

## **Example: Configuring CoS on EX-series Switches**

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Configure class of service (CoS) on your switch to manage traffic so that when the network experiences congestion and delay, critical applications are protected. Using CoS, you can divide traffic on your switch into classes and provide various levels of throughput and packet loss. This is especially important for traffic that is sensitive to jitter and delay, such as voice traffic.

This example shows how to configure CoS on a single EX-series switch in the network.

- Requirements on page 1
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### ***Requirements***

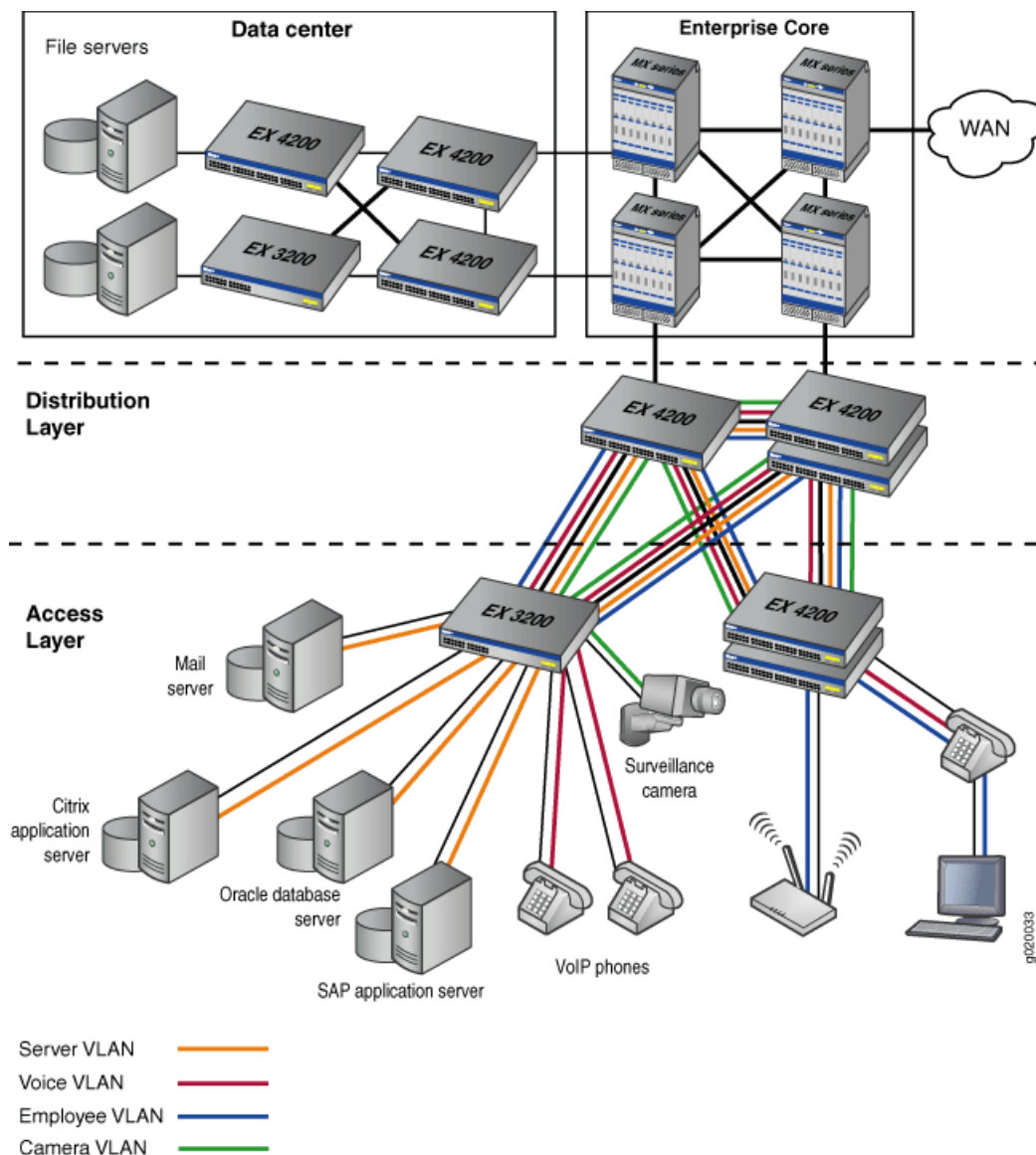
This example uses the following hardware and software components:

- JUNOS Release 9.0 or later for EX-series switches
- One Juniper Networks EX-series 3200 switch

### ***Overview and Topology***

This example uses the topology shown in Figure 1 on page 2.

**Figure 1: Topology for Configuring CoS**



The topology for this configuration example consists of one EX-series switch at the access layer.

The EX-series access switch is configured to support VLAN membership. Switch ports `ge-0/0/0` and `ge-0/0/1` are assigned to the **voice-vlan** for two VoIP phones. Switch port `ge-0/0/2` is assigned to the **camera-vlan** for the surveillance camera. Switch ports `ge-0/0/3`, `ge-0/0/4`, `ge-0/0/5`, and `ge-0/0/6` are assigned to the **server-vlan** for the servers hosting various applications such as those provided by Citrix, Microsoft, Oracle, and SAP.

Table 1 on page 3 shows the VLAN configuration components.

**Table 1: Configuration Components: VLANs**

VLAN Name	VLAN ID	VLAN Subnet and Available IP Addresses	VLAN Description
voice-vlan	10	192.168.1.0/32 192.168.1.1 through 192.168.1.11  192.168.1.12 is the subnet's broadcast address.	Voice VLAN used for employee VoIP communication.
camera-vlan	20	192.168.1.13/32 192.168.1.14 through 192.168.1.20  192.168.1.21 is the subnet's broadcast address.	VLAN for the surveillance cameras.
server-vlan	30	192.168.1.22/32 192.168.1.23 through 192.168.1.35  192.168.1.36 is the subnet's broadcast address.	VLAN for the servers hosting enterprise applications.

Ports on the EX-series switches support Power over Ethernet (PoE) to provide both network connectivity and power for VoIP telephones connecting to the ports. Table 2 on page 3 shows the switch interfaces that are assigned to the VLANs and the IP addresses for devices connected to the switch ports:

**Table 2: Configuration Components: Switch Ports on a 48-Port All-PoE Switch**

Interfaces	VLAN Membership	IP Addresses	Port Devices
ge-0/0/0, ge-0/0/1	voice-vlan	192.168.1.1 through 192.168.1.2	Two VoIP telephones.
ge-0/0/2	camera-vlan	192.168.1.14	Surveillance camera.
ge-0/0/3, ge-0/0/4, ge-0/0/5, ge-0/0/6	server-vlan	192.168.1.23 through 192.168.1.26	Four servers hosting applications such as those provided by Citrix, Microsoft, Oracle, and SAP.



**NOTE:** This example shows how to configure CoS on a single EX-series switch. This example does not consider across-the-network applications of CoS in which you might implement different configurations on ingress and egress switches to provide differentiated treatment to different classes across a set of nodes in a network.

## Configuration

**CLI Quick Configuration** To quickly configure CoS, copy the following commands and paste them into the switch terminal window:

```
[edit]
set class-of-service forwarding-classes class app queue-num 5
set class-of-service forwarding-classes class mail queue-num 1
set class-of-service forwarding-classes class db queue-num 2
set class-of-service forwarding-classes class erp queue-num 3
set class-of-service forwarding-classes class video queue-num 4
set class-of-service forwarding-classes class best-effort queue-num 0
set class-of-service forwarding-classes class voice queue-num 6
set class-of-service forwarding-classes class network-control queue-num 7
set firewall family ethernet-switching filter voip_class term voip from
source-address 192.168.1.1/32
set firewall family ethernet-switching filter voip_class term voip from
source-address 192.168.1.2/32
set firewall family ethernet-switching filter voip_class term voip from protocol
udp
set firewall family ethernet-switching filter voip_class term voip from source-port
2698
set firewall family ethernet-switching filter voip_class term voip then
forwarding-class voice loss-priority low
set firewall family ethernet-switching filter voip_class term network_control
from precedence [net-control internet-control]
set firewall family ethernet-switching filter voip_class term network_control
then forwarding-class network-control loss-priority low
set firewall family ethernet-switching filter voip_class term best_effort_traffic
then forwarding-class best-effort loss-priority low
set interfaces ge-0/0/0 description phone1-voip-ingress-port
set interfaces ge-0/0/0 unit 0 family ethernet-switching filter input voip_class
set interfaces ge-0/0/1 description phone2-voip-ingress-port
set interfaces ge-0/0/1 unit 0 family ethernet-switching filter input voip_class
set firewall family ethernet-switching filter video_class term video from
source-address 192.168.1.14/32
set firewall family ethernet-switching filter video_class term video from protocol
udp
set firewall family ethernet-switching filter video_class term video from
source-port 2979
set firewall family ethernet-switching filter video_class term video then
forwarding-class video loss-priority low
set firewall family ethernet-switching filter video_class term network_control
from precedence [net-control internet-control]
set firewall family ethernet-switching filter video_class term network_control
then forwarding-class network-control loss-priority low
set firewall family ethernet-switching filter video_class term best_effort_traffic
then forwarding-class best-effort loss-priority low
set interfaces ge-0/0/2 description video-ingress-port
set interfaces ge-0/0/2 unit 0 family ethernet-switching filter input video_class
```

```

set firewall family ethernet-switching filter app_class term app from
source-address 192.168.1.23/32
set firewall family ethernet-switching filter app_class term app from protocol
tcp
set firewall family ethernet-switching filter app_class term app from source-port
[1494 2512 2513 2598 2897]
set firewall family ethernet-switching filter app_class term app then
forwarding-class app loss-priority low
set firewall family ethernet-switching filter app_class term mail from
source-address 192.168.1.24/32
set firewall family ethernet-switching filter app_class term mail from protocol
tcp
set firewall family ethernet-switching filter app_class term mail from source-port
[25 143 389 691 993 3268 3269]
set firewall family ethernet-switching filter app_class term mail then
forwarding-class mail loss-priority low
set firewall family ethernet-switching filter app_class term db from source-address
192.168.1.25/32
set firewall family ethernet-switching filter app_class term db from protocol tcp
set firewall family ethernet-switching filter app_class term db from source-port
[1521 1525 1527 1571 1810 2481]
set firewall family ethernet-switching filter app_class term db then
forwarding-class db loss-priority low
set firewall family ethernet-switching filter app_class term erp from
source-address 192.168.1.26/32
set firewall family ethernet-switching filter app_class term erp from protocol
tcp
set firewall family ethernet-switching filter app_class term erp from source-port
[3200 3300 3301 3600]
set firewall family ethernet-switching filter app_class term erp then
forwarding-class erp loss-priority low
set firewall family ethernet-switching filter app_class term network_control from
precedence [net-control internet-control]
set firewall family ethernet-switching filter app_class term network_control then
forwarding-class network-control loss-priority low
set firewall family ethernet-switching filter app_class term best_effort_traffic
then forwarding-class best-effort loss-priority low
set interfaces ge-0/0/3 unit 0 family ethernet-switching filter input app_class
set interfaces ge-0/0/4 unit 0 family ethernet-switching filter input app_class
set interfaces ge-0/0/5 unit 0 family ethernet-switching filter input app_class
set interfaces ge-0/0/6 unit 0 family ethernet-switching filter input app_class
set class-of-service schedulers voice-sched buffer-size percent 10
set class-of-service schedulers voice-sched priority strict-high
set class-of-service schedulers voice-sched transmit-rate percent 10
set class-of-service schedulers video-sched buffer-size percent 15
set class-of-service schedulers video-sched priority low
set class-of-service schedulers video-sched transmit-rate percent 15
set class-of-service schedulers app-sched buffer-size percent 10
set class-of-service schedulers app-sched priority low
set class-of-service schedulers app-sched transmit-rate percent 10
set class-of-service schedulers mail-sched buffer-size percent 5
set class-of-service schedulers mail-sched priority low
set class-of-service schedulers mail-sched transmit-rate percent 5
set class-of-service schedulers db-sched buffer-size percent 10
set class-of-service schedulers db-sched priority low
set class-of-service schedulers db-sched transmit-rate percent 10
set class-of-service schedulers erp-sched buffer-size percent 10
set class-of-service schedulers erp-sched priority low
set class-of-service schedulers erp-sched transmit-rate percent 10
set class-of-service schedulers nc-sched buffer-size percent 5
set class-of-service schedulers nc-sched priority strict-high

```

```

set class-of-service schedulers nc-sched transmit-rate percent 5
set class-of-service schedulers be-sched buffer-size percent 35
set class-of-service schedulers be-sched priority low
set class-of-service schedulers be-sched transmit-rate percent 35
set class-of-service scheduler-maps ethernet-cos-map forwarding-class voice
scheduler voice-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class video
scheduler video-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class app scheduler
app-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class mail
scheduler mail-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class db scheduler
db-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class erp scheduler
erp-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class
network-control scheduler nc-sched
set class-of-service scheduler-maps ethernet-cos-map forwarding-class best-effort
scheduler be-sched
set class-of-service interfaces ge-0/0/20 scheduler-map ethernet-cos-map

```

**Step-by-Step Procedure** To configure and apply CoS:

1. Configure one-to-one mapping between eight forwarding classes and eight queues:

```

[edit class-of-service]
user@switch# set forwarding-classes class app queue-num 5
user@switch# set forwarding-classes class mail queue-num 1
user@switch# set forwarding-classes class db queue-num 2
user@switch# set forwarding-classes class erp queue-num 3
user@switch# set forwarding-classes class video queue-num 4
user@switch# set forwarding-classes class best-effort queue-num 0
user@switch# set forwarding-classes class voice queue-num 6
user@switch# set forwarding-classes class network-control queue-num 7

```

2. Define the firewall filter voip\_class to classify the VoIP traffic:

```

[edit firewall]
user@switch# set family ethernet-switching filter voip_class

```

3. Define the term voip:

```

[edit firewall]
user@switch# set family ethernet-switching filter voip_class term voip
from source-address 192.168.1.1/32
user@switch# set family ethernet-switching filter voip_class term voip
from source-address 192.168.1.2/32
user@switch# set family ethernet-switching filter voip_class term voip
protocol udp
user@switch# set family ethernet-switching filter voip_class term voip
source-port 2698
user@switch# set family ethernet-switching filter voip_class term voip
then forwarding-class voice loss-priority low

```

4. Define the term `network_control`:

```
[edit firewall]
user@switch# set family ethernet-switching filter voip_class term
network_control from precedence [net-control internet-control]
user@switch# set family ethernet-switching filter voip_class term
network_control then forwarding-class network-control loss-priority low
```

5. Define the term `best_effort_traffic` with no match conditions:

```
[edit firewall]
user@switch# set family ethernet-switching filter voip_class term
best_effort_traffic then forwarding-class best-effort loss-priority low
```

6. Apply the firewall filter `voip_class` as an input filter to the interfaces for the VoIP phones:

```
[edit interfaces]
user@switch# set ge-0/0/0 description phone1-voip-ingress-port
user@switch# set ge-0/0/0 unit 0 family ethernet-switching filter input
voip_class
user@switch# set ge-0/0/1 description phone2-voip-ingress-port
user@switch# set ge-0/0/1 unit 0 family ethernet-switching filter input
voip_class
```

7. Define the firewall filter `video_class` to classify the video traffic:

```
[edit firewall]
user@switch# set family ethernet-switching filter video_class
```

8. Define the term `video`:

```
[edit firewall]
user@switch# set family ethernet-switching filter video_class term video
from source-address 192.168.1.14/32
user@switch# set family ethernet-switching filter video_class term video
protocol udp
user@switch# set family ethernet-switching filter video_class term video
source-port 2979
user@switch# set family ethernet-switching filter video_class term video
then forwarding-class video loss-priority low
```

9. Define the term `network_control` (for the `video_class` filter):

```
[edit firewall]
user@switch# set family ethernet-switching filter video_class term
network_control from precedence [net-control internet-control]
user@switch# set family ethernet-switching filter video_class term
network_control then forwarding-class network-control loss-priority low
```

10. Define the term `best_effort_traffic` (for the `video_class` filter):

```
[edit firewall]
```

```
user@switch# set family ethernet-switching filter video_class term
best_effort_traffic then forwarding-class best-effort loss-priority low
```

11. Apply the firewall filter video\_class as an input filter to the interface for the surveillance camera:

```
[edit interfaces]
user@switch# set ge-0/0/2 description video-ingress-port
user@switch# set ge-0/0/2 unit 0 family ethernet-switching filter input
video_class
```

12. Define the firewall filter app\_class to classify the application server traffic:

```
[edit firewall]
user@switch# set family ethernet-switching filter app_class
```

13. Define the term app:

```
[edit firewall]
user@switch# set family ethernet-switching filter app_class term app from
source-address 192.168.1.23/32
user@switch# set family ethernet-switching filter app_class term app
protocol tcp
user@switch# set family ethernet-switching filter app_class term app
source-port [1494 2512 2513 2598 2897]
user@switch# set family ethernet-switching filter app_class term app then
forwarding-class app loss-priority low
```

14. Define the term mail:

```
[edit firewall]
user@switch# set family ethernet-switching filter app_class term mail from
source-address 192.168.1.24/32
user@switch# set family ethernet-switching filter app_class term mail
protocol tcp
user@switch# set family ethernet-switching filter app_class term mail
source-port [25 143 389 691 993 3268 3269]
user@switch# set family ethernet-switching filter app_class term mail then
forwarding-class mail loss-priority low
```

15. Define the term db:

```
[edit firewall]
user@switch# set family ethernet-switching filter app_class term db from
source-address 192.168.1.25/32
user@switch# set family ethernet-switching filter app_class term db
protocol tcp
user@switch# set family ethernet-switching filter app_class term db
source-port [1521 1525 1527 1571 1810 2481]
user@switch# set family ethernet-switching filter app_class term db then
forwarding-class db loss-priority low
```

16. Define the term erp:



```

[edit firewall]
user@switch# set family ethernet-switching filter app_class term erp from
source-address 192.168.1.26/32
user@switch# set family ethernet-switching filter app_class term erp
protocol tcp
user@switch# set family ethernet-switching filter app_class term erp
source-port [3200 3300 3301 3600]
user@switch# set family ethernet-switching filter app_class term erp then
forwarding-class erp loss-priority low

```

17. Define the term network\_control (for the app\_class filter):

```

[edit firewall]
user@switch# set family ethernet-switching filter app_class term
network_control from precedence [net-control internet-control]
user@switch# set family ethernet-switching filter app_class term
network_control then forwarding-class network-control loss-priority low

```

18. Define the term best\_effort\_traffic (for the app\_class filter):

```

[edit firewall]
user@switch# set family ethernet-switching filter app_class term
best_effort_traffic then forwarding-class best-effort loss-priority low

```

19. Apply the firewall filter app\_class as an input filter to the interfaces for the servers hosting applications:

```

[edit interfaces]
user@switch# set ge-0/0/3 unit 0 family ethernet-switching filter input
app_class
user@switch# set ge-0/0/4 unit 0 family ethernet-switching filter input
app_class
user@switch# set ge-0/0/5 unit 0 family ethernet-switching filter input
app_class
user@switch# set ge-0/0/6 unit 0 family ethernet-switching filter input
app_class

```

20. Configure schedulers:

```

[edit class-of-service]
user@switch# set schedulers voice-sched buffer-size percent 10
user@switch# set schedulers voice-sched priority strict-high
user@switch# set schedulers voice-sched transmit-rate percent 10
user@switch# set schedulers video-sched buffer-size percent 15
user@switch# set schedulers video-sched priority low
user@switch# set schedulers video-sched transmit-rate percent 15
user@switch# set schedulers app-sched buffer-size percent 10
user@switch# set schedulers app-sched priority low
user@switch# set schedulers app-sched transmit-rate percent 10
user@switch# set schedulers mail-sched buffer-size percent 5
user@switch# set schedulers mail-sched priority low
user@switch# set schedulers mail-sched transmit-rate percent 5
user@switch# set schedulers db-sched buffer-size percent 10
user@switch# set schedulers db-sched priority low
user@switch# set schedulers db-sched transmit-rate percent 10

```

```

user@switch# set schedulers erp-sched buffer-size percent 10
user@switch# set schedulers erp-sched priority low
user@switch# set schedulers erp-sched transmit-rate percent 10
user@switch# set schedulers nc-sched buffer-size percent 5
user@switch# set schedulers nc-sched priority strict-high
user@switch# set schedulers nc-sched transmit-rate percent 5
user@switch# set schedulers be-sched buffer-size percent 35
user@switch# set schedulers be-sched priority low
user@switch# set schedulers be-sched transmit-rate percent 35

```

21. Assign the forwarding classes to schedulers with the scheduler map ethernet-cos-map:

```

[edit class-of-service]
user@switch# set scheduler-maps ethernet-cos-map forwarding-class voice
scheduler voice-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class video
scheduler video-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class app
scheduler app-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class mail
scheduler mail-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class db
scheduler db-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class erp
scheduler erp-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class
network-control scheduler nc-sched
user@switch# set scheduler-maps ethernet-cos-map forwarding-class
best-effort scheduler be-sched

```

22. Associate the scheduler map with the outgoing interface:

```

[edit class-of-service interfaces]
user@switch# set ge-0/0/20 scheduler-map ethernet-cos-map

```

**Results** Display the results of the configuration:

```

user@switch# show firewall

firewall family ethernet-switching {
  filter voip_class {
    term voip {
      from {
        source-address {
          192.168.1.1/32;
          192.168.1.2/32;
        }
        protocol udp;
        source-port 2698;
      }
      then {
        forwarding-class voice;
        loss-priority low;
      }
    }
  }
}

```

```

    }
}
term network control {
    from {
        precedence [net-control internet-control];
    }
    then {
        forwarding-class network-control;
        loss-priority low;
    }
}
term best_effort_traffic {
    then {
        forwarding-class best-effort;
        loss-priority low;
    }
}
}
filter video_class {
    term video {
        from {
            source-address {
                192.168.1.14/32;
            }
            protocol udp;
            source-port 2979;
        }
        then {
            forwarding-class video;
            loss-priority low;
        }
    }
}
term network control {
    from {
        precedence [net-control internet-control];
    }
    then {
        forwarding-class network-control;
        loss-priority low;
    }
}
term best_effort_traffic {
    then {
        forwarding-class best-effort;
        loss-priority low;
    }
}
}
filter app_class {
    term app {
        from {
            source-address {
                192.168.1.23/32;
            }
        }
        protocol tcp;
        source-port [1491 2512 2513 2598 2897];
    }
}

```

```

    }
    then {
        forwarding-class app;
        loss-priority low;
    }
}
term mail {
    from {
        source-address {
            192.168.1.24/32;
        }
        protocol tcp;
        source-port [25 143 389 691 993 3268 3269];
    }
    then {
        forwarding-class mail;
        loss-priority low;
    }
}
term db {
    from {
        source-address {
            192.168.1.25/32;
        }
        protocol tcp;
        source-port [1521 1525 1527 1571 1810 2481];
    }
    then {
        forwarding-class db;
        loss-priority low;
    }
}
term erp {
    from {
        source-address {
            192.168.1.26/32;
        }
        protocol tcp;
        source-port [3200 3300 3301 3600];
    }
    then {
        forwarding-class erp;
        loss-priority low;
    }
}
term network control {
    from {
        precedence [net-control internet-control];
    }
    then {
        forwarding-class network-control;
        loss-priority low;
    }
}
term best_effort_traffic {
    then {

```

```

        forwarding-class best-effort;
        loss-priority low;
    }
}
}

```

user@switch# show class-of-service

```

forwarding-classes {
  class app queue-num 5;
  class mail queue-num 1;
  class db queue-num 2;
  class erp queue-num 3;
  class video queue-num 4;
  class best-effort queue-num 0;
  class voice queue-num 6;
  class network-control queue-num 7;
}
schedulers {
  voice-sched {
    buffer-size percent 10;
    priority strict-high;
    transmit-rate percent 10;
  }
  video-sched {
    buffer-size percent 15;
    priority low;
    transmit-rate percent 15;
  }
  app-sched {
    buffer-size percent 10;
    priority low;
    transmit-rate percent 10;
  }
  mail-sched {
    buffer-size percent 5;
    priority low;
    transmit-rate percent 5;
  }
  db-sched {
    buffer-size percent 10;
    priority low;
    transmit-rate percent 10;
  }
  erp-sched {
    buffer-size percent 10;
    priority low;
    transmit-rate percent 10;
  }
  nc-sched {
    buffer-size percent 5;
    priority strict-high;
    transmit-rate percent 5;
  }
  be-sched {

```

```

        buffer-size percent 35;
        priority low;
        transmit-rate percent 35;
    }
}
scheduler-maps {
    ethernet-cos-map {
        forwarding-class voice scheduler voice-sched;
        forwarding-class video scheduler video-sched;
        forwarding-class app scheduler app-sched;
        forwarding-class mail scheduler mail-sched;
        forwarding-class db scheduler db-sched;
        forwarding-class erp scheduler erp-sched;
        forwarding-class network-control scheduler nc-sched;
        forwarding-class best-effort scheduler be-sched;
    }
}

```

user@switch# show interfaces

```

ge-0/0/0 {
    unit 0 {
        family ethernet {
            filter {
                input voip_class;
            }
        }
    }
}
ge-0/0/1 {
    unit 0 {
        family ethernet {
            filter {
                input voip_class;
            }
        }
    }
}
ge-0/0/2 {
    unit 0 {
        family ethernet {
            filter {
                input video_class;
            }
        }
    }
}
ge-0/0/3 {
    unit 0 {
        family ethernet {
            filter {
                input app_class;
            }
        }
    }
}

```

```

ge-0/0/4 {
  unit 0 {
    family ethernet {
      filter {
        input app_class;
      }
    }
  }
}
ge-0/0/5 {
  unit 0 {
    family ethernet {
      filter {
        input app_class;
      }
    }
  }
}
ge-0/0/6 {
  unit 0 {
    family ethernet {
      filter {
        input app_class;
      }
    }
  }
}

```

## Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying That the Defined Forwarding Classes Exist and Are Mapped to Queues on page 15
- Verifying That the Forwarding Classes Have Been Assigned to Schedulers on page 16
- Verifying That the Scheduler Map Has Been Applied to the Interface on page 17

### Verifying That the Defined Forwarding Classes Exist and Are Mapped to Queues

**Purpose** Verify that the following forwarding classes app, db, erp, mail, video, and voice have been defined and mapped to queues.

**Action** user@switch> **show class-of-service forwarding-class**

Forwarding class	ID	Queue
app	0	5
db	1	2
erp	2	3
best-effort	3	0
mail	4	1
voice	5	6

video	6	4
network-control	7	7

**Meaning** This output shows that the forwarding classes have been defined and mapped to appropriate queues.

## Verifying That the Forwarding Classes Have Been Assigned to Schedulers

**Purpose** Verify that the forwarding classes have been assigned to schedulers.

**Action** user@switch> **show class-of-service scheduler-map**

Scheduler map: ethernet-cos-map, Index: 2

Scheduler: voice-sched, Forwarding class: voice, Index: 22  
 Transmit rate: 5 percent, Rate Limit: none, Buffer size: 15 percent,  
 Priority: Strict-high  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>

Scheduler: video-sched, Forwarding class: video, Index: 22  
 Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,  
 Priority: low  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>

Scheduler: app-sched, Forwarding class: app, Index: 22  
 Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,  
 Priority: low  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>

Scheduler: mail-sched, Forwarding class: mail, Index: 22  
 Transmit rate: 5 percent, Rate Limit: none, Buffer size: 5 percent,  
 Priority: low  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>

Scheduler: db-sched, Forwarding class: db, Index: 22  
 Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,  
 Priority: low  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>

Scheduler: erp-sched, Forwarding class: erp, Index: 22  
 Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,  
 Priority: low  
 Drop profiles:

Loss priority	Protocol	Index	Name
High	non-TCP	1	<default-drop-profile>
High	TCP	1	<default-drop-profile>



```

Scheduler: be-sched, Forwarding class: best-effort, Index: 20
  Transmit rate: 35 percent, Rate Limit: none, Buffer size: 35 percent,
  Priority: low
  Drop profiles:
    Loss priority  Protocol  Index  Name
    High          non-TCP   1      <default-drop-profile>
    High          TCP       1      <default-drop-profile>

Scheduler: nc-sched, Forwarding class: network-control, Index: 22
  Transmit rate: 5 percent, Rate Limit: none, Buffer size: 5 percent,
  Priority: Strict-high
  Drop profiles:
    Loss priority  Protocol  Index  Name
    High          non-TCP   1      <default-drop-profile>
    High          TCP       1      <default-drop-profile>

```

**Meaning** This output shows that the forwarding classes have been assigned to schedulers.

## Verifying That the Scheduler Map Has Been Applied to the Interface

**Purpose** Verify that the scheduler map has been applied to the interface.

**Action** user@switch> **show class-of-service interface**  
 ...  
 Physical interface: ge-0/0/20, Index: 149  
 Queues supported: 8, Queues in use: 8  
 Scheduler map: ethernet-cos-map, Index: 43366  
 Input scheduler map: <default>, Index: 3  
 ...

**Meaning** This output shows that the scheduler map (ethernet-cos-map) has been applied to the interface (ge-0/0/20).

- Related Topics**
- Defining CoS Code-Point Aliases (CLI Procedure)
  - Defining CoS Classifiers (CLI Procedure)
  - Defining CoS Forwarding Classes (CLI Procedure)
  - Defining CoS Schedulers (CLI Procedure)
  - Configuring CoS Tail Drop Profiles (CLI Procedure)
  - Assigning CoS Components to Interfaces (CLI Procedure)
  - Configuring Firewall Filters (CLI Procedure)

