

# Class of Service Using IPv6 DiffServ

Release

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## PART 1

# Overview

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## CHAPTER 1

# Product Overview

- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [Default DHCP Mappings on page 5](#)
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### Overview of Class of Service Using IPv6 DiffServ

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Class of service (CoS) is the assignment of traffic flows to different service levels. Service providers can use router-based CoS features to define service levels that provide different delay, jitter (delay variation), and packet loss characteristics to particular applications served by specific traffic flows.

Usually, IP routers forward packets independently and without any control on throughput or delay. This is known as *best-effort* service. This service is as good as the network equipment and links, and the result is satisfactory for many traditional IP applications emphasizing data delivery, such as e-mail or Web browsing. However, newer IP applications such as real-time video and audio (or voice) require lower delay, jitter, and loss parameters than simple best-effort networks can provide. CoS is intended for networks supporting these types of time-sensitive video and audio applications.

A router cannot compromise best-effort forwarding performance in order to deliver CoS features, because this merely trades one problem for another. When CoS features are enabled, they must allow routers to better process critical packets as well as best-effort traffic flows, even during times of congestion. Network throughput is determined by a combination of available bandwidth and delay. CoS guarantees a minimum bandwidth dedicated to a service class.

The main impact of CoS on network delay is in queueing delays, when packets are normally queued for output in the order of arrival, regardless of service class. Queueing delays increase with network congestion and often result in lost packets when queue buffers overflow. The other two elements of overall network delay, serial transmission delays determined by link speeds and propagation delays determined by media type, are not affected by CoS settings.

Any CoS implementation must work consistently end to end through the network. A standards-based, vendor-neutral CoS implementation satisfies this requirement best.

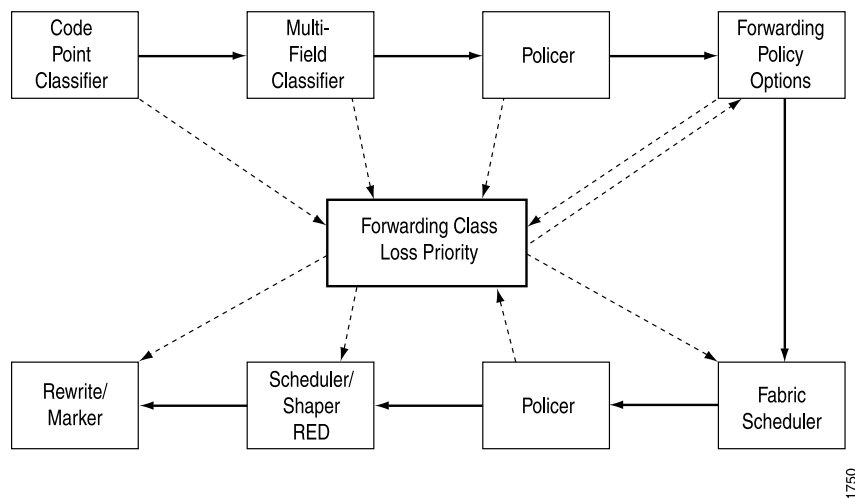
Juniper Networks CoS features interoperate with other vendors' CoS implementations because they are based on IETF Differentiated Services (DiffServ) standards.

DiffServ specifications establish a six-bit field in the IPv4 and IPv6 packet header to indicate the service class that should be applied to the packet. The bit values in the DiffServ field form DiffServ code points (DSCPs) that can be set by the application or a router on the edge of a DiffServ-enabled network.

Although CoS methods such as DiffServ specify the position and length of the DSCP in the packet header, the implementation of the router mechanisms to deliver DiffServ internally is vendor-specific. CoS functions in Junos OS are configured through a series of mechanisms that you can configure individually or in combination to define particular service offerings.

Figure 1 on page 4 shows the components of the Junos CoS features, illustrating the sequence in which they interact.

**Figure 1: Packet Flow Through CoS-Configurable Components**



You can configure one or more of the following Junos CoS mechanisms:

- **Classifiers**—Allow you to associate incoming packets with a forwarding class and packet loss priority (PLP). Two general types of classifiers are supported:
  - Behavior aggregate (BA) or code point traffic classifiers allow you to set the forwarding class and PLP based on DSCP.
  - Multifield (MF) traffic classifiers allow you to set the forwarding class and PLP based on firewall filter rules. This is usually done at the edge of the network for packets that do not have valid DSCPs in the packet headers.
- **Forwarding classes**—Allow you to set the scheduling and marking of packets as they transit the router. Known as ordered aggregates in the DiffServ architecture, the forwarding class plus the loss priority determine the router's per-hop behavior (PHB in DiffServ) for CoS.

- Loss priorities—Allow you to set the priority of dropping a packet before it is sent. Loss priority affects the scheduling of a packet without affecting the packet's relative ordering.
- Forwarding policy options—Allow you to associate forwarding classes with next hops. Forwarding policy options also allow you to create classification overrides, which assign forwarding classes to sets of prefixes.
- Transmission scheduling and rate control—Provide you with a variety of tools to manage traffic flows:
  - Schedulers—Allow you to define the priority, bandwidth, delay buffer size, rate control status, and RED drop profiles to be applied to a particular forwarding class for packet transmission.
  - Fabric schedulers—For M120, M320, and T Series routers only, fabric schedulers allow you to identify a packet as high or low priority based on its forwarding class, and to associate schedulers with the fabric priorities.
  - Policers for traffic classes—Allow you to limit traffic of a certain class to a specified bandwidth and burst size. Packets exceeding the policer limits can be discarded, or can be assigned to a different forwarding class or to a different loss priority, or to both. You define policers with filters that can be associated with input or output interfaces.
- Rewrite markers—Allow you to redefine the DSCP value of outgoing packets. Rewriting or marking outbound packets is useful when the router is at the border of a network and must alter the code points to meet the policies of the targeted peer.

Typically, rewrites of the DSCPs on outgoing packets are done once, when packets enter the DiffServ portion of the network, either because the packets do not arrive from the customer with the proper DSCP bit set or because the service provider wishes to verify that the customer has set the DSCP properly. CoS schemes that accept the DSCP and classify and schedule traffic solely on DSCP value perform behavior aggregate (BA) DiffServ functions and do not usually rewrite the DSCP. DSCP rewrites typically occur in multifield (MF) DiffServ scenarios.

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Default DHCP Mappings

[Table 1 on page 6](#) shows the mapping of DiffServ service class meanings (aliases) to DSCPs.

Table 1: Default DSCP Mappings

DiffServ Service Class Alias	IPv4 and IPv6 DSCP Mapping
ef	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	000000
cs1	001000
cs2	010000
cs3	011000
cs4	100000
cs5	101000
nc1/cs6	110000
nc2/cs7	111000



None of the aliases are established by DiffServ specifications. The aliases are well-known only through usage. For example, it is widely accepted that the alias for DSCP **101110** is **ef** (expedited forwarding). The 21 well-known DSCPs establish 5 DiffServ service classes:

- **Best-effort (be)**—The router does not apply any special CoS handling to packets with **000000** in the DiffServ field, a backward compatibility feature. There is usually a high probability that these packets will be dropped under congested network conditions.
- **Assured forwarding (af)**—The router offers a high level of assurance that the packets are delivered as long as the packet flow from the customer stays within a certain service profile (the service provider defines the values). The router accepts excess traffic, but applies a random early discard (RED) drop profile to decide if the excess packets should be dropped and not forwarded. Three drop probabilities (low, medium, and high) are defined for this service class.
- **Expedited forwarding (ef)**—The router delivers assured bandwidth, low loss, low delay, and low delay variation (jitter) end-to-end for packets in this service class. Routers accept excess traffic in this class, but in contrast to assured forwarding, out-of-profile expedited-forwarding packets can be forwarded out of sequence or dropped.
- **Conversational services (cs)**—The router delivers assured (usually low) bandwidth with low delay and jitter for packets in this service class. Packets can be dropped, but never delivered out of sequence. Packetized voice is a good example of a conversational service.
- **Network control (nc)**—The router delivers packets in this service class with a low priority (these packets are not delay-sensitive). Typically, these packets represent routing protocol hello or keepalive messages and loss of these packets jeopardizes proper network operation, so delay is preferable to discard.

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Default Forwarding Classes

Table 2 on page 7 shows the default forwarding class and packet loss priority (PLP) for the well-known DSCPs. It is important to note that although several DSCPs map to the **expedited-forwarding** and **assured-forwarding** classes, by default no resources are assigned to these forwarding classes. All of these settings can be changed through configuration.

**Table 2: Default Behavior Aggregate Classification**

DSCP and DSCP IPv6	Forwarding Class	PLP
ef	expedited-forwarding	low

Table 2: Default Behavior Aggregate Classification (*continued*)

DSCP and DSCP IPv6	Forwarding Class	PLP
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

Table 3 on page 9 shows the router forwarding classes associated with each well-known DSCP code point and the resources assigned to their output queues.

Table 3: Classification Forwarding Classes and Queues

DCSP Alias	DSCP Bits	Forwarding Class	PLP	Queue
ef	101110	expedited-forwarding	low	1
af11	001010	assured-forwarding	low	2
af12	001100	assured-forwarding	high	2
af13	001110	assured-forwarding	high	2
af21	010010	best-effort	low	0
af22	010100	best-effort	low	0
af23	010110	best-effort	low	0
af31	011010	best-effort	low	0
af32	011100	best-effort	low	0
af33	011110	best-effort	low	0
af41	100010	best-effort	low	0
af42	100100	best-effort	low	0
af43	100110	best-effort	low	0
be	000000	best-effort	low	0
cs1	001000	best-effort	low	0
cs2	010000	best-effort	low	0
cs3	011000	best-effort	low	0
cs4	100000	best-effort	low	0
cs5	101000	best-effort	low	0
nc1/cs6	110000	network-control	low	3
nc2/cs7	111000	network-control	low	3
other	—	best-effort	low	0

Table 4 on page 10 shows the resources assigned to the four forwarding classes in this example.

Table 4: Resources Assigned to Queues

Queue	Forwarding Class	Transmit Rate	Buffer Size	Priority
0	<b>be</b> (data)	40%	40%	Low
1	<b>ef</b> (financial)	10%	10%	High
2	<b>af</b> (audiovisual)	45%	45%	High (with RED)
3	<b>nc</b> (network control)	5%	5%	Low

The table shows how the 95 percent of output link transmission rate and buffer size (queue) resources assigned by default to Q0 (best-effort) are distributed to Q1 (expedited forwarding) and Q2 (assured forwarding). The audiovisual traffic consumes more bandwidth than other applications, but the financial information, although critical, is carried in fewer packets. In keeping with DiffServ specifications, a RED drop profile is applied to the assured forwarding class. The financial data has a strict set of traffic parameters that must be respected.

The three DiffServ assured forwarding classes supported (**af11**, **af12**, and **af13**, with low, medium, and high packet drop probability, respectively) are distinguished by using a low PLP and RED drop profile for **af11** and a high PLP and RED for **af12** and **af13**. All of these parameters should be closely monitored initially for performance and adjusted as necessary.

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Juniper Networks Default Forwarding Classes

Most M Series routers have only four queues built into the hardware. M120, M320, MX Series, and T Series routers can be configured for up to eight queues. If a classifier does not assign a packet to any other queue (for example, for other than well-known DSCPs that have not been added to the classifier), the packet is assigned by default to the class associated with queue 0 (Q0).

[Table 5 on page 11](#) shows the four forwarding classes and queues to which Juniper Networks classifiers assign a packet based on the DSCP values in arriving packet headers.

Table 5: Default Forwarding Classes

Forwarding Class Name	Queue
best-effort	queue 0
expedited-forwarding	queue 1
assured-forwarding	queue 2
network-control	queue 3

Each forwarding class has an associated scheduler priority. Only two forwarding classes, **best-effort** and **network-control** (Q0 and Q3), are actually referenced in the default scheduler configuration. However, you can manually configure resources for the **expedited-forwarding** and **assured-forwarding** classes (Q1 and Q2).

The default scheduler settings are not visible in the output of the **show class-of-service** command; rather, they are implicit.

#### Default Scheduler

```
[edit class-of-service]
schedulers {
  network-control {
    transmit-rate percent 5;
    buffer-size percent 5;
    priority low;
    drop-profile-map loss-priority any protocol any;
    drop-profile terminal;
  }
  best-effort {
    transmit-rate percent 95;
    buffer-size percent 95;
    priority low;
    drop-profile-map loss-priority any protocol any;
    drop-profile terminal;
  }
}
drop-profiles {
  terminal {
    fill-level 100 drop-probability 100;
  }
}
```

By default, the **best-effort** forwarding class (Q0) receives 95 percent of the output link bandwidth and buffer space, and the **network-control** forwarding class (Q3) receives 5 percent of the output link bandwidth and buffer space. The default drop profile provides *tail drop*, where the buffer fills and then discards all packets until there is space in the buffer again. There are no schedulers for the **expedited-forwarding** or **assured-forwarding** classes because by default no resources are assigned to Q1 and Q2.

All **af** classes other than **af1x** are mapped to **best-effort**, since RFC 2597 prohibits a node from aggregating classes. In effect, mapping to **best-effort** implies that the node does not support that class.

**Related  
Documentation**

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
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## CHAPTER 2

# System Requirements

- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)

### System Requirements for CoS with DiffServ for IPv6

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To implement CoS with DiffServ for IPv6, your system must meet these minimum requirements:

- Junos OS Release 8.2 or later for MX Series routers
- Junos OS Release 6.3 or later for M Series and T Series routers
- Three Juniper Networks M Series, MX Series, or T Series routers
- For M Series routers, Enhanced FPCs capable of supporting DSCPs and, for MF classifiers, Internet Processor II ASICs

#### **Related Documentation**

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
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## CHAPTER 3

# Glossary

- [Terms and Acronyms for CoS with DiffServ for IPv6 on page 15](#)

## Terms and Acronyms for CoS with DiffServ for IPv6

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### C

<b>class of service</b>	A set of forwarding class parameters that define different treatment for different traffic flows.
<b>classifier</b>	A method of reading a sequence of bits in a packet header or label and determining the packet's forwarding class.

### D

<b>Differentiated Services (DiffServ)</b>	A standards-based method of associating CoS parameters with traffic flows and their forwarding classes.
<b>Differentiated Services code point (DSCP)</b>	Values for a 6-bit field defined for IPv4 and IPv6 packet headers that can be used to enforce CoS distinctions in routers.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Class of Service Using IPv6 DiffServ</a></li><li>• <a href="#">Overview of Class of Service Using IPv6 DiffServ on page 3</a></li><li>• <a href="#">System Requirements for CoS with DiffServ for IPv6 on page 13</a></li><li>• <a href="#">Roadmap for Configuring CoS with IPv6 DiffServ on page 21</a></li><li>• <a href="#">Example: CoS with IPv6 DiffServ Configuration on page 33</a></li></ul>



## CHAPTER 4

# Standards

- [For More Information about CoS using DiffServ and IPv6 on page 17](#)

### [For More Information about CoS using DiffServ and IPv6](#)

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For additional information about CoS using DiffServ and IPv6, see the following:

- RFC 1924, *A Compact Representation of IPv6 Addresses*
- RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*
- RFC 2475, *An Architecture for Differentiated Services*
- RFC 2640, *Internet Protocol, Version 6 (IPv6) Specification*
- RFC 2983, *Differentiated Service and Tunnels*
- RFC 3260, *New Terminology and Clarifications for DiffServ*
- RFC 3317, *Differentiated Services Quality of Service Policy Information Base*
- RFC 3513, *IP Version 6 Addressing Architecture*

#### **Related Documentation**

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)



## PART 2

# Configuration

- [Configuration Overview on page 21](#)
- [Configuration Steps on page 23](#)



## CHAPTER 5

# Configuration Overview

- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)

### Roadmap for Configuring CoS with IPv6 DiffServ

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To configure class of service (CoS) over IPv6, you must:

- Configure a multifield (MF) classifier for IPv6 to detect packets of interest to CoS and assign the packet to the proper forwarding class independently of Differentiated Services Code Point (DSCP). See [“Configuring a Firewall Filter for an MF Classifier on Customer Interfaces” on page 23](#).

Next, apply the MF classifier to the appropriate interface. See [“Applying the Firewall Filter to Customer Interfaces” on page 24](#).

- Assign the forwarding classes established by the MF classifier to output queues. See [“Assigning Forwarding Classes to Output Queues” on page 27](#).
- Configure rewrite rules to replace DSCPs on packets received from the customer with the values expected by other routers. See [“Configuring Rewrite Rules” on page 27](#).

Next, apply the rewrite rules to the appropriate interface. See [“Applying Rewrite Rules to an Interface” on page 26](#).

- Configure behavior aggregate (BA) classifiers for IPv6 on network interfaces because the DSCPs have been explicitly rewritten on the edge routers. See [“Configuring BA Classifiers” on page 25](#).

Next, apply the BA classifier to the appropriate interface. See [“Applying a BA Classifier to an Interface” on page 26](#).

- Configure random early discard (RED) drop profiles to determine the probability of DiffServ assured forwarding packets being discarded under congested conditions. See [“Configuring RED Drop Profiles” on page 28](#).
- Configure schedulers to assign resources, priorities, and drop profiles to output queues. See [“Configuring Schedulers” on page 28](#).
- Configure a scheduler map to assign a forwarding class to a scheduler. See [“Configuring Scheduler Maps” on page 29](#).

Next, apply the scheduler map to the appropriate interface. See [“Applying a Scheduler Map to an Interface” on page 30](#).

**Related  
Documentation**

- [Class of Service Using IPv6 DiffServ](#)
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## CHAPTER 6

# Configuration Steps

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### Configuring a Firewall Filter for an MF Classifier on Customer Interfaces

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You configure an MF classifier for IPv6 to detect packets of interest to CoS and assign the packet to the proper forwarding class independently of DSCP. To configure an MF classifier on a customer-facing link, configure a policer for the expedited forwarding traffic and a firewall filter to classify traffic.

```
[edit firewall]
policer ef-FIN-Policer-Profile {
  if-exceeding {
    bandwidth-percent 10;
    burst-size-limit 2k;
  }
  then loss-priority high;
}
family inet6 {
  filter mf-classifier {
    filter-specific;
    term AV {
      from {
        destination-address {
          0:0:FFFF:172.16.79.11;
        }
      }
    }
  }
}
```

```
        then {
            loss-priority low;
            forwarding-class af-AV-class;
        }
    }
    term Finance {
        from {
            destination-address {
                O:0:FFFF:172.16.79.63;
            }
        }
        then {
            policer ef-FIN-Policer-Profile;
            forwarding-class ef-FIN-class;
        }
    }
    term Network-Control {
        from {
            traffic-class 192; # 192 is the 110000 traffic class.
        }
        then {
            forwarding-class nc-CONTROL-class; # This is network control traffic.
        }
    }
    term Data {
        then forwarding-class be-DATA-class; # The rest is data.
    }
}
}
```

**Related Documentation**

- [Applying the Firewall Filter to Customer Interfaces on page 24](#)
- [Class of Service Using IPv6 DiffServ](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

---

## Applying the Firewall Filter to Customer Interfaces

You apply an MF classifier firewall filter for IPv6 to customer interfaces. To apply an MF classifier firewall filter on customer-facing links, apply the classifier as an input filter at the **[edit interfaces]** hierarchy level.

```
[edit interfaces]
so-0/0/1 {
    unit 0 {
        family inet {
            address 192.168.54.1/24;
        }
        family inet6 {
            filter {
```

```

        input mf-classifier;
    }
    address 0:0:FFFF:192.168.54.1/120;
}
}
}

```

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Configuring a Firewall Filter for an MF Classifier on Customer Interfaces on page 23](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Configuring BA Classifiers

You configure BA classifiers for IPv6 on network interfaces because the DSCPs have been explicitly rewritten on the edge routers. To configure a BA classifier for IPv6 DSCPs, include the **dscp-ipv6** statement and give the classifier a name. Then import the default classifier and specify the forwarding class, loss priority, and code points for each established traffic class at the **[edit class-of-service]** hierarchy level.

```

[edit class-of-service]
classifiers {
  dscp-ipv6 IPv6-classifier {
    import default; # Uses the DSCP default map.
    forwarding-class be-DATA-class {
      loss-priority high code-points 000001;
    }
    forwarding-class ef-FIN-class {
      loss-priority high code-points 101111;
    }
    forwarding-class af-AV-class {
      loss-priority high code-points 001100;
    }
    forwarding-class nc-CONTROL-class {
      loss-priority high code-points 110001;
    }
  }
}

```

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Applying a BA Classifier to an Interface on page 26](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Applying a BA Classifier to an Interface

---

To apply the configured classifier, include the **classifiers** statement at the **[edit class-of-service interfaces]** hierarchy level.

```
[edit class-of-service interfaces]
so-0/1/1 {
  unit 0 {
    classifiers {
      dscp-ipv6 IPv6-classifier;
    }
  }
}
```

### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Configuring BA Classifiers on page 25](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Applying Rewrite Rules to an Interface

---

To apply the configured rewrite rules, include the **rewrite-rules** statement at the **[edit class-of-service interfaces]** hierarchy level.

```
[edit class-of-service interfaces]
so-0/1/1 {
  unit 0 {
    rewrite-rules {
      dscp-ipv6 rewrite-IPv6-dscps;
    }
  }
}
```

### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Configuring Rewrite Rules on page 27](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Configuring Rewrite Rules

You configure rewrite rules to replace DSCPs on packets received from the customer with the values expected by other routers. Rewrite rules use the forwarding class information and packet loss priority (PLP) used internally by the router to establish the DSCP on outbound packets. To configure rewrite rules, include the **rewrite-rules** statement at the **[edit class-of-service]** hierarchy level.

```
[edit class-of-service]
rewrite-rules rewrite-IPv6-dscps {
  forwarding-class be-DATA-class {
    loss-priority low code points 000000;
    loss-priority high code points 000001;
  }
  forwarding-class ef-FIN-class {
    loss-priority low code points 101110;
    loss-priority high code points 101111;
  }
  forwarding-class af-AV-class {
    loss-priority low code points 001010;
    loss-priority high code points 001100;
  }
  forwarding-class nc-CONTROL-class {
    loss-priority low code points 110000;
    loss-priority high code points 110001;
  }
}
```

### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Applying Rewrite Rules to an Interface on page 26](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Assigning Forwarding Classes to Output Queues

You must assign the forwarding classes established by the MF classifier to output queues. To assign a forwarding class to an output queue, include the **forwarding-classes** statement at the **[edit class-of-service]** hierarchy level.

```
[edit class-of-service]
forwarding-classes {
  queue 0 be-DATA-class;
  queue 1 ef-FIN-class;
  queue 2 af-AV-class;
  queue 3 nc-CONTROL-class;
}
```

**Related Documentation**

- [Class of Service Using IPv6 DiffServ](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

---

## Configuring RED Drop Profiles

You configure RED drop profiles to determine the probability of DiffServ assured forwarding packets being discarded under congested conditions. To configure RED drop profiles for assured forwarding without the PLP bit set and with the PLP bit set, include the **drop-profiles** statement at the **[edit class-of-service]** hierarchy level.

```
[edit class-of-service]
drop-profiles {
  af-AV-normal {
    interpolate {
      fill-level [95 100];
      drop-probability [0 100];
    }
  }
  af-AV-with-PLP {
    interpolate {
      fill-level [60 70 80 90 95];
      drop-probability [80 90 95 97 100];
    }
  }
}
```

Assured forwarding traffic with the PLP bit set has a more aggressive drop probability than traffic without the PLP bit set.

**Related Documentation**

- [Class of Service Using IPv6 DiffServ](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

---

## Configuring Schedulers

You configure schedulers to assign resources, priorities, and drop profiles to output queues. To configure a scheduler, include the **schedulers** statement at the **[edit class-of-service]** hierarchy level.

```
[edit class-of-service]
schedulers {
  be-DATA-scheduler {
```

```

        transmit-rate percent 40;
        buffer-size percent 40;
        priority low;
    }
    ef-FIN-scheduler {
        transmit-rate percent 10;
        buffer-size percent 10;
        priority high;
    }
    af-AV-scheduler {
        transmit-rate percent 45;
        buffer-size percent 45;
        priority high;
        drop-profile-map loss-priority low protocol any drop-profile af-AV-normal;
        drop-profile-map loss-priority high protocol any drop-profile af-AV-with-PLP;
    }
    nc-CONTROL-scheduler {
        transmit-rate percent 5;
        buffer-size percent 5;
        priority low;
    }
}

```

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

## Configuring Scheduler Maps

You configure a scheduler map to assign a forwarding class to a scheduler. To configure a scheduler map, include the **scheduler-maps** statement and scheduler name at the **[edit class-of-service]** hierarchy level.

```

[edit class-of-service]
scheduler-maps {
    diffserv-cos-map {
        forwarding-class be-DATA-class scheduler be-DATA-scheduler;
        forwarding-class ef-FIN-class scheduler ef-FIN-scheduler;
        forwarding-class af-AV-class scheduler af-AV-scheduler;
        forwarding-class nc-CONTROL-class scheduler nc-CONTROL-scheduler;
    }
}

```

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Applying a Scheduler Map to an Interface on page 30](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)

- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

---

## Applying a Scheduler Map to an Interface

To apply the configured scheduler map, include the **scheduler-map** statement at the **[edit class-of-service]** hierarchy level.

```
[edit class-of-service]
interfaces {
  so-1/0/1 {
    scheduler-map diffserv-cos-map;
  }
}
```

### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Configuring Scheduler Maps on page 29](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)



## PART 3

# Examples

- [Examples on page 33](#)



## CHAPTER 7

# Examples

- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)

### Example: CoS with IPv6 DiffServ Configuration

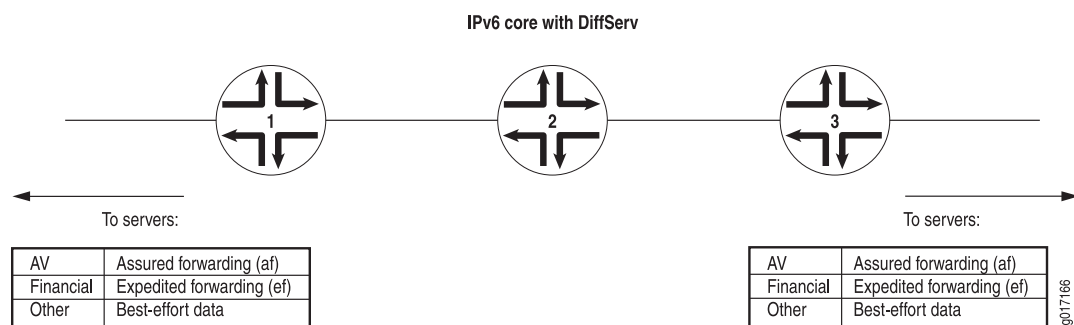
- [Example: CoS with IPv6 DiffServ Configuration on page 33](#)
- [Verifying Your Work on page 43](#)

### Example: CoS with IPv6 DiffServ Configuration

The example assigns expedited forwarding to Q1 and a subset of the assured forwarding classes (**af1x**) to Q2, and distributes resources among all four forwarding classes.

[Figure 2 on page 33](#) shows the topology of the three routers and links that are used as a case study in this chapter.

Figure 2: Basic IPv6 DiffServ Topology



In this case study, the service provider has agreed to provide high-priority delivery of packets for two applications between the customer's servers at two sites. The first application generates streams of high-definition audiovisual (television) packet flows and the second generates large quantities of time-sensitive financial information. In all cases, the packet flow is from server to server. The service provider marks the packets appropriately as they enter the network from either site, configures special queues and forwarding classes for this traffic on the three routers, and uses DiffServ for IPv6 for this purpose.

Routers 1 and 3 use multifield (MF) classifiers on the customer-facing interfaces to detect high-priority packets and rewrite the Differentiated Services code points (DSCPs)

appropriately. Best-effort data and network control packets are not affected. All three routers are configured with consistent schedulers and resources to handle high-priority packets properly.

**Figure 3: IPv6 DiffServ Configuration**

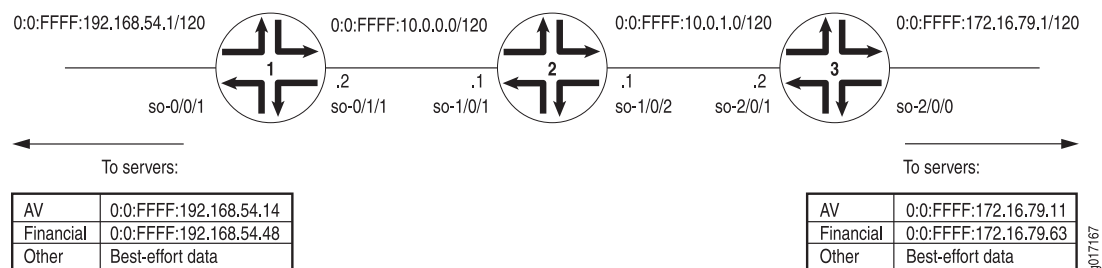


Figure 3 on page 34 shows the complete topology for IPv6 DiffServ, complete with interfaces and IPv6 addresses. The IPv4-mapped IPv6 address format described in RFC 1884 is used.

Begin your configuration on Router 2, the core router. This ensures that when DiffServ is enabled on the edge routers, class of service (CoS) is enabled end to end through the network. The core router configuration is a little simpler because no MF classification is configured in the core.

```
Router 2 [edit]
class-of-service {
  classifiers { # Router 2 classifiers.
    dscp-ipv6 IPv6-classifier {
      import default; # Uses the DSCP default map.
      forwarding-class be-DATA-class {
        loss-priority high code-points 000001;
      }
      forwarding-class ef-FIN-class {
        loss-priority high code-points 101111;
      }
      forwarding-class af-AV-class {
        loss-priority high code-points 001100;
      }
      forwarding-class nc-CONTROL-class {
        loss-priority high code-points 110001;
      }
    }
  }
  drop-profiles { # Router 2 drop profiles.
    af-AV-normal {
      interpolate {
        fill-level [95 100];
        drop-probability [0 100];
      }
    }
    af-AV-with-PLP {
      interpolate {
        fill-level [60 70 80 90 95];
        drop-probability [80 90 95 97 100];
      }
    }
  }
}
```

```

    }
  }
  forwarding-classes { # Router 2 forwarding classes.
    queue 0 be-DATA-class;
    queue 1 ef-FIN-class;
    queue 2 af-AV-class;
    queue 3 nc-CONTROL-class;
  }
  interfaces { # Router 2 class-of-service interfaces.
    so-1/0/1 { # Connected to R1.
      scheduler-map diffserv-cos-map;
      unit 0 {
        classifiers {
          dscp-ipv6 IPv6-classifier;
        }
        rewrite-rules {
          dscp-ipv6 rewrite-IPv6-dscp;
        }
      }
    }
    so-1/0/2 { # Connected to R3.
      scheduler-map diffserv-cos-map;
      unit 0 {
        classifiers {
          dscp-ipv6 IPv6-classifier;
        }
        rewrite-rules {
          dscp-ipv6 rewrite-IPv6-dscp;
        }
      }
    }
  }
  rewrite-rules rewrite-IPv6-dscps { # Router 2 rewrite rules.
    forwarding-class be-DATA-class {
      loss-priority low code points 000000;
      loss-priority high code points 000001;
    }
    forwarding-class ef-FIN-class {
      loss-priority low code points 101110;
      loss-priority high code points 101111;
    }
    forwarding-class af-AV-class {
      loss-priority low code points 001010;
      loss-priority high code points 001100;
    }
    forwarding-class nc-CONTROL-class {
      loss-priority low code points 110000;
      loss-priority high code points 110001;
    }
  }
  scheduler-maps { # Router 2 scheduler maps.
    diffserv-cos-map {
      forwarding-class be-DATA-class scheduler be-DATA-scheduler;
      forwarding-class ef-FIN-class scheduler ef-FIN-scheduler;
      forwarding-class af-AV-class scheduler af-AV-scheduler;
      forwarding-class nc-CONTROL-class scheduler nc-CONTROL-scheduler;
    }
  }

```

```
    }
  }
  schedulers { # Router 2 schedulers.
    be-DATA-scheduler {
      transmit-rate percent 40;
      buffer-size percent 40;
      priority low;
    }
    ef-FIN-scheduler {
      transmit-rate percent 10;
      buffer-size percent 10;
      priority high;
    }
    af-AV-scheduler {
      transmit-rate percent 45;
      buffer-size percent 45;
      priority high;
      drop-profile-map loss-priority low protocol any drop-profile af-AV-normal;
      drop-profile-map loss-priority high protocol any drop-profile af-AV-with-PLP;
    }
    nc-CONTROL-scheduler {
      transmit-rate percent 5;
      buffer-size percent 5;
      priority low;
    }
  }
}
interfaces { # R2 interfaces.
  so-1/0/1 { # Connected to R1.
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
      family inet6 {
        address 0:0:FFFF:10.0.0.1/120;
      }
    }
  }
  so-1/0/2 { # Connected to R3.
    unit 0 {
      family inet {
        address 10.0.1.1/24;
      }
      family inet6 {
        address 0:0:FFFF:10.0.1.1/120;
      }
    }
  }
}
```

Continue your configuration on Router 1 and Router 3, the edge routers. These routers get firewall-filter-based MF classifiers and rewrite rules for markers as well as schedulers and drop profiles on the core-facing interfaces.

**Router 1**    [edit]  
              class-of-service {

```

classifiers { # Router 1 classifiers.
  dscp-ipv6 IPv6-classifier {
    import default; # Uses the DSCP default map.
    forwarding-class be-DATA-class {
      loss-priority high code-points 000001;
    }
    forwarding-class ef-FIN-class {
      loss-priority high code-points 101111;
    }
    forwarding-class af-AV-class {
      loss-priority high code-points 001100;
    }
    forwarding-class nc-CONTROL-class {
      loss-priority high code-points 110001;
    }
  }
}
drop-profiles { # Router 1 drop profiles.
  af-AV-normal {
    interpolate {
      fill-level [95 100];
      drop-probability [0 100];
    }
  }
  af-AV-with-PLP {
    interpolate {
      fill-level [60 70 80 90 95];
      drop-probability [80 90 95 97 100];
    }
  }
}
forwarding-classes { # Router 1 forwarding classes.
  queue 0 be-DATA-class;
  queue 1 ef-FIN-class;
  queue 2 af-AV-class;
  queue 3 nc-CONTROL-class;
}
interfaces { # Router 1 class-of-service interfaces.
  so-0/1/1 { # To servers.
    scheduler-map diffserv-cos-map;
    unit 0 {
      classifiers {
        dscp-ipv6 IPv6-classifier;
      }
      rewrite-rules {
        dscp-ipv6 rewrite-IPv6-dscp;
      }
    }
  }
}
rewrite-rules rewrite-IPv6-dscps { # Router 1 rewrite rules.
  forwarding-class be-DATA-class {
    loss-priority low code points 000000;
    loss-priority high code points 000001;
  }
  forwarding-class ef-FIN-class {
    loss-priority low code points 101110;
  }
}

```

```

        loss-priority high code points 101111;
    }
    forwarding-class af-AV-class {
        loss-priority low code points 001010;
        loss-priority high code points 001100;
    }
    forwarding-class nc-CONTROL-class {
        loss-priority low code points 110000;
        loss-priority high code points 110001;
    }
}
scheduler-maps { # Router 1 scheduler map.
    diffserv-cos-map {
        forwarding-class be-DATA-class scheduler be-DATA-scheduler;
        forwarding-class ef-FIN-class scheduler ef-FIN-scheduler;
        forwarding-class af-AV-class scheduler af-AV-scheduler;
        forwarding-class nc-CONTROL-class scheduler nc-CONTROL-scheduler;
    }
}
schedulers { # Router 1 schedulers.
    be-DATA-scheduler {
        transmit-rate percent 40;
        buffer-size percent 40;
        priority low;
    }
    ef-FIN-scheduler {
        transmit-rate percent 10;
        buffer-size percent 10;
        priority high;
    }
    af-AV-scheduler {
        transmit-rate percent 45;
        buffer-size percent 45;
        priority high;
        drop-profile-map loss-priority low protocol any drop-profile af-AV-normal;
        drop-profile-map loss-priority high protocol any drop-profile af-AV-with-PLP;
    }
    nc-CONTROL-scheduler {
        transmit-rate percent 5;
        buffer-size percent 5;
        priority low;
    }
}
}
firewall { # Router 1 firewall policer and filter.
    policer ef-FIN-Policer-Profile {
        if-exceeding {
            bandwidth-percent 10;
            burst-size-limit 2k;
        }
        then loss-priority high;
    }
}
family inet6 {
    filter mf-classifier {
        filter-specific;
        term AV {

```



```

        from {
            destination-address {
                O:0:FFFF:172.16.79.11;
            }
        }
        then {
            loss-priority low;
            forwarding-class af-AV-class;
        }
    }
    term Finance {
        from {
            destination-address {
                O:0:FFFF:172.16.79.63;
            }
        }
        then {
            policer ef-FIN-Policer-Profile;
            forwarding-class ef-FIN-class;
        }
    }
    term Network-Control {
        from {
            traffic-class 192; # 192 is the 110000 traffic class.
        }
        then {
            forwarding-class nc-CONTROL-class; # This is network control traffic.
        }
    }
    term Data {
        then forwarding-class be-DATA-class; # The rest is data.
    }
}
}
}
}
interfaces { # Router 1 interfaces.
    so-0/0/1 { # To servers.
        unit 0 {
            family inet {
                address 192.168.54.1/24;
            }
            family inet6 {
                filter {
                    input mf-classifier;
                }
                address O:0:FFFF:192.168.54.1/120;
            }
        }
    }
    so-0/1/1 { # Connected to R2.
        unit 0 {
            family inet {
                address 10.0.0.2/24;
            }
            family inet6 {
                address O:0:FFFF:10.0.0.2/120;
            }
        }
    }
}

```

```

    }
  }
}

```

```

Router 3 [edit]
class-of-service {
  classifiers { # Router 3 classifiers.
    dscp-ipv6 IPv6-classifier {
      import default; # Uses the DSCP default map.
      forwarding-class be-DATA-class {
        loss-priority high code-points 000001;
      }
      forwarding-class ef-FIN-class {
        loss-priority high code-points 101111;
      }
      forwarding-class af-AV-class {
        loss-priority high code-points 001100;
      }
      forwarding-class nc-CONTROL-class {
        loss-priority high code-points 110001;
      }
    }
  }
  drop-profiles { # Router 3 drop profiles.
    af-AV-normal {
      interpolate {
        fill-level [95 100];
        drop-probability [0 100];
      }
    }
    af-AV-with-PLP {
      interpolate {
        fill-level [60 70 80 90 95];
        drop-probability [80 90 95 97 100];
      }
    }
  }
  forwarding-classes { # Router 3 forwarding classes.
    queue 0 be-DATA-class;
    queue 1 ef-FIN-class;
    queue 2 af-AV-class;
    queue 3 nc-CONTROL-class;
  }
  interfaces { # Router 3 class-of-service interfaces.
    so-2/0/1 { # To servers.
      scheduler-map diffserv-cos-map;
      unit 0 {
        classifiers {
          dscp-ipv6 IPv6-classifier;
        }
        rewrite-rules {
          dscp-ipv6 rewrite-IPv6-dscp;
        }
      }
    }
  }
}

```

```

}
rewrite-rules rewrite-IPv6-dscps { # Router 3 rewrite rules.
  forwarding-class be-DATA-class {
    loss-priority low code points 000000;
    loss-priority high code points 000001;
  }
  forwarding-class ef-FIN-class {
    loss-priority low code points 101110;
    loss-priority high code points 101111;
  }
  forwarding-class af-AV-class {
    loss-priority low code points 001010;
    loss-priority high code points 001100;
  }
  forwarding-class nc-CONTROL-class {
    loss-priority low code points 110000;
    loss-priority high code points 110001;
  }
}
scheduler-maps { # Router 3 scheduler map.
  diffserv-cos-map {
    forwarding-class be-DATA-class scheduler be-DATA-scheduler;
    forwarding-class ef-FIN-class scheduler ef-FIN-scheduler;
    forwarding-class af-AV-class scheduler af-AV-scheduler;
    forwarding-class nc-CONTROL-class scheduler nc-CONTROL-scheduler;
  }
}
schedulers { # Router 3 schedulers.
  be-DATA-scheduler {
    transmit-rate percent 40;
    buffer-size percent 40;
    priority low;
  }
  ef-FIN-scheduler {
    transmit-rate percent 10;
    buffer-size percent 10;
    priority high;
  }
  af-AV-scheduler {
    transmit-rate percent 45;
    buffer-size percent 45;
    priority high;
    drop-profile-map loss-priority low protocol any drop-profile af-AV-normal;
    drop-profile-map loss-priority high protocol any drop-profile af-AV-with-PLP;
  }
  nc-CONTROL-scheduler {
    transmit-rate percent 5;
    buffer-size percent 5;
    priority low;
  }
}
firewall { # Router 3 firewall policer and filter.
  policer ef-FIN-Policer-Profile {
    if-exceeding {
      bandwidth-percent 10;
      burst-size-limit 2k;
    }
  }
}

```

```

    }
    then loss-priority high;
  }
family inet6 {
  filter mf-classifier {
    filter-specific;
    term AV {
      from {
        destination-address {
          0:0:FFFF:172.16.79.11;
        }
      }
      then {
        loss-priority low;
        forwarding-class af-AV-class;
      }
    }
    term Finance {
      from {
        destination-address {
          0:0:FFFF:172.16.79.63;
        }
      }
      then {
        policer ef-FIN-Policer-Profile;
        forwarding-class ef-FIN-class;
      }
    }
    term Network-Control {
      from {
        traffic-class 192; # 192 is the 110000 traffic class.
      }
      then {
        forwarding-class nc-CONTROL-class; # This is network control traffic.
      }
    }
    term Data {
      then forwarding-class be-DATA-class; # The rest is data.
    }
  }
}
}
interfaces { # Router 3 interfaces.
  so-2/0/0 { # To servers.
    unit 0 {
      family inet {
        address 172.16.79.1/24;
      }
      family inet6 {
        filter {
          input mf-classifier;
        }
        address 0:0:FFFF:172.16.79.1/120;
      }
    }
  }
}

```

```

so-2/0/1 { # to R2
  unit 0 {
    family inet {
      address 10.0.1.2/24;
    }
    family inet6 {
      address 0:0:FFFF:10.0.1.2/120;
    }
  }
}
}
}
}

```

## Verifying Your Work

To verify that your CoS using IPv6 DiffServ configuration is correct, use the following commands:

- **show class-of-service classifier type dscp-ipv6**
- **show class-of-service rewrite-rule type dscp-ipv6**
- **show class-of-service interface**
- **show class-of-service forwarding-table classifier mapping**
- **show class-of-service forwarding-table rewrite-rule mapping**
- **show class-of-service scheduler-map *scheduler-map-name***
- **show class-of-service forwarding-table scheduler-map**

The following section shows the output of these commands used with the configuration example.

### DiffServ Classifiers

```

user@R1> show class-of-service classifier type dscp-ipv6
Classifier: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 4

```

Code point	Forwarding class	Loss priority
000000	be-DATA-class	low
000001	be-DATA-class	low
000010	be-DATA-class	low
000011	be-DATA-class	low
000100	be-DATA-class	low
000101	be-DATA-class	low
000110	be-DATA-class	low
000111	be-DATA-class	low
001000	be-DATA-class	low
001001	be-DATA-class	low
001010	af-AV-class	low
001011	be-DATA-class	low
001100	af-AV-class	high
001101	be-DATA-class	low
001110	af-AV-class	high
001111	be-DATA-class	low
010000	be-DATA-class	low
010001	be-DATA-class	low
010010	be-DATA-class	low
010011	be-DATA-class	low

010100	be-DATA-class	low
010101	be-DATA-class	low
010110	be-DATA-class	low
010111	be-DATA-class	low
011000	be-DATA-class	low
011001	be-DATA-class	low
011010	be-DATA-class	low
011011	be-DATA-class	low
011100	be-DATA-class	low
011101	be-DATA-class	low
011110	be-DATA-class	low
011111	be-DATA-class	low
100000	be-DATA-class	low
100001	be-DATA-class	low
100010	be-DATA-class	low
100011	be-DATA-class	low
100100	be-DATA-class	low
100101	be-DATA-class	low
100110	be-DATA-class	low
100111	be-DATA-class	low
101000	be-DATA-class	low
101001	be-DATA-class	low
101010	be-DATA-class	low
101011	be-DATA-class	low
101100	be-DATA-class	low
101101	be-DATA-class	low
101110	ef-FIN-class	low
101111	be-DATA-class	low
110000	nc-CONTROL-class	low
110001	be-DATA-class	low
110010	be-DATA-class	low
110011	be-DATA-class	low
110100	be-DATA-class	low
110101	be-DATA-class	low
110110	be-DATA-class	low
110111	be-DATA-class	low
111000	nc-CONTROL-class	low
111001	be-DATA-class	low
111010	be-DATA-class	low
111011	be-DATA-class	low
111100	be-DATA-class	low
111101	be-DATA-class	low
111110	be-DATA-class	low
111111	be-DATA-class	low
Classifier: IPv6-classifier, Code point type: dscp-ipv6, Index: 18301		
Code point	Forwarding class	Loss priority
000000	be-DATA-class	low
000001	be-DATA-class	high
000010	be-DATA-class	low
000011	be-DATA-class	low
000100	be-DATA-class	low
000101	be-DATA-class	low
000110	be-DATA-class	low
000111	be-DATA-class	low
001000	be-DATA-class	low
001001	be-DATA-class	low
001010	af-AV-class	low
001011	be-DATA-class	low
001100	af-AV-class	high
001101	be-DATA-class	low
001110	af-AV-class	high

001111	be-DATA-class	low
010000	be-DATA-class	low
010001	be-DATA-class	low
010010	be-DATA-class	low
010011	be-DATA-class	low
010100	be-DATA-class	low
010101	be-DATA-class	low
010110	be-DATA-class	low
010111	be-DATA-class	low
011000	be-DATA-class	low
011001	be-DATA-class	low
011010	be-DATA-class	low
011011	be-DATA-class	low
011100	be-DATA-class	low
011101	be-DATA-class	low
011110	be-DATA-class	low
011111	be-DATA-class	low
100000	be-DATA-class	low
100001	be-DATA-class	low
100010	be-DATA-class	low
100011	be-DATA-class	low
100100	be-DATA-class	low
100101	be-DATA-class	low
100110	be-DATA-class	low
100111	be-DATA-class	low
101000	be-DATA-class	low
101001	be-DATA-class	low
101010	be-DATA-class	low
101011	be-DATA-class	low
101100	be-DATA-class	low
101101	be-DATA-class	low
101110	ef-FIN-class	low
101111	ef-FIN-class	high
110000	nc-CONTROL-class	low
110001	nc-CONTROL-class	high
110010	be-DATA-class	low
110011	be-DATA-class	low
110100	be-DATA-class	low
110101	be-DATA-class	low
110110	be-DATA-class	low
110111	be-DATA-class	low
111000	nc-CONTROL-class	low
111001	be-DATA-class	low
111010	be-DATA-class	low
111011	be-DATA-class	low
111100	be-DATA-class	low
111101	be-DATA-class	low
111110	be-DATA-class	low
111111	be-DATA-class	low

**Rewrite Rules** user@R1> show class-of-service rewrite-rule type dscp-ipv6  
Rewrite rule: dscp-ipv6-default, Code point type: dscp-ipv6, Index: 20

Forwarding class	Loss priority	Code point
be-DATA-class	low	000000
be-DATA-class	high	000000
ef-FIN-class	low	101110
ef-FIN-class	high	101110
af-AV-class	low	001010
af-AV-class	high	001100
nc-CONTROL-class	low	110000
nc-CONTROL-class	high	111000

```

Rewrite rule: rewrite-IPv6-dscp, Code point type: dscp-ipv6, Index: 58077
Forwarding class      Loss priority  Code point
be-DATA-class         low           000000
be-DATA-class         high          000001
ef-FIN-class          low           101110
ef-FIN-class          high          101111
af-AV-class           low           001010
af-AV-class           high          001100
nc-CONTROL-class      low           110000
nc-CONTROL-class      high          110001

```

### Class-of-Service Interfaces

```

user@R1> show class-of-service interface
...
Physical interface: so-0/0/1, Index: 141
Queues supported: 4, Queues in use: 4
Scheduler map: diffserv-cos-map, Index: -543019056
Logical interface: so-0/0/1.0, Index: 68
  Object      Name                Type                Index
  Rewrite     rewrite-IPv6-dscp    dscp-ipv6          58077
  Rewrite     exp-default         exp                 21
  Classifier   IPv6-classifier     dscp-ipv6          18301
  Classifier   exp-default         exp                 5
...
Physical interface: so-0/1/1, Index: 144
Queues supported: 4, Queues in use: 4
Scheduler map: <default>, Index: -113795564

Logical interface: so-0/1/1.0, Index: 69
  Object      Name                Type                Index
  Rewrite     exp-default         exp                 21
  Classifier   exp-default         exp                 5
  Classifier   ipprec-compatibility ip                  8

```

### Classifier Mapping

```

user@R1> show class-of-service forwarding-table classifier mapping
Table Index/
Interface  Index  Q num  Table type
so-0/0/1.0  68    18301  IPv6 DSCP
so-0/1/1.0  69     8     IPv4 precedence

```

### Rewrite Rule Mapping

```

user@R1> show class-of-service forwarding-table rewrite-rule mapping
Interface  Index  Table index  Type
so-0/1/1.0  68    58077       IPv6 DSCP

```

### Scheduler Map

```

user@R1> show class-of-service scheduler-map diffserv-cos-map
Scheduler map: diffserv-cos-map, Index: 1094596010
Scheduler: be-DATA-scheduler, Forwarding class: be-DATA-class, Index: 14343
  Transmit rate: 40 percent, Rate Limit: none, Buffer size: 40 percent,
  Priority: low
  Drop profiles:
    Loss priority  Protocol  Index  Name
    Low           non-TCP   1      <default-drop-profile>
    Low           TCP       1      <default-drop-profile>
    High          non-TCP   1      <default-drop-profile>
    High          TCP       1      <default-drop-profile>
Scheduler: ef-FIN-scheduler, Forwarding class: ef-FIN-class, Index: 21707
  Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,
  Priority: high
  Drop profiles:
    Loss priority  Protocol  Index  Name
    Low           non-TCP   1      <default-drop-profile>

```



```

    Low          TCP          1      <default-drop-profile>
    High         non-TCP      1      <default-drop-profile>
    High         TCP          1      <default-drop-profile>
Scheduler: af-AV-scheduler, Forwarding class: af-AV-class, Index: 51704
Transmit rate: 45 percent, Rate Limit: none, Buffer size: 45 percent,
Priority: high
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   61474  af-AV-normal
  Low           TCP       61474  af-AV-normal
  High          non-TCP   65199  af-AV-with-PLP
  High          TCP       65199  af-AV-with-PLP
Scheduler: nc-CONTROL-scheduler, Forwarding class: nc-CONTROL-class, Index:
50404
Transmit rate: 5 percent, Rate Limit: none, Buffer size: 5 percent,
Priority: low
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   1      <default-drop-profile>
  Low           TCP       1      <default-drop-profile>
  High          non-TCP   1      <default-drop-profile>
  High          TCP       1      <default-drop-profile>

user@R1> show class-of-service forwarding-table scheduler-map
...
Interface: so-0/0/1 (Index: 141, Map index: -543019056, Map type: FINAL,
Num of queues: 4):
  Entry 0 (Scheduler index: 14343, Queue #: 0):
    Tx rate: 0 Kb (40%), Buffer size: 40 percent
  Priority low
    PLP high: 1, PLP low: 1, TCP PLP high: 1, TCP PLP low: 1
  Entry 1 (Scheduler index: 21707, Queue #: 1):
    Tx rate: 0 Kb (10%), Buffer size: 10 percent
  Priority high
    PLP high: 1, PLP low: 1, TCP PLP high: 1, TCP PLP low: 1
  Entry 2 (Scheduler index: 51704, Queue #: 2):
    Tx rate: 0 Kb (45%), Buffer size: 45 percent
  Priority high
    PLP high: 65199, PLP low: 61474, TCP PLP high: 65199, TCP PLP low: 61474
  Entry 3 (Scheduler index: 50404, Queue #: 3):
    Tx rate: 0 Kb (5%), Buffer size: 5 percent
  Priority low
    PLP high: 1, PLP low: 1, TCP PLP high: 1, TCP PLP low: 1
  ...

```

#### Related Documentation

- [Class of Service Using IPv6 DiffServ](#)
- [Overview of Class of Service Using IPv6 DiffServ on page 3](#)
- [System Requirements for CoS with DiffServ for IPv6 on page 13](#)
- [Roadmap for Configuring CoS with IPv6 DiffServ on page 21](#)



## PART 4

# Administration

- [Commands on page 51](#)



## CHAPTER 8

# Commands

## show class-of-service classifier

<b>Syntax</b>	show class-of-service classifier <name <i>name</i> > <type dscp   type dscp-ipv6   type exp   type ieee-802.1   type inet-precedence>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	For each class-of-service (CoS) classifier, display the mapping of code point value to forwarding class and loss priority.
<b>Options</b>	none—Display all classifiers.  name <i>name</i> —(Optional) Display named classifier.  type dscp—(Optional) Display all classifiers of the Differentiated Services code point (DSCP) type.  type dscp-ipv6—(Optional) Display all classifiers of the DSCP for IPv6 type.  type exp—(Optional) Display all classifiers of the MPLS experimental (EXP) type.  type ieee-802.1—(Optional) Display all classifiers of the ieee-802.1 type.  type inet-precedence—(Optional) Display all classifiers of the inet-precedence type.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service classifier type ieee-802.1 on page 53</a> <a href="#">show class-of-service classifier type ieee-802.1 (QFX Series) on page 53</a>
<b>Output Fields</b>	<a href="#">Table 6 on page 52</a> describes the output fields for the <b>show class-of-service classifier</b> command. Output fields are listed in the approximate order in which they appear.

**Table 6: show class-of-service classifier Output Fields**

Field Name	Field Description
<b>Classifier</b>	Name of the classifier.
<b>Code point type</b>	Type of the classifier: <b>exp</b> (not on EX Series switch), <b>dscp</b> , <b>dscp-ipv6</b> (not on EX Series switch), <b>ieee-802.1</b> , or <b>inet-precedence</b> .
<b>Index</b>	Internal index of the classifier.
<b>Code point</b>	Code point value used for classification
<b>Forwarding class</b>	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.

Table 6: show class-of-service classifier Output Fields (*continued*)

Field Name	Field Description
Loss priority	Loss priority value used for classification. For most platforms, the value is <b>high</b> or <b>low</b> . For some platforms, the value is <b>high</b> , <b>medium-high</b> , <b>medium-low</b> , or <b>low</b> .

### Sample Output

```

show class-of-service user@host> show class-of-service classifier type ieee-802.1
classifier type
ieee-802.1
Classifier: ieee802.1-default, Code point type: ieee-802.1, Index: 3
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    medium-high
110             network-control       low
111             network-control       high

Classifier: users-ieee802.1, Code point type: ieee-802.1
Code point      Forwarding class      Loss priority
100             expedited-forwarding  low

show class-of-service user@switch> show class-of-service classifier type ieee-802.1
classifier type
ieee-802.1 (QFX
Series)
Classifier: ieee8021p-default, Code point type: ieee-802.1, Index: 11
Code point      Forwarding class      Loss priority
000             best-effort           low
001             best-effort           low
010             best-effort           low
011             best-effort           low
100             best-effort           low
101             best-effort           low
110             network-control       low
111             network-control       low

Classifier: ieee-mcast, Code point type: ieee-802.1, Index: 46
Code point      Forwarding class      Loss priority
000             mcast-be              low
001             mcast-be              low
010             mcast-be              low
011             mcast-be              low
100             mcast-be              low
101             mcast-be              low
110             mcast-nc              low
111             mcast-nc              low

```

## show class-of-service interface

<b>Syntax</b>	<code>show class-of-service interface</code> <code>&lt;interface-name&gt;</code>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Forwarding class map information added in Junos OS Release 9.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	Display the logical and physical interface associations for the classifier, rewrite rules, and scheduler map objects.
<b>Options</b>	<code>none</code> —Display class-of-service (CoS) associations for all physical and logical interfaces.  <code>interface-name</code> —(Optional) Display CoS associations for the specified interface.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service interface (Physical) on page 55</a> <a href="#">show class-of-service interface (Logical) on page 55</a> <a href="#">show class-of-service interface (Gigabit Ethernet) on page 56</a>
<b>Output Fields</b>	<a href="#">Table 7 on page 54</a> describes the output fields for the <b>show class-of-service interface</b> command. Output fields are listed in the approximate order in which they appear.

**Table 7: show class-of-service interface Output Fields**

Field Name	Field Description
<b>Physical interface</b>	Name of a physical interface.
<b>Index</b>	Index of this interface or the internal index of this object.
<b>Dedicated Queues</b>	Status of dedicated queues configured on an interface. Supported on Trio MPC/MIC interfaces on MX Series routers only.
<b>Queues supported</b>	Number of queues you can configure on the interface.
<b>Queues in use</b>	Number of queues currently configured.
<b>Total non-default queues created</b>	Number of queues created in addition to the default queues. Supported on Trio MPC/MIC interfaces on MX Series routers.
<b>Shaping rate</b>	Maximum transmission rate on the physical interface. You can configure the shaping rate on the physical interface, or on the logical interface, but not both. Therefore, the <b>Shaping rate</b> field is displayed for the physical interface or the logical interface, but not both.
<b>Scheduler map</b>	Name of the output scheduler map associated with this interface.
<b>Input shaping rate</b>	For Gigabit Ethernet IQ2 PICs, maximum transmission rate on the input interface.



Table 7: show class-of-service interface Output Fields (*continued*)

Field Name	Field Description
<b>Input scheduler map</b>	For Gigabit Ethernet IQ2 PICs, name of the input scheduler map associated with this interface.
<b>Chassis scheduler map</b>	Name of the scheduler map associated with the packet forwarding component queues.
<b>Rewrite</b>	Name and type of the rewrite rules associated with this interface.
<b>Classifier</b>	Name and type of classifiers associated with this interface.
<b>Forwarding-class-map</b>	Name of the forwarding map associated with this interface.
<b>Congestion-notification</b>	Congestion notification state, <b>enabled</b> or <b>disabled</b> (QFX Series only).
<b>Logical interface</b>	Name of a logical interface.
<b>Shaping rate</b>	Maximum transmission rate on the logical interface. You can configure the shaping rate on the physical interface, or on the logical interface, but not both. Therefore, the <b>Shaping rate</b> field is displayed for the physical interface or the logical interface, but not both.
<b>Object</b>	Category of an object: <b>Classifier</b> , <b>Fragmentation-map</b> (for LSQ interfaces only), <b>Scheduler-map</b> , <b>Rewrite</b> , or <b>Translation Table</b> (for IQE PICs only).
<b>Name</b>	Name of an object.
<b>Type</b>	Type of an object: <b>dscp</b> , <b>dscp-ipv6</b> , <b>exp</b> , <b>ieee-802.1</b> , <b>ip</b> , or <b>inet-precedence</b> .

## Sample Output

```

show class-of-service interface (Physical) user@host> show class-of-service interface so-0/2/3
Physical interface: so-0/2/3, Index: 135
Queues supported: 8, Queues in use: 4
Total non-default queues created: 4
Scheduler map: <default>, Index: 2032638653

Logical interface: fe-0/0/1.0, Index: 68, Dedicated Queues: no
Shaping rate: 32000
Object      Name      Type
Index
Scheduler-map  <default>
27 Rewrite      exp-default  exp
21 Classifier   exp-default  exp
5 Classifier   ipprec-compatibility  ip
8 Forwarding-class-map  exp-default  exp
5
show class-of-service interface (Logical) user@host> show class-of-service interface so-0/2/3.0

```

Logical interface: so-0/2/3.0, Index: 68, Dedicated Queues: no  
Shaping rate: 32000

Object	Name	Type
Index		
Scheduler-map	<default>	
27		
Rewrite	exp-default	exp
21		
Classifier	exp-default	exp
5		
Classifier	ipprec-compatibility	ip
8		
Forwarding-class-map	exp-default	exp
5		

**show class-of-service  
interface  
(Gigabit Ethernet)**

user@host> show class-of-service interface ge-6/2/0  
Physical interface: ge-6/2/0, Index: 175  
Queues supported: 4, Queues in use: 4  
Scheduler map: <default>, Index: 2  
Input scheduler map: <default>, Index: 3  
Chassis scheduler map: <default-chassis>, Index: 4

## show class-of-service forwarding-table classifier mapping

<b>Syntax</b>	show class-of-service forwarding-table classifier mapping
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	For each logical interface, display either the table index of the classifier for a given code point type or the queue number (if it is a fixed classification) in the forwarding table.
<b>Options</b>	This command has no options.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service forwarding-table classifier mapping on page 57</a>
<b>Output Fields</b>	<a href="#">Table 8 on page 57</a> describes the output fields for the <b>show class-of-service forwarding-table classifier mapping</b> command. Output fields are listed in the approximate order in which they appear.

**Table 8: show class-of-service forwarding-table classifier mapping Output Fields**

Field Name	Field Description
Table index/ Q num	If the type is <b>Fixed</b> , the number of the queue to which the interface is mapped. For all other types, this value is the classifier index number.
Interface	Name of the logical interface.
Index	Logical interface index.
Table type	Type of code points in the table: <b>DSCP</b> , <b>EXP</b> (not on the QFX Series), <b>IEEE 802.1</b> , <b>IPv4 precedence</b> (not on the QFX Series), or <b>IPv6 DSCP</b> (not on the QFX Series).

## Sample Output

```

show class-of-service forwarding-table classifier mapping
user@host> show class-of-service forwarding-table classifier mapping

```

Interface	Index	Table index/ Q num	Table type
so-5/0/0.0	10	62436	DSCP
so-0/1/0.0	11	62436	DSCP
so-0/2/0.0	12	1	Fixed
so-0/2/1.0	13	62436	DSCP
so-0/2/1.0	13	62437	IEEE 802.1
so-0/2/2.0	14	62436	DSCP
so-0/2/2.0	14	62438	IPv4 precedence

## show class-of-service forwarding-table rewrite-rule mapping

<b>Syntax</b>	show class-of-service forwarding-table rewrite-rule mapping
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	For each logical interface, display the table identifier of the rewrite rule map for each code point type.
<b>Options</b>	This command has no options.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service forwarding-table rewrite-rule mapping on page 58</a>
<b>Output Fields</b>	<a href="#">Table 9 on page 58</a> describes the output fields for the <b>show class-of-service forwarding-table rewrite-rule mapping</b> command. Output fields are listed in the approximate order in which they appear.

**Table 9: show class-of-service forwarding-table rewrite-rule mapping Output Fields**

Field Name	Field Description
<b>Interface</b>	Name of the logical interface.
<b>Index</b>	Logical interface index.
<b>Table index</b>	Rewrite table index.
<b>Type</b>	Type of classifier: <b>DSCP</b> , <b>EXP</b> (not on the QFX Series), <b>EXP-PUSH-3</b> (not on the QFX Series), <b>EXP-SWAP-PUSH-2</b> (not on the QFX Series), <b>Frame-Relay DE</b> (J Series routers only), <b>IEEE 802.1</b> , <b>IPv4 precedence</b> (not on the QFX Series), <b>IPv6 DSCP</b> (not on the QFX Series), or <b>Fixed</b> .

### Sample Output

```

user@host> show class-of-service forwarding-table rewrite-rule mapping
Interface      Index  Table index  Type
so-5/0/0.0     10     3753        DSCP
so-0/1/0.0     11     3753        DSCP
so-0/2/0.0     12     3753        DSCP
so-0/2/1.0     13     3753        DSCP
so-0/2/2.0     14     3753        DSCP
so-0/2/3.0     15     3753        DSCP

```

## show class-of-service forwarding-table scheduler-map

<b>Syntax</b>	show class-of-service forwarding-table scheduler-map
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	For each physical interface, display the scheduler map information as it exists in the forwarding table.
<b>Options</b>	This command has no options.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service forwarding-table scheduler-map on page 60</a>
<b>Output Fields</b>	<a href="#">Table 10 on page 59</a> describes the output fields for the <b>show class-of-service forwarding-table scheduler-map</b> command. Output fields are listed in the approximate order in which they appear.

**Table 10: show class-of-service forwarding-table scheduler-map Output Fields**

Field Name	Field Description
Interface	Name of the physical interface.
Index	Physical interface index.
Map index	Scheduler map index.
Num of queues	Number of queues defined in this scheduler map.
Entry	Number of this entry in the scheduler map.
Scheduler index	Scheduler policy index.
Forwarding-class #	Forwarding class number to which this entry is applied.
Tx rate	Configured transmit rate of the scheduler (in bps). The rate is a percentage of the total interface bandwidth, or the keyword <b>remainder</b> , which indicates that the scheduler receives the remaining bandwidth of the interface.
Max buffer delay	Amount of transmit delay (in milliseconds) or buffer size of the queue. This amount is a percentage of the total interface buffer allocation or the keyword <b>remainder</b> , which indicates that the buffer is sized according to what remains after other scheduler buffer allocations.
High priority is set	If this line appears in the output, the queue priority is high. Otherwise, it is low.
PLP high	Drop profile index for a high packet loss priority profile.

Table 10: show class-of-service forwarding-table scheduler-map Output Fields (*continued*)

Field Name	Field Description
PLP low	Drop profile index for a low packet loss priority profile.
PLP medium-high	Drop profile index for a medium-high packet loss priority profile.
PLP medium-low	Drop profile index for a medium-low packet loss priority profile.
TCP PLP high	Drop profile index for a high TCP packet loss priority profile.
TCP PLP low	Drop profile index for a low TCP packet loss priority profile.
Policy is exact	If this line appears in the output, exact rate limiting is enabled. Otherwise, no rate limiting is enabled.

### Sample Output

```

show class-of-service forwarding-table scheduler-map
user@host> show class-of-service forwarding-table scheduler-map
Interface: so-5/0/0 (Index: 9, Map index: 17638, Num of queues: 2):
  Entry 0 (Scheduler index: 6090, Forwarding-class #: 0):
    Tx rate: 0 Kb (30%), Max buffer delay: 39 bytes (0%)
    Priority low
    PLP high: 25393, PLP low: 24627, TCP PLP high: 25393, TCP PLP low: 8742
    Policy is exact
  Entry 1 (Scheduler index: 38372, Forwarding-class #: 1):
    Traffic chunk: Max = 0 bytes, Min = 0 bytes
    Tx rate: 0 Kb (40%), Max buffer delay: 68 bytes (0%)
    Priority high
    PLP high: 25393, PLP low: 24627, TCP PLP high: 25393, TCP PLP low: 8742

Interface: at-6/1/0 (Index: 10, Map index: 17638, Num of queues: 2):
  Entry 0 (Scheduler index: 6090, Forwarding-class #: 0):
    Traffic chunk: Max = 0 bytes, Min = 0 bytes
    Tx rate: 0 Kb (30%), Max buffer delay: 39 bytes (0%)
    Priority high
    PLP high: 25393, PLP low: 24627, TCP PLP high: 25393, TCP PLP low: 8742
  Entry 1 (Scheduler index: 38372, Forwarding-class #: 1):
    Traffic chunk: Max = 0 bytes, Min = 0 bytes
    Tx rate: 0 Kb (40%), Max buffer delay: 68 bytes (0%)
    Priority low
    PLP high: 25393, PLP low: 24627, TCP PLP high: 25393, TCP PLP low: 8742

```

## show class-of-service rewrite-rule

<b>Syntax</b>	show class-of-service rewrite-rule <name <i>name</i> > <type <i>type</i> >
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	Display the mapping of forwarding classes and loss priority to code point values.
<b>Options</b>	<p>none—Display all rewrite rules.</p> <p>name <i>name</i>—(Optional) Display the specified rewrite rule.</p> <p>type <i>type</i>—(Optional) Display the rewrite rule of the specified type. The rewrite rule type can be one of the following:</p> <ul style="list-style-type: none"> <li>• <b>dscp</b>—For IPv4 traffic.</li> <li>• <b>dscp-ipv6</b>—For IPv6 traffic.</li> <li>• <b>exp</b>—For MPLS traffic.</li> <li>• <b>frame-relay-de</b>—(J Series routers only) For Frame Relay traffic.</li> <li>• <b>ieee-802.1</b>—For Layer 2 traffic.</li> <li>• <b>inet-precedence</b>—For IPv4 traffic.</li> </ul>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service rewrite-rule type dscp on page 62</a> <a href="#">show class-of-service rewrite-rule type dscp (QFX Series) on page 62</a>
<b>Output Fields</b>	Table 11 on page 61 describes the output fields for the <b>show class-of-service rewrite-rule</b> command. Output fields are listed in the approximate order in which they appear.

**Table 11: show class-of-service rewrite-rule Output Fields**

Field Name	Field Description
<b>Rewrite rule</b>	Name of the rewrite rule.
<b>Code point type</b>	Type of rewrite rule: <b>dscp</b> , <b>dscp-ipv6</b> , <b>exp</b> , <b>frame-relay-de</b> , or <b>inet-precedence</b> .
<b>Forwarding class</b>	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router or switch.
<b>Index</b>	Internal index for this particular rewrite rule.
<b>Loss priority</b>	Loss priority for rewriting.

Table 11: show class-of-service rewrite-rule Output Fields (*continued*)

Field Name	Field Description
Code point	Code point value to rewrite.

## Sample Output

```

show class-of-service user@host> show class-of-service rewrite-rule type dscp
rewrite-rule type dscp Rewrite rule: dscp-default, Code point type: dscp
  Forwarding class      Loss priority      Code point
  gold                  high              000000
  silver                low              110000
  silver                high              111000
  bronze                low              001010
  bronze                high              001100
  lead                  high              101110

Rewrite rule: abc-dscp-rewrite, Code point type: dscp, Index: 3245
Forwarding class      Loss priority      Code point
  gold                  low              000111
  gold                  high              001010
  silver                low              110000
  silver                high              111000
  bronze                high              001100
  lead                  low              101110
  lead                  high              110111

```

## Sample Output

```

show class-of-service user@host> show class-of-service rewrite-rule type dscp
rewrite-rule type dscp Rewrite rule: dscp-default, Code point type: dscp, Index: 31
(QFX Series)
  Forwarding class      Loss priority      Code point
  best-effort           low              000000
  best-effort           high              000000
  fcoe                  low              101110
  fcoe                  high              101110
  no-loss               low              001010
  no-loss               high              001100
  newclass              low              110000
  newclass              high              111000

```



## show class-of-service scheduler-map

<b>Syntax</b>	show class-of-service scheduler-map <name>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	Display the mapping of schedulers to forwarding classes and a summary of scheduler parameters for each entry.
<b>Options</b>	none—Display all scheduler maps.  name—(Optional) Display a summary of scheduler parameters for each forwarding class to which the named scheduler is assigned.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service scheduler-map on page 64</a>
<b>Output Fields</b>	<a href="#">Table 12 on page 63</a> describes the output fields for the <b>show class-of-service scheduler-map</b> command. Output fields are listed in the approximate order in which they appear.

Table 12: show class-of-service scheduler-map Output Fields

Field Name	Field Description
Scheduler map	Name of the scheduler map.
Index	Index of the indicated object. Objects having indexes in this output include scheduler maps, schedulers, and drop profiles.
Scheduler	Name of the scheduler.
Forwarding class	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.
Transmit rate	Configured transmit rate of the scheduler (in bps). The rate is a percentage of the total interface bandwidth, or the keyword <b>remainder</b> , which indicates that the scheduler receives the remaining bandwidth of the interface.
Rate Limit	Rate limiting configuration of the queue. Possible values are <b>none</b> , meaning no rate limiting, and <b>exact</b> , meaning the queue only transmits at the configured rate.
Maximum buffer delay	Amount of transmit delay (in milliseconds) or the buffer size of the queue. The buffer size is shown as a percentage of the total interface buffer allocation, or by the keyword <b>remainder</b> to indicate that the buffer is sized according to what remains after other scheduler buffer allocations.
Priority	Scheduling priority: <b>low</b> or <b>high</b> .

Table 12: show class-of-service scheduler-map Output Fields (*continued*)

Field Name	Field Description
<b>Drop profiles</b>	Table displaying the assignment of drop profile by name and index to a given loss priority and protocol pair.
<b>Loss priority</b>	Packet loss priority for drop profile assignment.
<b>Protocol</b>	Transport protocol for drop profile assignment.
<b>Name</b>	Name of the drop profile.

## Sample Output

```

user@host> show class-of-service scheduler-map
Scheduler map: dd-scheduler-map, Index: 84

Scheduler: aa-scheduler, Index: 8721, Forwarding class: aa-forwarding-class
Transmit rate: 30 percent, Rate Limit: none, Maximum buffer delay: 39 ms,
Priority: high
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   8724   aa-drop-profile
  Low           TCP       9874   bb-drop-profile
  High          non-TCP   8833   cc-drop-profile
  High          TCP       8484   dd-drop-profile

Scheduler: bb-scheduler, Forwarding class: aa-forwarding-class
Transmit rate: 40 percent, Rate limit: none, Maximum buffer delay: 68 ms,
Priority: high
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   8724   aa-drop-profile
  Low           TCP       9874   bb-drop-profile
  High          non-TCP   8833   cc-drop-profile
  High          TCP       8484   dd-drop-profile

```

## PART 5

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