outer-and-inner VLAN tag.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Rewrite Rules• Example: Configuring CoS for a PBB Network on MX Series Routers• dscp (Rewrite Rules) on page 56• dscp-ipv6 (Class-of-Service) on page 57• exp on page 59• exp-push-push-push• exp-swap-push-push• ieee-802.1 (Rewrite Rules on Logical Interface) on page 61• inet-precedence on page 64• rewrite-rules (Definition)

import (Classifiers)

Syntax	<code>import (classifier-name default);</code>
Hierarchy Level	<code>[edit class-of-service classifiers type classifier-name]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify a default or previously defined classifier.
Options	<p>classifier-name—Name of the classifier mapping configured at the <code>[edit class-of-service classifiers]</code> hierarchy level.</p> <p>default—The default classifier mapping.</p>
Required Privilege Level	<p><code>interface</code>—To view this statement in the configuration.</p> <p><code>interface-control</code>—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Overview of BA Classifier Types on page 5

inet-precedence

Syntax	<code>inet-precedence (<i>rewrite-name</i> default);</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> rewrite-rules]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Apply a IPv4 precedence rewrite rule.
Options	<p><i>rewrite-name</i>—Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules inet-precedence] hierarchy level.</p> <p>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.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Rewrite Rules• dscp (Rewrite Rules) on page 56• dscp-ipv6 (Class-of-Service) on page 57• exp on page 59• exp-push-push-push• exp-swap-push-push• ieee-802.1 (Rewrite Rules on Logical Interface) on page 61• ieee-802.1ad on page 62• rewrite-rules (Definition)

inet-precedence (Classifier on Physical Interface)

Syntax	<code>inet-precedence (<i>classifier-name</i> default);</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> classifiers]
Release Information	Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.
Description	On ACX Series Universal Access routers, map the inet-precedence field of the incoming packet to the forwarding class and packet loss priority, based on the specified inet-precedence classifier. When no classifier is configured on the physical interface, the default ipprec-compatibility inet-precedence classifier is applied on the physical interface.
Options	<i>classifier-name</i> —Name of the previously defined inet-precedence behavior aggregate classifier. default —Default inet-precedence behavior aggregate classifier.
Required Privilege Level	interface —To view this statement in the configuration. interface-control —To add this statement to the configuration.

interfaces

```
Syntax interfaces {
    interface-name {
        classifiers{
            dscp(classifier-name | default) {
            }
            ieee-802.1 (classifier-name | default) vlan-tag (inner | outer | classifier-name);
            inet-precedence (rewrite-name | default);
        }
        input-scheduler-map map-name;
        input-shaping-rate rate;
        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);
                }
            }
        }
        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 {
                type (classifier-name | default) family (mpls | inet);
            }
            forwarding-class class-name;
            fragmentation-map map-name;
            input-shaping-rate (percent percentage | rate);
            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;
    translation-table (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 | to-exp-from-exp
    | to-inet-precedence-from-inet-precedence) table-name;
  }
}
interface-set interface-set-name {
  excess-bandwidth-share;
  internal-node;
  output-traffic-control-profile profile-name;
  output-traffic-control-profile-remaining profile-name;
}
}

```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.
Interface-set level added in Junos OS Release 8.5.

Description Configure interface-specific CoS properties for incoming packets.



NOTE: The `dscp-ipv6` and `ieee-802.1ad` classifier types are not supported on ACX Series routers. For further information about support on ACX Series routers, see [Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers](#).

Options 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 on page 5](#)
- Configuring Rewrite Rules
- Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers

loss-priority (BA Classifiers)

Syntax	loss-priority <i>level</i> ;
Hierarchy Level	[edit class-of-service classifiers <i>type classifier-name</i> forwarding-class <i>class-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	Specify packet loss priority value for a specific set of code-point aliases and bit patterns.
Options	<i>level</i> can be one of the following: <ul style="list-style-type: none">• high—Packet has high loss priority.• medium-high—Packet has medium-high loss priority.• medium-low—Packet has medium-low loss priority.• low—Packet has low loss priority.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Overview of BA Classifier Types on page 5• Example: Configuring CoS for a PBB Network on MX Series Routers• Configuring Tricolor Marking

routing-instances (Class of Service)

Syntax	<pre> routing-instances <i>routing-instance-name</i> { classifiers { dscp (<i>classifier-name</i> default); dscp-ipv6 (<i>classifier-name</i> default); exp (<i>classifier-name</i> default); } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For routing instances with VRF table labels enabled, apply a custom MPLS EXP classifier or DSCP classifier to the routing instance. You can apply the default MPLS EXP classifier or one that is previously defined.
Default	If you do not include this statement, the default MPLS EXP classifier is applied to the routing instance. When no DSCP classifier is configured, the default MPLS EXP classifier is applied.
Options	<p><i>routing-instance-name</i>—Name of a routing instance.</p> <p><i>classifier-name</i>—Name of the behavior aggregate MPLS EXP classifier or DSCP classifier.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> Configuring Forwarding Classes Applying Custom MPLS EXP Classifiers to Routing Instances in Layer 3 VPNs

system-defaults

Syntax `system-defaults {
 classifiers{
 type classifier-name;
 }
 }`

Hierarchy Level [edit class-of-service]

Release Information Statement introduced in Junos OS release 12.2

Description Define a CoS classifier to support global classifiers.

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

type—Traffic type: dscp, dscp-ipv6, or exp.



.....
NOTE: The **dscp** and **dscp-ipv6** classifier types are not supported on ACX Series routers.
.....

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

Related Documentation • Configuring CoS on ACX Series Universal Access Routers

unit

Syntax	<pre> unit <i>logical-unit-number</i> { classifiers { type (<i>classifier-name</i> default) family (mpls all); } forwarding-class <i>class-name</i>; fragmentation-map <i>map-name</i>; input-traffic-control-profile <i>profile-name</i> shared-instance <i>instance-name</i>; output-traffic-control-profile <i>profile-name</i> shared-instance <i>instance-name</i>; per-session-scheduler; rewrite-rules { dscp (<i>rewrite-name</i> default); dscp-ipv6 (<i>rewrite-name</i> default); exp (<i>rewrite-name</i> default) protocol <i>protocol-types</i>; exp-push-push-push default; exp-swap-push-push default; ieee-802.1 (<i>rewrite-name</i> default) vlan-tag (outer outer-and-inner); inet-precedence (<i>rewrite-name</i> default); } scheduler-map <i>map-name</i>; shaping-rate <i>rate</i>; } </pre>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i>]
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	<p><i>logical-unit-number</i>—Number of the logical unit.</p> <p>Range: 0 through 16,384</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Overview of BA Classifier Types on page 5 • Configuring Rewrite Rules

PART 3

Index

- [Index on page 75](#)

Index

Symbols

#, comments in configuration statements.....	xii
(), in syntax descriptions.....	xii
< >, in syntax descriptions.....	xii
[], in configuration statements.....	xii
{ }, in configuration statements.....	xii
(pipe), in syntax descriptions.....	xii

B

BA classifiers	
bridging.....	33
inner VLAN tag.....	33
braces, in configuration statements.....	xii
brackets	
angle, in syntax descriptions.....	xii
square, in configuration statements.....	xii
bridging	
BA classifiers.....	33

C

classification	
behavior aggregate.....	3
applying DSCP IPv6 to an interface.....	39
applying MPLS EXP to routing	
instances.....	41
applying to an interface.....	24
default forwarding classes and loss	
priorities.....	5
defining custom.....	21
example configuration.....	30, 43
global classifiers.....	42
overriding the default PLP.....	30
types of BA classifiers.....	5
wildcard routing instances.....	42
for IEEE 802.1ad traffic.....	47
multifield	
example configuration.....	30

classification and rewrite	
at global and physical interface levels, example	
configuration.....	37
at global and physical interface levels,	
overview.....	7
classifiers statement	
usage guidelines.....	5, 41
code-point aliases.....	9, 13
code-point-aliases statement.....	53
usage guidelines.....	9
code-points statement.....	54
usage guidelines.....	5
comments, in configuration statements.....	xii
conventions	
text and syntax.....	xi
copy-plp-all statement.....	54
CoS	
for IEEE 802.1ad.....	47
curly braces, in configuration statements.....	xii
customer support.....	xiii
contacting JTAC.....	xiii

D

DiffServ.....	9, 13
documentation	
comments on.....	xiii
DSCP.....	9, 13
for VPLS.....	6
for VPLS, example.....	34
DSCP IPv6	
rewrites and forwarding class maps.....	35
dscp statement	
usage guidelines.....	5, 21
dscp-ipv6 statement.....	57, 58
usage guidelines.....	5, 21

E

exp statement.....	59
usage guidelines.....	5, 21
explicit-null statement	
with MPLS EXP classifiers.....	45

F

font conventions.....	xi
forwarding class maps	
DSCP IPv6 rewrites.....	35

I

IEEE 802.1ad	
CoS classification of traffic.....	47
ieee-802.1 statement	
classifier on physical interface.....	60
rewrite rules on logical interface.....	61
ieee-802.1ad statement.....	62
import statement	
usage guidelines.....	5
inet-precedence statement.....	64
usage guidelines.....	5, 21
interfaces	
CoS classifiers on.....	5
interfaces statement	
CoS.....	66
IPv6	
DSCP rewrites and forwarding class maps.....	35

L

loss-priority statement	
usage guidelines.....	5

M

manuals	
comments on.....	xiii
MPLS EXP classifiers	
for explicit-null labels.....	45
routing instances.....	41
example configuration.....	43

P

parentheses, in syntax descriptions.....	xii
PICs	
ToS translation.....	7

R

rewrites	
DSCP IPv6 and forwarding class maps.....	35
routing instances	
MPLS EXP classifier.....	41
example configuration.....	43
routing-instance statement	
usage guidelines.....	41
routing-instances statement.....	69
usage guidelines.....	41

S

support, technical See technical support	
syntax conventions.....	xi

system-defaults statement.....	70
--------------------------------	----

T

technical support	
contacting JTAC.....	xiii

U

unit statement	
CoS.....	71
usage guidelines.....	5

V

VLAN tag	
BA classifiers.....	33
VPLS	
BA classifiers.....	33
with DSCP.....	6
with DSCP, example.....	34