

## Chapter 19

# Configuring CoS Schedulers for Aggregated Ethernet and SONET/SDH Interfaces

You can apply a class-of-service (CoS) configuration to aggregated Ethernet and aggregated SONET/SDH interfaces. The CoS configuration applies to all member links included in the aggregated interface. You cannot apply different CoS configurations to the individual member links.

To view the summation of the queue statistics for the member links of an aggregate interface, issue the `show interfaces queue` command. To view the queue statistics for each member link, issue the `show interfaces queue aggregated-interface-name` command.

To configure CoS schedulers on aggregated interfaces, you can include the following statements at the [edit class-of-service] hierarchy level of the configuration:

```
class-of-service {
  interfaces {
    interface-name {
      scheduler-map map-name;
      scheduler-map-chassis map-name;
      unit logical-unit-number {
        scheduler-map map-name;
      }
    }
  }
  scheduler-maps {
    map-name {
      forwarding-class class-name scheduler scheduler-name;
    }
  }
  schedulers {
    scheduler-name {
      buffer-size (percent percentage | remainder | temporal microseconds);
      drop-profile-map loss-priority (any | low | medium-low | medium-high | high)
        protocol (any | non-tcp | tcp) drop-profile profile-name;
      priority priority-level;
      transmit-rate (rate | percent percentage | remainder) <exact>;
    }
  }
}
```

This chapter discusses the following topics:

- Limitations for Configuring CoS for Aggregated Interfaces on page 234
- Examples: Configuring CoS for Aggregated Ethernet and SONET/SDH Interfaces on page 235

## Limitations for Configuring CoS for Aggregated Interfaces

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There are some restrictions when you configure CoS on aggregated Ethernet and SONET/SDH interfaces:

- Chassis scheduling, described in “Associating the Scheduler Map with the Packet Forwarding Component Queues” on page 157, is not supported on aggregated interfaces, because a chassis scheduler applies to the entire PIC and not just to one interface.
- Per-unit scheduling, described in “Associating the Scheduler Map and a Shaping Rate with a DLCI or VLAN” on page 141, is not supported on aggregated interfaces. Furthermore, you cannot configure per-unit scheduling on any member link in an aggregated interface.
- An aggregated interface is a pseudo-interface. Therefore, CoS queues are not associated with the aggregated interface. Instead, CoS queues are associated with the member link interfaces of the aggregated interface.
- When you apply CoS parameters to the aggregated interface, they are applied to the CoS queues of the member link interfaces. You can apply CoS classifiers and rewrite rules directly to the member link interfaces, and the software uses the values you configure.
- When you apply scheduler maps to member link interfaces, the software cannot always use the values you configure because the speed of the aggregated interface is the sum of the speeds of its member link interfaces.

When the scheduler map of the aggregate interface has schedulers configured for absolute transmit rate, the scheduler for the member link interfaces is scaled to the speed of each member link interface. Each member link interface has an automatic scheduler map that is not visible in the CLI. This scheduler map is allocated when the member link is added to the aggregate interface and is deleted when the member link is removed from the aggregate interface.

- If you configure the scheduler transmit rate of the aggregate interface as an absolute rate, the software uses the following formula to scale the transmit rate of each member link:

$$\begin{aligned} \text{transmit rate of member link interface} = & \\ & (\text{configured transmit rate of aggregate interface} / \\ & \text{total speed of aggregate interface}) * \\ & (\text{total speed of member link interface} / \text{total configured percent}) * 100 \end{aligned}$$

- If you configure the scheduler transmit rate of the aggregate interface as a percentage, the software uses the following formula to scale the transmit rate of each member link:

$$\text{transmit rate percent of member link interface} = \frac{\text{(configured transmit rate percent of aggregate interface / total configured percent)} * 100$$

The total configured percent is the sum of the configured transmit rate of all schedulers in terms of percentage of the total speed of the aggregate interface.

For more information, see “Examples: Configuring CoS for Aggregated Ethernet and SONET/SDH Interfaces” on page 235.

- All the other parameters for the schedulers, including priority, drop profile, and buffer size, are copied without change from the scheduler of the aggregated interface to the member link interfaces.
- The configuration related to the logical interfaces, including classifiers and rewrite rules, is copied from the aggregated logical interface configuration to the member link logical interfaces.
- For the scheduler map applied to an aggregated interface, if you configure a transmission rate in absolute terms, then the traffic of all the member link interfaces might be affected if any of the member link interfaces go up or down.

## Examples: Configuring CoS for Aggregated Ethernet and SONET/SDH Interfaces

**Apply Scaling Formula to Absolute Rates** Configure queues as follows when the total speed of member link interfaces is 100 Mbps (the available bandwidth is 100 Mbps):

```
[edit class-of-service]
schedulers {
  be {
    transmit-rate 10m;
  }
  af {
    transmit-rate 20m;
  }
  ef {
    transmit-rate 80m;
  }
  nc {
    transmit-rate 30m;
  }
}
```

The total configured transmit rates of the aggregated interface is 10m + 20m + 80m + 30m = 140 Mbps, meaning the transmit rate is overconfigured by 40 percent. Therefore, the software scales down the configuration to match the 100 Mbps of available bandwidth, as follows:

$$\begin{aligned} \text{be} &= (10/140) * 100 = 7 \text{ percent of } 100 \text{ Mbps} = 7 \text{ Mbps} \\ \text{af} &= (20/140) * 100 = 14 \text{ percent of } 100 \text{ Mbps} = 14 \text{ Mbps} \\ \text{ef} &= (80/140) * 100 = 57 \text{ percent of } 100 \text{ Mbps} = 57 \text{ Mbps} \\ \text{nc} &= (30/140) * 100 = 21 \text{ percent of } 100 \text{ Mbps} = 21 \text{ Mbps} \end{aligned}$$

**Apply Scaling Formula to Mixture of Percent and Absolute Rates**

Configure the following mixture of percent and absolute rates:

```
[edit class-of-service]
schedulers {
  be {
    transmit-rate 20 percent;
  }
  af {
    transmit-rate 40 percent;
  }
  ef {
    transmit-rate 150m;
  }
  nc {
    transmit-rate 10 percent;
  }
}
```

Assuming 300 Mbps of available bandwidth, the configured percentages correlate with the following absolute rates:

```
schedulers {
  be {
    transmit-rate 60m;
  }
  af {
    transmit-rate 120m;
  }
  ef {
    transmit-rate 150m;
  }
  nc {
    transmit-rate 30m;
  }
}
```

The software scales the bandwidth allocation as follows:

$$\begin{aligned} \text{be} &= (60/360) * 100 = 17 \text{ percent of } 300 \text{ Mbps} = 51 \text{ Mbps} \\ \text{af} &= (120/360) * 100 = 33 \text{ percent of } 300 \text{ Mbps} = 99 \text{ Mbps} \\ \text{ef} &= (150/360) * 100 = 42 \text{ percent of } 300 \text{ Mbps} = 126 \text{ Mbps} \\ \text{nc} &= (30/360) * 100 = 8 \text{ percent of } 300 \text{ Mbps} = 24 \text{ Mbps} \end{aligned}$$

**Configuring an Aggregated Ethernet Interface**

Configure an aggregated Ethernet interface with the following scheduler map:

```
[edit class-of-service]
scheduler-maps {
  aggregated-sched {
    forwarding-class be scheduler be;
    forwarding-class af scheduler af;
    forwarding-class ef scheduler ef;
    forwarding-class nc scheduler nc;
  }
}
schedulers {
  be {
    transmit-rate percent 10;
    buffer-size percent 25;
  }
  af {
    transmit-rate percent 20;
    buffer-size percent 25;
  }
  ef {
    transmit-rate 80m;
    buffer-size percent 25;
  }
  nc {
    transmit-rate percent 30;
    buffer-size percent 25;
  }
}
```

In this case, the transmission rate for the member link scheduler map is as follows:

- be—7 percent
- af —14 percent
- ef —57 percent
- nc —21 percent

If you add a Fast Ethernet interface to the aggregate, the aggregate bandwidth is 200 Mbps, and the transmission rate for the member link scheduler map is as follows:

- be—10 percent
- af —20 percent
- ef —40 percent
- nc —30 percent

