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Junos® OS

Channelized IQ Interfaces

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Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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Table of Contents

List of Figures

List of Tables

PART 1

Overview

CHAPTER 1

Product Overview

Overview of Channelized IQ Interfaces

Channelized interfaces allow service providers to customize bandwidth to satisfy the needs of their customers. Whether the subscriber needs DS0, T1, fractional T1, E1, fractional E1, E3, T3, STM1, OC3, or OC12 service, a channelized interface can provide the necessary bandwidth today and can be reconfigured to support the customer's expanding network tomorrow. Standard channelized interfaces have been available on Juniper Networks routing platforms since JUNOS Release 3.4.

The original channelized interfaces for Juniper Networks M-series routers are available in the following models:

- 1-port Channelized OC12 PIC
- 10-port Channelized E1 PIC
- 1-port Channelized STM1 PIC
- 4-port Channelized DS3 PIC
- 1-port and 2-port multichannel Channelized DS3 PIC

These channelized interfaces provide a single level of channelization and require at both the **[edit chassis]** and the **[edit interfaces]** hierarchy levels. Most configuration options must be set on channel 0 and apply to all channels on these channelized interfaces.

The new channelized interfaces with intelligent queuing offer several advantages over the original channelized interfaces:

- Complete configuration tasks for channelized IQ interfaces are now centralized at the **[edit interfaces]** hierarchy level.
- Multiple levels of channelization are now possible with channelized IQ interfaces. For example, a channelized OC12 IQ interface can be divided into channelized OC1 interfaces, then subdivided into channelized T1 interfaces, and further split into *N*xDS0 channels.

- You can now configure interface statements, such as **clocking**, on individual channels rather than configuring them on channel 0 for all channels at the same hierarchy level.
- Class-of-service (CoS) processing now occurs on the PIC for channelized IQ interfaces rather than in the FPC.

The following M-series and T-series PICs support channelized interfaces with intelligent queuing:

- 1-port Channelized OC12 IQ PIC
- 1-port Channelized OC3 PIC
- 4-port Channelized DS3 IQ PIC
- 10-port Channelized T1 IQ PIC
- 10-port Channelized E1 IQ PIC
- 1-port Channelized STM1 IQ PIC

To determine which PIC is installed, issue the **show chassis hardware** command:

```
user@RouterA> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                20070             M160
Midplane         REV 03   710-001245   AB4123
FPM CMB          REV 02   710-001642   AB3266
FPM Display      REV 02   710-001647   AB3038
CIP              REV 04   710-001593   AB3276
PEM 0            Rev 03   740-001243   KM28410           DC
PEM 1            Rev 03   740-001243   LF21558           Power Entry Module
PCG 0            REV 03   710-001568   AB3006
PCG 1            REV 02   710-001568   AB2992
Routing Engine 0                       20000005dfae3a01  RE-2.0
MCS 0            REV 04   710-001226   AB3208
MCS 1            REV 04   710-001226   AB3212
SFM 0 SPP        REV 06   710-001228   AB3103
SFM 0 SPR        REV 01   710-002189   AB2936            Internet Processor II
SFM 1 SPP        REV 07   710-001228   AG2634
SFM 1 SPR        REV 03   710-002189   AE3503            Internet Processor II
SFM 2 SPP        REV 06   710-001228   AB2976
SFM 2 SPR        REV 01   710-002189   AB2938            Internet Processor II
SFM 3 SPP        REV 06   710-001228   AB5826
SFM 3 SPR        REV 01   710-002189   AB2917            Internet Processor II
FPC 0            REV 03   710-003947   HE0614            E-FPC Type 1
  CPU            REV 01   710-004600   AT3217
 PIC 0     REV 03  750-005636  BE1826     4x CHDS3 IQ

  # This is the Channelized DS3 IQ PIC.

  PIC 1          REV 07   750-003846   HG5572            1x 800M Crypto
  PIC 2          REV 01   750-004507   BA5341            10x CE1-NxDS0
 PIC 3     REV 06  750-003009  AM6929     4x CT3

  # This is the original Channelized T3 PIC.

FPC 1            REV 03   710-003309   AD9434            E-FPC Type 2
  CPU            REV 05   710-001217   AH2707
```

```
PIC 2          REV 05   750-001900   AD5738           1x OC-48 SONET, SMSR
PIC 3          REV 04   750-003737   BC1106           4x G/E, 1000 BASE-SX
```

Related Documentation

- Channelized IQ Interfaces
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

Guidelines for Configuring Channelized IQ Interfaces

When you configure channelized IQ interfaces, keep in mind these rules of thumb:

- You normally configure media-related statements and options at the physical interface level (also known as the controller level). This level is indicated by the **[edit interfaces *cxx-fpc/pic/port*]** hierarchy level.
- You should always configure HDLC-related statements (for example, **bytes**, **fcs**, **idle-cycle-flag**, **mtu**, **receive-bucket**, **start-end-flag**, and **transmit-bucket**) and logical interfaces (for example, **[edit interfaces *interface-name* unit *unit-number*]**) on end channels such as DS0 and T1. Never configure these statements at the controller level.
- Pay attention to the channel numbering rules:
  - OC3 data channels configured on channelized OC12 IQ interfaces are numbered from 1 to 4.
  - T3 channels configured on a channelized OC12 IQ or channelized OC3 IQ interface are numbered from 1 to 12.
  - T1 channels on a channelized OC12 IQ, channelized OC3 IQ, channelized DS3 IQ, or channelized T1 IQ interface are numbered from 1 to 28.
  - E1 channels configured on a channelized STM1 IQ interface are numbered from 1 to 63.
  - *N*xDS0 time slots configured on a channelized OC12 IQ, channelized OC3 IQ, channelized DS3 IQ, or channelized T1 IQ interface are numbered from 1 to 24.
  - *N*xDS0 time slots configured on either a channelized STM1 IQ interface or channelized E1 IQ interface are numbered from 2 to 32 (1 is reserved).
- You can configure Automatic Protection Switching (APS) on channelized OC12 IQ interfaces and Multiplex Section Protection (MSP) on channelized STM1 IQ interfaces. The JUNOS implementation of APS and MSP allows you to protect against circuit failures between a SONET/SDH add/drop multiplexer (ADM) and one or more routers, and between multiple interfaces in the same router. When a device fails, a backup device immediately takes over.

  You configure APS and MSP at the controller level only. To configure, include the **working-circuit** and **protect-circuit** statements at the **[edit interfaces coc12-*fpc/pic/port* sonet-options aps]** or **[edit interfaces coc3-*fpc/pic/port* sonet-options aps]** hierarchy

level for APS and the **[edit interfaces cstm1-*fpc/pic/port* sonet-options aps]** hierarchy level for MSP.

When you enable the controller-level interface as the working circuit, all partitions under the working circuit are also enabled. This is the default behavior even when APS or MSP is not configured. When the backup circuit interface is disabled, all partitions under this protected circuit are also disabled. If the working circuit fails, the interfaces are switched: The working circuit and all its partitions are disabled, and the protect circuit and all its partitions are enabled. You can verify this behavior by entering the **show interfaces controller** command. The disabled interfaces are shown as "admin down" and the enabled interfaces are shown as "admin up."

- You can delete several channelized interfaces simultaneously by using a single command and regular expressions. To delete sequential channelized interfaces, issue the **wildcard** command with the **delete** option at the **[edit]** hierarchy level. Specify the hierarchy level and the channelized interfaces to be summarized with a regular expression. For example, to delete channelized interfaces in the range of **ds-0/0/0:0:0** through **ds-0/0/0:0:23**, issue the following command:

  user@router# **wildcard delete interfaces ds-0/0/0:0:.***

- In JUNOS Release 6.2 and later, additional Frame Relay encapsulation types on physical interfaces and channels of channelized IQ interfaces are available:

  - Extended Frame Relay circuit cross-connect (CCC)—Allows you to assign any DLCI number from 1 to 1022 on Frame Relay CCC logical interfaces. To configure, include the **extended-frame-relay-ccc** statement at the **[edit interfaces *interface-name* encapsulation]** hierarchy level.

  - Extended Frame Relay translational cross-connect (TCC)—Allows you to assign any DLCI number from 1 to 1022 on Frame Relay TCC logical interfaces. To configure, include the **extended-frame-relay-tcc** statement at the **[edit interfaces *interface-name* encapsulation]** hierarchy level.

  - Flexible Frame Relay—Allows you to configure any DLCI number from 1 to 1022 and any combination of Frame Relay encapsulation types on logical interfaces. To configure, include the **flexible-frame-relay** statement at the **[edit interfaces *interface-name* encapsulation]** hierarchy level.

- When you configure clocking, bit error rate testing (BERT), C-bit parity, and loopback statements on T3, T1, or DS0 channels on channelized IQ interfaces, you must follow these guidelines:

  - If you include the statements at both the **[edit interfaces ct3-*fpc /pic/\port:channel* t3-options]** and **[edit interfaces t3-*fpc/pic/port:channel* t3-options]** hierarchy levels, channelized T3-level statements are operational and T3-level statements are ignored.

  - If you include the statements at both the **[edit interfaces ct3-*fpc/pic/port:channel* t3-options]** and **[edit interfaces t1-*fpc/pic/port:channel* t1-options]** hierarchy levels, the channelized T3-level statements are operational for the T3 connections and the T1-level statements are operational for the T1 connections.

- Because DS0 channels do not have a valid clocking option, you must configure clocking for all *N*xDS0s at the **[edit interfaces ct1-*fpc/ pic/port:channel*t1-options]** hierarchy level.
- You configure BERT at the **[edit interfaces ct3-*fpc/pic/port:channel* t3-options]** hierarchy level or on any partitioned subchannel of the channelized T3 interface. There are 12 BERT patterns available for DS0 channels and 28 BERT patterns for T1, channelized T1, T3, and channelized T3 channels within channelized IQ interfaces.
- For Channelized OC3 IQ PICs, if you need a remote loopback on a far-end *N*xDS0 interface, and you are running a BERT test from the local *N*xDS0 interface, you must configure a remote loopback on the associated channelized T1 interface (**ct1**) for the far-end routing platform. To do this, include the **loopback remote** statement at the **[edit interfaces ct1-fpc/pic/port t1-options]** hierarchy level.
- You can configure loopbacks at the **[edit interfaces ct3-*fpc/pic/port:channel* t3-options]** hierarchy level. Local loopbacks recirculate framing information within the local router. Remote loopbacks resend entire frames back to the remote sender. A new loopback called a *payload loopback* is similar to a remote loopback, but it resends only the data portion of a frame back to the remote sender.
- You can configure C-bit parity at the **[edit interfaces ct3-*fpc/ pic/port:channel* t3-options]** hierarchy level or on any partitioned subchannel of the channelized T3 interface.

- In JUNOS Release 7.5 and later, you can increase the delay buffer for E1, T1, and *N*xDS0 channels on all Channelized IQ PICs (except the Channelized OC12 IQ PIC) by including the **q-pic-large-buffer** statement at the **[edit chassis fpc *fpc-slot* pic *pic-slot*]** hierarchy level. By doing so, you enable the slower interfaces to handle bursts of traffic from faster upstream neighbors. As a result, any class-of-service (CoS) scheduler that you apply to an interface will inherit the larger delay buffer and the buffer is shared across all four CoS queues. For more information about increasing the delay buffer, see the *JUNOS Class of Service Configuration Guide*.

NOTE: If you configure the q-pic-large-buffer statement and APS in a multirouter topology, the Channelized IQ PIC resets and causes an APS switchover.

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

Frame Relay DLCI Limitations for Channelized IQ Interfaces

If you use Frame Relay encapsulation on a channelized interface, see Table 7 on page 8 for the maximum number of data-link connection identifiers (DLCIs) per channel that you can configure at each channel level for various channelized PICs.

NOTE: The actual number of DLCIs you can configure for each channel is determined by the capabilities of your system, such as the number and type of PICs installed. If the number of DLCIs in the configuration exceeds the capabilities of your system, the router might not be able to support the maximum DLCI values shown in Table 7 on page 8. To determine the capabilities of your system, contact Juniper Networks customer support.

Table 1: Frame Relay DLCI Limitations for Channelized Interfaces

Channelized PIC Type		
Original Channelized PICs	**Number of DLCIs per Level**	**Range**
T3 and T1 level channels	64 for regular mode 3 for sparse mode	0–63 for regular mode 1–1022 for sparse mode (0 is reserved for the Local Management Interface or LMI)
DS0 level channels	3 for sparse mode	1–1022 for sparse mode (0 is reserved for LMI)
Channelized IQ PICs	**Number of DLCIs per Level**	**Range**
OC12 level channels (Channelized OC12 IQ PIC)	64	1–1022 (0 is reserved for LMI)
OC3 level channels (Channelized OC12 IQ and Channelized OC3 IQ PICs)	64	1–1022 (0 is reserved for LMI)
T3 level channel (Channelized OC12 IQ, Channelized OC3 IQ, and Channelized DS3 IQ PICs)	256	1–1022 (0 is reserved for LMI)
STM1 level channel (Channelized STM1 IQ PIC)	64	1–1022 (0 is reserved for LMI)
E1 level channels (Channelized STM1 IQ and Channelized E1 IQ PICs)	64	1–1022 (0 is reserved for LMI)
T1 level channels (Channelized OC12 IQ, Channelized OC3 IQ, Channelized DS3 IQ, and Channelized T1 IQ PICs)	64	1–1022 (0 is reserved for LMI)

Table 1: Frame Relay DLCI Limitations for Channelized Interfaces *(continued)*

Channelized PIC Type		
DS0 level channels (Channelized OC12 IQ, Channelized OC3 IQ, Channelized DS3 IQ, Channelized T1 IQ, Channelized STM1 IQ, and Channelized E1 IQ PICs)	16	1–1022 (0 is reserved for LMI)

Related Documentation

- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

CHAPTER 2

System Requirements

System Requirements for Channelized IQ Interfaces

To implement channelized IQ interfaces, your system must meet these requirements:

- JUNOS Release 8.0 or later for DLCI-level scheduler support on E1 channels configured on Channelized STM1 IQ PICs
- JUNOS Release 7.6 or later for converting a Channelized OC12 IQ PIC to a channelized STM4 SDH interface
- JUNOS Release 7.5 or later for increased delay buffers on channelized E1 IQ, channelized DS3 IQ, channelized OC3 IQ, channelized STM1 IQ, and channelized T1 IQ interfaces; support for rate limiting on physical interfaces; and support for channelized STM1 IQ interfaces on T-series platforms
- JUNOS Release 7.4 or later for channelized T1 IQ interfaces
- JUNOS Release 7.1 or later for channelized OC3 IQ interfaces
- JUNOS Release 6.3 or later for configuration of 256 DLCIs at the T3 channel level for channelized OC12 IQ interfaces
- JUNOS Release 6.2 or later for configuration of 64 DLCIs at the T1 channel level for channelized OC12 IQ interfaces, 64 DLCIs at the E1 channel level for channelized STM1 IQ interfaces, and 256 DLCIs at the T3 channel level for channelized DS3 IQ interfaces
- JUNOS Release 6.2 or later for configuration of flexible Frame Relay, extended Frame Relay CCC, and extended Frame Relay TCC encapsulation types
- JUNOS Release 6.2 or later for support of E3 IQ interfaces
- JUNOS Release 6.0 or later for logical interface-level class of service on channelized STM1 IQ interfaces, and APS/MSP on channelized OC12 IQ and channelized STM1 IQ interfaces
- JUNOS Release 5.7 or later for channelized STM1 IQ interfaces
- JUNOS Release 5.7 or later for logical interface-level class of service on the channelized DS3 IQ, channelized E1 IQ, and channelized OC12 IQ interfaces

- JUNOS Release 5.6 or later for channelized DS3 IQ, channelized E1 IQ, and channelized OC12 IQ interfaces
- Two Juniper Networks M-series or T-series routers equipped with an Enhanced Type 1 or Type 2 Flexible PIC Concentrator (FPC)

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

CHAPTER 3

Glossary

Terms and Acronyms for Channelized IQ Interfaces

P

Performance Processor (QPP) ASIC A next-generation processor that provides enhanced capabilities for channelized IQ interfaces.

PART 2

Configuration

CHAPTER 4

Configuration Overview

Roadmap for Configuring Channelized IQ Interfaces

To configure a channelized IQ interface, you must perform one or more of the following procedures:

- Configure a clear channel. A clear channel consolidates the entire bandwidth of a channelized interface into a single unpartitioned stream that looks like a standard interface. For example, a channelized OC12 IQ interface configured as a clear channel appears to have an OC12 SONET interface.

  See "Configuring a Clear Channel on a Channelized IQ Interface" on page 19.

- Configure single-level channels. By configuring single-level channels, you subdivide a channelized interface into a set of large end channels.

  See "Configuring Single-Level Channels on a Channelized IQ Interface" on page 20.

- Configure multilevel channels. You can subdivide a channelized interface and then split these subchannelized interfaces into end channels. Creating small end channels might require you to configure multilevel channels.

  See "Configuring Multilevel Channels on a Channelized IQ Interface" on page 20.

- Configure class of service. On channelized IQ interfaces, you can apply class of service at the logical interface level for Frame Relay data-link connection identifiers (DLCIs).

  See "Configuring a Class-of-Service Scheduler Map" on page 23.

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

CHAPTER 5

Basic Configuration Steps

Configuring a Clear Channel on a Channelized IQ Interface

A clear channel consolidates the entire bandwidth of a channelized interface into a single unpartitioned stream that looks like a standard interface. For example, a channelized OC12 IQ interface configured as a clear channel appears to have an OC12 SONET interface. To configure a clear channel on a channelized IQ interface, include the **no-partition** statement at the **[edit interfaces c*xx-fpc/pic/port*]** hierarchy level. Include the **interface-type** option to set the channelized interface type. Once the interface is established, you can configure it the same way as a regular interface.

```
[edit]
interfaces {
   coc12-1/1/0 {
      no-partition interface-type so; # This creates a SONET OC12 interface:
   }
   so-1/1/0 {
      unit 0 {
         family inet {
            address 10.245.1.1/30;
         }
      }
   }
}
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

Configuring Single-Level Channels on a Channelized IQ Interface

You can subdivide a channelized interface directly into a set of large end channels. To configure part of a channelized IQ interface as a channel, include the **partition** statement at the **[edit interfaces** *cxx-fpc/pic/port***]** hierarchy level. On a channelized OC12 IQ interface, use the **oc-slice** option to create slice sizes corresponding to the desired bandwidth. On a channelized E1 IQ interface, use the **timeslots** option to define *N*xDS0 channels or channel groups. On all channelized IQ interfaces, use the **interface-type** option to set the interface type (such as SONET OC3 or T3). Once the channel interfaces are established, you can configure them the same way as regular interfaces.

NOTE: One oc-slice in a channelized OC12 IQ interface partition is equivalent to one OC1/DS3-sized channel. If you add three slices together in sequence as a triplet, these pieces become an OC3-sized interface. However, you can configure triplets only with the following sequential slices: 1–3, 4–6, 7–9, 10–12.

```
[edit]
interfaces {
   coc12-0/0/0 {
      partition 1 oc-slice 1-3 interface-type so; # Creates an OC3 SONET
   }
   so-0/0/0:1 {
      encapsulation ppp;
      unit 0 {
         family inet {
            address 10.255.0.2/30;
         }
      }
   }
}
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

Configuring Multilevel Channels on a Channelized IQ Interface

You can subdivide a channelized interface and then split these subchannelized interfaces into end channels. Creating small end channels might require multiple levels of channelization.

To configure a subdivided channelized interface within a partition of a channelized IQ interface, include the **partition** statement at the **[edit interfaces** *cxx-fpc/pic/port***]** hierarchy level. On a channelized OC12 IQ interface, use the **oc-slice** option to create slice sizes

corresponding to the desired bandwidth. On all channelized IQ interfaces, use the **interface-type** option to set the channelized interface type (such as channelized OC1).

On a channelized OC12 IQ interface, you can convert a subdivided channelized OC1 interface into a T3 or channelized T3 interface. To configure, include the **no-partition** statement at the **[edit interfaces coc1-*fpc/pic/port:channel*]** hierarchy level and set the **interface-type** to **ct3**. A **ct3-*fpc/pic/port:channel*** interface is the result. Such a conversion is known as M13 with C-bit parity mapping. T1 and DS0 channels created directly from a **coc-1** interface use VT mapping.

To further split your channelized interfaces into even smaller channelized interfaces, use the **partition** and **interface-type** statements at the **[edit interfaces c*xx-fpc/pic/port:channel*]** hierarchy level. You can create channelized OC1, channelized T3, and channelized T1 interfaces, depending on the PIC type.

Finally, you configure these "channels of channels" as end channels. To configure end channels on a segmented channelized IQ interface, include the **partition** statement at the [**edit interfaces c*xx-fpc/pic/port:channel***] hierarchy level. The number of channels in the hierarchy depends on how finely you partition the channelized IQ interface. Use the **timeslots** option to select *N*xDS0 level channels and the **interface-type** option to set the interface type (such as T1 or *N*xDS0). Once the resulting channels have been established, you can configure them as regular interfaces.

```
[edit]
interfaces {
   coc12-0/0/0 {
      partition 2 oc-slice 4 interface-type coc1; # Creates channelized OC1
      partition 3 oc-slice 5 interface-type coc1; # interfaces: coc1-0/0/0:2,
      partition 4 oc-slice 6 interface-type coc1; # :3, and :4.
   }
   coc1-0/0/0:2 {
      no-partition interface-type t3; # Converts a channelized OC1 to
   }
   t3-0/0/0:2 {
      encapsulation ppp;
      unit 0 {
         family inet {
            address 10.255.0.6/30;
         }
      }
      coc1-0/0/0:3 {
         no-partition interface-type ct3; # Creates a channelized T3 interface:
      }
      ct3-0/0/0:3 {
         partition 1-28 interface-type t1; # Creates 28 T1 interfaces:
      }
      coc1-0/0/0:4 {
         partition 1 interface-type ct1; # Creates a channelized T1 interface:
      }
      ct1-0/0/0:4:1 {
         partition 1 timeslots 1 interface-type ds; # Creates a 1xDS0 interface:
         ...# ds-0/0/0:4:1:1.
         partition 24 timeslots 24 interface-type ds; # Creates a 1xDS0 interface:
      }
```

```
    t1-0/0/0:3:1 {
      encapsulation ppp;
      unit 0 {
        family inet {
          address 10.255.0.26/30;
        }
      }
    }
    ...
  }
  ds-0/0/0:4:1:24 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.0.214/30;
      }
    }
  }
}
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

CHAPTER 6

Configuring Class of Service on a Channelized IQ Interface

Configuring a Class-of-Service Scheduler Map

To configure a class-of-service scheduler map, include the **scheduler-map** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

To specify the amount of bandwidth allocated to the logical interface, you must also include the **shaping-rate** statement at the **[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]** hierarchy level. You can specify a peak bandwidth rate in bits per second (bps), either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000). The range is 1000 through 32,000,000,000 bps.

```
[edit]
class-of-service {
  interfaces {
    interface-name {
      unit logical-unit-number {
        scheduler-map map-name;
        shaping-rate rate;
      }
    }
  }
}
```

If you do not include the **shaping-rate** statement in the configuration, the logical interface might not be able to transmit traffic unless surplus bandwidth is available on the physical interface. The sum of the bandwidth you allocate to all the logical interfaces on a physical interface should not exceed the bandwidth of the physical interface.

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- System Requirements for Channelized IQ Interfaces on page 11
- Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 91

Associating the Scheduler with a DLCI on a Channelized IQ Interface

For channelized OC12 IQ, channelized OC3 IQ, channelized DS3 IQ, channelized T1 IQ, channelized STM1 IQ, and channelized E1 IQ interfaces with Frame Relay encapsulation, you can associate a scheduler map name with a logical interface. To activate transmission scheduling on a DLCI, include the **per-unit-scheduler** statement at the **[edit interfaces *interface-name*]** hierarchy level.

```
[edit]
interfaces {
   interface-name {
      per-unit-scheduler;
   }
}
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 91

Scheduler Limitations for Channelized IQ Interfaces

You can configure logical interface scheduling on up to 16 channelized interfaces per channelized IQ PIC. For channelized IQ interfaces, the number of schedulers you can apply varies by channel level. Table 2 on page 24 shows the number of schedulers you can apply at each channel level.

Table 2: Scheduler Limitations for Channelized IQ Interfaces

Channelized IQ Interfaces	Number of Schedulable DLCIs per Level
Channelized OC12 IQ interfaces	63 for OC3 and OC12 channels, 255 for T3 channels
Channelized OC3 IQ interfaces	63 for OC3 channels, 255 for T3 channels, 63 for T1 channels
Channelized DS3 IQ interfaces	255 for T3 channels
Channelized T1 IQ interfaces	63 for T1 channels
Channelized STM1 IQ interfaces	63 for STM1 channels, 63 for E1 channels

Table 2: Scheduler Limitations for Channelized IQ Interfaces *(continued)*

Channelized IQ Interfaces	Number of Schedulable DLCIs per Level
Channelized E1 IQ interfaces	63 for E1 channels

You can associate up to four forwarding classes per physical interface. Keep in mind that you can configure either a physical interface scheduler or a logical interface scheduler, but not both on the same interface simultaneously.

If you use a Gigabit Ethernet IQ interface, you can apply schedulers on up to 768 VLANs per PIC. For more information on class of service for VLANs on a Gigabit Ethernet IQ interface, see the *JUNOS Network Interfaces Configuration Guide*.

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Roadmap for Channelized IQ Interface Configuration Examples on page 29

Verifying Class-of-Service Schedulers on Channelized IQ Interfaces

Purpose To verify the correct operation of class-of-service schedulers on channelized IQ interfaces.

Action Verify the correct operation of class-of-service schedulers on channelized interfaces:

- **show class of service forwarding-table**
- **show class-of-service interface**

```
user@router> show class-of-service interface t3-3/1/0
Physical interface: t3-3/1/0, Index: 169
  Scheduler map: <default>, Index: 1
  Logical interface: t3-3/1/0.0, Index: 68
    Object         Name                   Type                        Index
    Scheduler-map  sched-0                                            11204
    Rewrite        exp-default            exp                            2
    Classifier     ipprec-compatibility   ip                             5
  Logical interface: t3-3/1/0.1, Index: 69
    Object         Name                   Type                        Index
    Scheduler-map  sched-1                                             7038
    Rewrite        exp-default            exp                            2
    Classifier     ipprec-compatibility   ip                             5
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17
- Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 91

PART 3

Examples

CHAPTER 7

Example Overview

Roadmap for Channelized IQ Interface Configuration Examples

The following examples give typical topologies and configurations for some of the more common channelized IQ interface configurations:

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Overview of Channelized IQ Interfaces on page 3
- Roadmap for Configuring Channelized IQ Interfaces on page 17

CHAPTER 8

Examples

Merging Examples

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
    scripts {
        commit {
            file ex-script.xsl;
        }
    }
}
interfaces {
    fxp0 {
        disable;
        unit 0 {
            family inet {
                address 10.0.0.1/24;
            }
```

```
        }
      }
    }
```

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

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

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xsl; }
```

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

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

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

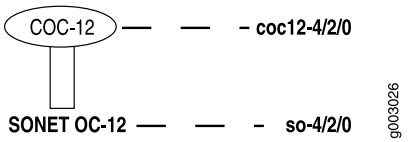
```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

Related Documentation

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

Example: OC12 Clear Channel on a Channelized OC12 IQ Interface

Figure 1: OC12 Clear Channel on a Channelized OC12 IQ Interface



The key to this simple example is to remove all partitions from the channelized interface. To configure a clear channel on a channelized IQ interface, include the **no-partition** statement at the **[edit interfaces coc12-*fpc*/*pic*/0]** hierarchy level and select the interface type. After you commit this part of the configuration, the clear channel is set and you can configure the resulting SONET interface normally.

Router A

```
[edit]
interfaces {
```

```
    coc12-4/2/0 {
      no-partition interface-type so;
    }
    so-4/2/0 {
      unit 0 {
        family inet {
          address 10.245.1.1/30;
        }
      }
    }
  }
```

Verifying Your Work

To verify correct operation of a channelized OC12 IQ interface configured as a clear channel, use the following commands:

- **show interfaces**
- **show interfaces controller**

To view the interface names of the physical channelized OC12 IQ interface and the clear channel OC12 interface configured on the channelized IQ interface, use the **show interfaces controller** command:

```
user@RouterA> show interfaces controller
Controller                                                      Admin Link
coc12-4/2/0                                                      up    up

# This is the physical channelized OC12 IQ interface.

so-4/2/0                                                         up    up

# This is the resulting SONET OC12 interface.
```

To view information about the physical channelized interface, include the **c*xx-fpc/pic*/0** option with the **show interfaces** command:

```
user@RouterA> show interfaces extensive coc12-4/2/0

Physical interface: coc12-4/2/0, Enabled, Physical link is Up
  Interface index: 74, SNMP ifIndex: 1269, Generation: 73
  Link-level type: Controller, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC12, Loopback: None,
  FCS: 16, Payload scrambler: Disabled, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-09 10:56:45 PDT (05:14:39 ago)
  Statistics last cleared: Never
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
    HS link FIFO overflows: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
  SONET alarms   : None
  SONET defects  : None
```

```
  SONET PHY:            Seconds        Count  State
    PLL Lock                  0            0  OK
    PHY Light                 0            0  OK
  SONET section:
    BIP-B1                   10           55
    SEF                       0            0  OK
    LOS                       0            0  OK
    LOF                       0            0  OK
    ES-S                     10
    SES-S                     0
    SEFS-S                    0
  SONET line:
    BIP-B2                   10          144
    REI-L                     0            0
    RDI-L                     3            1  OK
    AIS-L                     0            0  OK
    BERR-SF                   0            0  OK
    BERR-SD                   1            1  OK
    ES-L                     10
    SES-L                     0
    UAS-L                     0
    ES-LFE                    3
    SES-LFE                   3
    UAS-LFE                   0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00
```

To view information about the clear channel SONET interface, include the **so-*fpc/pic/0*** (interface name) option with the **show interfaces** command:

```
user@RouterA> show interfaces extensive so-4/2/0

Physical interface: so-4/2/0, Enabled, Physical link is Up
  Interface index: 261, SNMP ifIndex: 2000, Generation: 260
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode,
Speed: OC12, Loopback: None, FCS: 16,
  Payload scrambler: Enabled, Parent: coc12-4/2/0 (Index 74)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 37 (last seen 00:00:04 ago)
    Output: 36 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-10-09 16:04:18 PDT (00:07:26 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :             80461791              7435000 bps
   Output bytes  :             81637408              7502352 bps
   Input  packets:                34017                  275 pps
   Output packets:                34298                  278 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runs: 0, Giants: 0,
```



```
Bucket drops: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
    HS link FIFO overflows: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0 best-effort               34129                34129                    0
    1 expedited-fo                  0                    0                    0
    2 assured-forw                  0                    0                    0
    3 network-cont                  0                    0                    0
  SONET alarms   : None
  SONET defects  : None
  SONET path:
    BIP-B3                    0            0
    REI-P                     0            0
    LOP-P                     0            0  OK
    AIS-P                     0            0  OK
    RDI-P                     0            0  OK
    UNEQ-P                    0            0  OK
    PLM-P                     0            0  OK
    ES-P                      0
    SES-P                     0
    UAS-P                     0
    ES-PFE                    0
    SES-PFE                   0
    UAS-PFE                   0
  Received SONET overhead:
    C2      : 0xcf, C2(cmp) : 0xcf, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    C2      : 0xcf, F2      : 0x00, Z3      : 0x00, Z4      : 0x00
  Received path trace: RouterB so-2/2/0
    61 72 6d 61 67 6e 61 63 20 73 6f 2d 32 2f 32 2f   RouterB so-2/2/0
    30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a   ................
  Transmitted path trace: RouterA so-4/2/0
    74 69 6d 6d 65 73 73 71 75 61 72 65 20 73 6f 2d   RouterA so-4/2/0
    34 2f 32 2f 30 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 0, Runt threshold: 0
  Packet Forwarding Engine configuration:
    Destination slot: 4, PLP byte: 4 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                                 %          bps   %        bytes
    0 best-effort               95    590976000  95            0      low    none
    3 network-control            5     31104000   5            0      low    none
  Logical interface so-4/2/0.0 (Index 7) (SNMP ifIndex 2001) (Generation 12)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470, Generation: 18, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.245.1.0/30, Local: 10.245.1.1, Broadcast: Unspecified, Generation: 21
```

Related Documentation

- Channelized IQ Interfaces Solutions Page

- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Complex Configuration for a Channelized OC12 IQ Interface

Figure 2: Complex Configuration for a Channelized OC12 IQ Interface

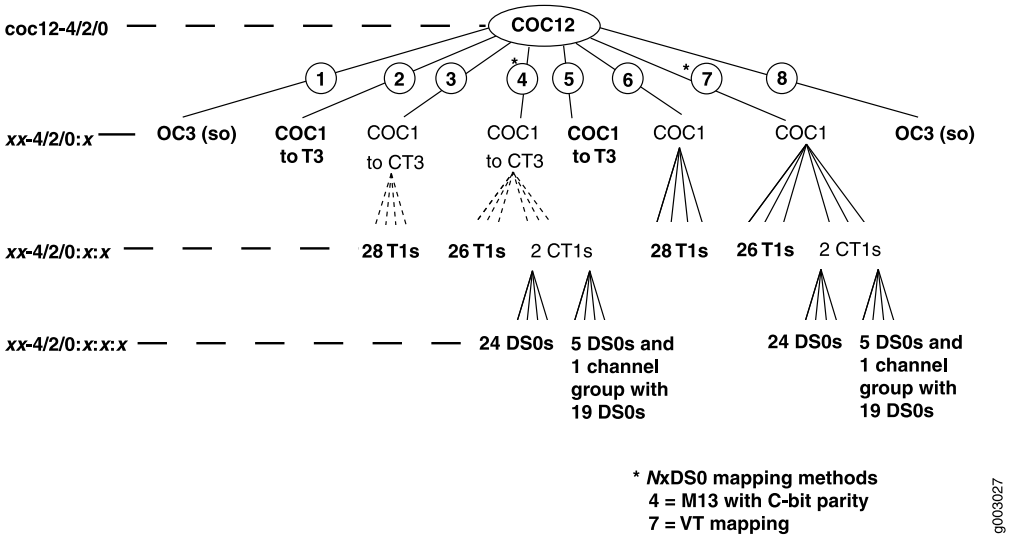


Table 3: Complex Channelization for a Channelized OC12 IQ Interface

Partition	Slices	Interface Type	Interface Level 2	Interface Level 3
1	1–3	OC3	–	–
2	4	Channelized OC1 converted to T3	–	–
3	5	Channelized OC1 converted to channelized T3	28 T1s	–
4	6	Channelized OC1 converted to channelized T3	26 T1s	–
–	–	–	2 CT1s	24 DS0s
–	–	–	–	5 DS0s and 1 channel group of 19 DS0s
5	7	Channelized OC1 converted to T3	–	–
6	8	Channelized OC1	28 T1s	–

Table 3: Complex Channelization for a Channelized OC12 IQ Interface *(continued)*

Partition	Slices	Interface Type	Interface Level 2	Interface Level 3
7	9	Channelized OC1	26 T1s	–
–	–	–	2 CT1s	24 DS0s
–	–	–	–	5 DS0s and 1 channel group of 19 DS0s
8	10–12	OC3	–	–

Figure 2 on page 36 and Table 3 on page 36 show a complex channelization structure that you might encounter if you use the full capabilities of a channelized OC12 IQ interface. Partitions 1 and 8 create an OC3 interface, while Partitions 2 and 5 create T3 interfaces out of channelized OC1 interfaces. Partition 3 (channelized OC1 converted to channelized T3) and Partition 6 (channelized OC1) are channelized interfaces that each subdivide into 28 T1 interfaces. Finally, Partition 4 (channelized OC1 converted to channelized T3) and Partition 7 (channelized OC1) are channelized interfaces that each split into 2 channelized T1 interfaces and 26 T1 interfaces. The first channelized T1 splits into 24 DS0 time slots, whereas the second channelized T1 subdivides into 5 DS0 channels and 1 channel group comprised of 19 DS0 channels.

This example shows two *N*xDS0 mapping methods. Partition 4 uses M13 mapping for North American T-carrier equipment and Partition 7 uses VT mapping for SONET/SDH equipment.

This example also assumes corresponding interfaces. For example, for every sublevel T1 interface you configure on Router A, assume you have configured a matching sublevel or physical T1 interface on a neighboring router.

Router A

```
[edit]
interfaces {
   coc12-4/2/0 {
      partition 1 oc-slice 1-3 interface-type so; # Creates OC3 interface so-4/2/0:1.
      partition 2 oc-slice 4 interface-type coc1; # Creates interface coc1-4/2/0:2.
      partition 3 oc-slice 5 interface-type coc1; # Creates interface coc1-4/2/0:3.
      partition 4 oc-slice 6 interface-type coc1; # Creates interface coc1-4/2/0:4.
      partition 5 oc-slice 7 interface-type coc1; # Creates interface coc1-4/2/0:5.
      partition 6 oc-slice 8 interface-type coc1; # Creates interface coc1-4/2/0:6.
      partition 7 oc-slice 9 interface-type coc1; # Creates interface coc1-4/2/0:7.
      partition 8 oc-slice 10-12 interface-type so; # Creates an OC3 SONET interface:
   }                                                # so-4/2/0:8.
   so-4/2/0:1 {
      encapsulation ppp;
      unit 0 {
         family inet {
            address 10.255.0.2/30;
         }
      }
   }
```

```
coc1-4/2/0:2 {
   no-partition interface-type t3; # This converts the coc1 interface into a
}                                  # T3 interface: t3-4/2/0:2.
t3-4/2/0:2 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.0.6/30;
      }
   }
}
coc1-4/2/0:3 {
   no-partition interface-type ct3; # This converts the coc1 interface into a
}                                  # channelized T3 interface: ct3-4/2/0:3.
ct3-4/2/0:3 {
   partition 1-28 interface-type t1; # This converts the channelized T3 interface
}                                 # into 28 T1 channels: t1-4/2/0:3:1 through t1-4/2/0:3:28.
coc1-4/2/0:4 {
   no-partition interface-type ct3; # This converts the coc1 interface into a
}                                  # channelized T3 interface: ct3-4/2/0:4.
ct3-4/2/0:4 {
   partition 1-2 interface-type ct1; # This creates ct1-4/2/0:4:1 and ct1-4/2/0:4:2.
   partition 3-28 interface-type t1; # This creates t1-4/2/0:4:3 through
}                                  # t1-4/2/0:4:28.
coc1-4/2/0:5 {
   no-partition interface-type t3; # This converts the coc1 interface to a T3:
}                                  # t3-4/2/0:5.
t3-4/2/0:5 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.1.90/30;
      }
   }
}
coc1-4/2/0:6 {
   partition 1-28 interface-type t1; # This converts the channelized OC1 interface
}                                 # into 28 T1s: t1-4/2/0:6:1 through t1-4/2/0:6:28.
coc1-4/2/0:7 {
   partition 1-2 interface-type ct1; # This creates ct1-4/2/0:7:1 and :2.
   partition 3-28 interface-type t1; # This creates t1-4/2/0:7:3 through :28.
}
so-4/2/0:8 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.2.174/30;
      }
   }
}
t1-4/2/0:3:1 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.0.10/30;
      }
```

```
    }
  }
  ...
  t1-4/2/0:3:28 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.0.118/30;
      }
    }
  }
  ct1-4/2/0:4:1 {
    partition 1 timeslots 1 interface-type ds; # This creates 24 DS0 channels:
    partition 2 timeslots 2 interface-type ds; # ds-4/2/0:4:1:1 through
    partition 3 timeslots 3 interface-type ds; # ds-4/2/0:4:1:24.
    partition 4 timeslots 4 interface-type ds;
    partition 5 timeslots 5 interface-type ds;
    partition 6 timeslots 6 interface-type ds;
    partition 7 timeslots 7 interface-type ds;
    partition 8 timeslots 8 interface-type ds;
    partition 9 timeslots 9 interface-type ds;
    partition 10 timeslots 10 interface-type ds;
    partition 11 timeslots 11 interface-type ds;
    partition 12 timeslots 12 interface-type ds;
    partition 13 timeslots 13 interface-type ds;
    partition 14 timeslots 14 interface-type ds;
    partition 15 timeslots 15 interface-type ds;
    partition 16 timeslots 16 interface-type ds;
    partition 17 timeslots 17 interface-type ds;
    partition 18 timeslots 18 interface-type ds;
    partition 19 timeslots 19 interface-type ds;
    partition 20 timeslots 20 interface-type ds;
    partition 21 timeslots 21 interface-type ds;
    partition 22 timeslots 22 interface-type ds;
    partition 23 timeslots 23 interface-type ds;
    partition 24 timeslots 24 interface-type ds;
  }
  ds-4/2/0:4:1:1 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.0.122/30;
      }
    }
  }
  ...
  ds-4/2/0:4:1:24 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.0.214/30;
      }
    }
  }
  ct1-4/2/0:4:2 {
    partition 1 timeslots 1-19 interface-type ds; # This creates a channel group.
```

```
    partition 2 timeslots 20 interface-type ds; # ds-4/2/0:4:2:2 through
    partition 3 timeslots 21 interface-type ds; # ds-4/2/0:4:2:6 are single 64-Kbps
    partition 4 timeslots 22 interface-type ds; # NxDS0 channels.
    partition 5 timeslots 23 interface-type ds;
    partition 6 timeslots 24 interface-type ds;
}
ds-4/2/0:4:2:1 { # This is a channel group with 19 DS0s bundled as one.
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.255.0.218/30;
        }
    }
}
ds-4/2/0:4:2:2 {
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.120.0.222/30;
        }
    }
}
...
ds-4/2/0:4:2:6 {
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.120.0.238/30;
        }
    }
}
t1-4/2/0:4:3 {
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.120.0.242/30;
        }
    }
}
...
t1-4/2/0:4:28 {
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.255.1.86/30;
        }
    }
}
t1-4/2/0:6:1 {
    encapsulation ppp;
    unit 0 {
        family inet {
            address 10.255.1.94/30;
        }
    }
}
```

```
...
t1-4/2/0:6:28 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.1.202/30;
      }
   }
}
ct1-4/2/0:7:1 {
   partition 1 timeslots 1 interface-type ds; # This creates 24 DS0 channels:
   partition 2 timeslots 2 interface-type ds; # ds-4/2/0:7:1:1 through
   partition 3 timeslots 3 interface-type ds; # ds-4/2/0:7:1:24.
   partition 4 timeslots 4 interface-type ds;
   partition 5 timeslots 5 interface-type ds;
   partition 6 timeslots 6 interface-type ds;
   partition 7 timeslots 7 interface-type ds;
   partition 8 timeslots 8 interface-type ds;
   partition 9 timeslots 9 interface-type ds;
   partition 10 timeslots 10 interface-type ds;
   partition 11 timeslots 11 interface-type ds;
   partition 12 timeslots 12 interface-type ds;
   partition 13 timeslots 13 interface-type ds;
   partition 14 timeslots 14 interface-type ds;
   partition 15 timeslots 15 interface-type ds;
   partition 16 timeslots 16 interface-type ds;
   partition 17 timeslots 17 interface-type ds;
   partition 18 timeslots 18 interface-type ds;
   partition 19 timeslots 19 interface-type ds;
   partition 20 timeslots 20 interface-type ds;
   partition 21 timeslots 21 interface-type ds;
   partition 22 timeslots 22 interface-type ds;
   partition 23 timeslots 23 interface-type ds;
   partition 24 timeslots 24 interface-type ds;
}
ds-4/2/0:7:1:1 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.1.206/30;
      }
   }
}
...
ds-4/2/0:7:1:24 {
   encapsulation ppp;
   unit 0 {
      family inet {
         address 10.255.2.42/30;
      }
   }
}
ct1-4/2/0:7:2 {
   partition 1 timeslots 1-19 interface-type ds; # This is a channel group.
   partition 2 timeslots 20 interface-type ds; # ds-4/2/0:7:2:2 through
   partition 3 timeslots 21 interface-type ds; # ds-4/2/0:7:2:6 are single 64-Kbps
```

```
    partition 4 timeslots 22 interface-type ds; # NxDS0 channels.
    partition 5 timeslots 23 interface-type ds;
    partition 6 timeslots 24 interface-type ds;
  }
  ds-4/2/0:7:2:1 { # This is a channel group with 19 DS0s bundled as one.
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.2.46/30;
      }
    }
  }
  ds-4/2/0:7:2:2 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.2.50/30;
      }
    }
  }
  ...
  ds-4/2/0:7:2:6 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.2.66/30;
      }
    }
  }
  t1-4/2/0:7:3 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.2.70/30;
      }
    }
  }
  ...
  t1-4/2/0:7:28 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.255.2.170/30;
      }
    }
  }
}
```

Verifying Your Work

To verify correct operation of a channelized OC12 IQ interface configured for complex channelization, use the following commands:

- **show interfaces controller**

- **show interfaces**
- **show interfaces interval** (for OC12, channelized OC12, OC3, T3, channelized T3, T1, and channelized T1 channels)

To view the names of the resulting interfaces and channelized interfaces configured on a channelized OC12 IQ interface, use the **show interfaces controller** command:

```
user@RouterA> show interfaces controller
Controller                                                      Admin Link
coc12-4/2/0                                                     up    up
    so-4/2/0:1                                                  up    up
    t3-4/2/0:2                                                  up    up
    ct3-4/2/0:3                                                 up    up
        t1-4/2/0:3:1                                            up    up
        t1-4/2/0:3:2                                            up    up
        t1-4/2/0:3:3                                            up    up
        t1-4/2/0:3:4                                            up    up
        t1-4/2/0:3:5                                            up    up
        t1-4/2/0:3:6                                            up    up
        t1-4/2/0:3:7                                            up    up
        t1-4/2/0:3:8                                            up    up
        t1-4/2/0:3:9                                            up    up
        t1-4/2/0:3:10                                           up    up
        t1-4/2/0:3:11                                           up    up
        t1-4/2/0:3:12                                           up    up
        t1-4/2/0:3:13                                           up    up
        t1-4/2/0:3:14                                           up    up
        t1-4/2/0:3:15                                           up    up
        t1-4/2/0:3:16                                           up    up
        t1-4/2/0:3:17                                           up    up
        t1-4/2/0:3:18                                           up    up
        t1-4/2/0:3:19                                           up    up
        t1-4/2/0:3:20                                           up    up
        t1-4/2/0:3:21                                           up    up
        t1-4/2/0:3:22                                           up    up
        t1-4/2/0:3:23                                           up    up
        t1-4/2/0:3:24                                           up    up
        t1-4/2/0:3:25                                           up    up
        t1-4/2/0:3:26                                           up    up
        t1-4/2/0:3:27                                           up    up
        t1-4/2/0:3:28                                           up    up
    ct3-4/2/0:4                                                 up    up
        ct1-4/2/0:4:1                                           up    up
            ds-4/2/0:4:1:1                                      up    up
            ds-4/2/0:4:1:2                                      up    up
            ds-4/2/0:4:1:3                                      up    up
            ds-4/2/0:4:1:4                                      up    up
            ds-4/2/0:4:1:5                                      up    up
            ds-4/2/0:4:1:6                                      up    up
            ds-4/2/0:4:1:7                                      up    up
            ds-4/2/0:4:1:8                                      up    up
            ds-4/2/0:4:1:9                                      up    up
            ds-4/2/0:4:1:10                                     up    up
            ds-4/2/0:4:1:11                                     up    up
            ds-4/2/0:4:1:12                                     up    up
            ds-4/2/0:4:1:13                                     up    up
            ds-4/2/0:4:1:14                                     up    up
            ds-4/2/0:4:1:15                                     up    up
            ds-4/2/0:4:1:16                                     up    up
            ds-4/2/0:4:1:17                                     up    up
```

```
            ds-4/2/0:4:1:18                                         up    up
            ds-4/2/0:4:1:19                                         up    up
            ds-4/2/0:4:1:20                                         up    up
            ds-4/2/0:4:1:21                                         up    up
            ds-4/2/0:4:1:22                                         up    up
            ds-4/2/0:4:1:23                                         up    up
            ds-4/2/0:4:1:24                                         up    up
        ct1-4/2/0:4:2                                               up    up
            ds-4/2/0:4:2:1                                          up    up
            ds-4/2/0:4:2:2                                          up    up
            ds-4/2/0:4:2:3                                          up    up
            ds-4/2/0:4:2:4                                          up    up
            ds-4/2/0:4:2:5                                          up    up
            ds-4/2/0:4:2:6                                          up    up
        t1-4/2/0:4:3                                                up    up
        t1-4/2/0:4:4                                                up    up
        t1-4/2/0:4:5                                                up    up
        t1-4/2/0:4:6                                                up    up
        t1-4/2/0:4:7                                                up    up
        t1-4/2/0:4:8                                                up    up
        t1-4/2/0:4:9                                                up    up
        t1-4/2/0:4:10                                               up    up
        t1-4/2/0:4:11                                               up    up
        t1-4/2/0:4:12                                               up    up
        t1-4/2/0:4:13                                               up    up
        t1-4/2/0:4:14                                               up    up
        t1-4/2/0:4:15                                               up    up
        t1-4/2/0:4:16                                               up    up
        t1-4/2/0:4:17                                               up    up
        t1-4/2/0:4:18                                               up    up
        t1-4/2/0:4:19                                               up    up
        t1-4/2/0:4:20                                               up    up
        t1-4/2/0:4:21                                               up    up
        t1-4/2/0:4:22                                               up    up
        t1-4/2/0:4:23                                               up    up
        t1-4/2/0:4:24                                               up    up
        t1-4/2/0:4:25                                               up    up
        t1-4/2/0:4:26                                               up    up
        t1-4/2/0:4:27                                               up    up
        t1-4/2/0:4:28                                               up    up
    t3-4/2/0:5                                                      up    up
    coc1-4/2/0:6                                                    up    up
        t1-4/2/0:6:1                                                up    up
        t1-4/2/0:6:2                                                up    up
        t1-4/2/0:6:3                                                up    up
        t1-4/2/0:6:4                                                up    up
        t1-4/2/0:6:5                                                up    up
        t1-4/2/0:6:6                                                up    up
        t1-4/2/0:6:7                                                up    up
        t1-4/2/0:6:8                                                up    up
        t1-4/2/0:6:9                                                up    up
        t1-4/2/0:6:10                                               up    up
        t1-4/2/0:6:11                                               up    up
        t1-4/2/0:6:12                                               up    up
        t1-4/2/0:6:13                                               up    up
        t1-4/2/0:6:14                                               up    up
        t1-4/2/0:6:15                                               up    up
        t1-4/2/0:6:16                                               up    up
        t1-4/2/0:6:17                                               up    up
        t1-4/2/0:6:18                                               up    up
        t1-4/2/0:6:19                                               up    up
```

```
    t1-4/2/0:6:20                                                 up    up
    t1-4/2/0:6:21                                                 up    up
    t1-4/2/0:6:22                                                 up    up
    t1-4/2/0:6:23                                                 up    up
    t1-4/2/0:6:24                                                 up    up
    t1-4/2/0:6:25                                                 up    up
    t1-4/2/0:6:26                                                 up    up
    t1-4/2/0:6:27                                                 up    up
    t1-4/2/0:6:28                                                 up    up
coc1-4/2/0:7                                                      up    up
    ct1-4/2/0:7:1                                                 up    up
        ds-4/2/0:7:1:1                                            up    up
        ds-4/2/0:7:1:2                                            up    up
        ds-4/2/0:7:1:3                                            up    up
        ds-4/2/0:7:1:4                                            up    up
        ds-4/2/0:7:1:5                                            up    up
        ds-4/2/0:7:1:6                                            up    up
        ds-4/2/0:7:1:7                                            up    up
        ds-4/2/0:7:1:8                                            up    up
        ds-4/2/0:7:1:9                                            up    up
        ds-4/2/0:7:1:10                                           up    up
        ds-4/2/0:7:1:11                                           up    up
        ds-4/2/0:7:1:12                                           up    up
        ds-4/2/0:7:1:13                                           up    up
        ds-4/2/0:7:1:14                                           up    up
        ds-4/2/0:7:1:15                                           up    up
        ds-4/2/0:7:1:16                                           up    up
        ds-4/2/0:7:1:17                                           up    up
        ds-4/2/0:7:1:18                                           up    up
        ds-4/2/0:7:1:19                                           up    up
        ds-4/2/0:7:1:20                                           up    up
        ds-4/2/0:7:1:21                                           up    up
        ds-4/2/0:7:1:22                                           up    up
        ds-4/2/0:7:1:23                                           up    up
        ds-4/2/0:7:1:24                                           up    up
    ct1-4/2/0:7:2                                                 up    up
        ds-4/2/0:7:2:1                                            up    up
        ds-4/2/0:7:2:2                                            up    up
        ds-4/2/0:7:2:3                                            up    up
        ds-4/2/0:7:2:4                                            up    up
        ds-4/2/0:7:2:5                                            up    up
        ds-4/2/0:7:2:6                                            up    up
    t1-4/2/0:7:3                                                  up    up
    t1-4/2/0:7:4                                                  up    up
    t1-4/2/0:7:5                                                  up    up
    t1-4/2/0:7:6                                                  up    up
    t1-4/2/0:7:7                                                  up    up
    t1-4/2/0:7:8                                                  up    up
    t1-4/2/0:7:9                                                  up    up
    t1-4/2/0:7:10                                                 up    up
    t1-4/2/0:7:11                                                 up    up
    t1-4/2/0:7:12                                                 up    up
    t1-4/2/0:7:13                                                 up    up
    t1-4/2/0:7:14                                                 up    up
    t1-4/2/0:7:15                                                 up    up
    t1-4/2/0:7:16                                                 up    up
    t1-4/2/0:7:17                                                 up    up
    t1-4/2/0:7:18                                                 up    up
    t1-4/2/0:7:19                                                 up    up
    t1-4/2/0:7:20                                                 up    up
    t1-4/2/0:7:21                                                 up    up
```

```
        t1-4/2/0:7:22                                                 up    up
        t1-4/2/0:7:23                                                 up    up
        t1-4/2/0:7:24                                                 up    up
        t1-4/2/0:7:25                                                 up    up
        t1-4/2/0:7:26                                                 up    up
        t1-4/2/0:7:27                                                 up    up
        t1-4/2/0:7:28                                                 up    up
    so-4/2/0:8                                                        up    up
```

To verify that your channelized IQ interfaces are working as expected, use the **show interfaces** command. Use the **show interfaces controller** command to find the name of the channelized interface you want to view; then include this channelized name (for example, **ct3-4/2/0:4**) as an option with the **show interfaces** command.

The next sections provide sample **show interfaces** output for each of the major interface types configured in this example:

Channelized OC12

```
user@RouterA> show interfaces extensive coc12-4/2/0

 Physical interface: coc12-4/2/0, Enabled, Physical link is Up
  Interface index: 266, SNMP ifIndex: 1269, Generation: 601
  Link-level type: Controller, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC12, Loopback: None,
  FCS: 16, Payload scrambler: Disabled, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-09 17:45:15 PDT (00:14:38 ago)
  Statistics last cleared: Never
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
    HS link FIFO overflows: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
  SONET alarms   : None
  SONET defects  : None
  SONET PHY:             Seconds        Count  State
    PLL Lock                   0            0  OK
    PHY Light                  0            0  OK
  SONET section:
    BIP-B1                    14           83
    SEF                        0            0  OK
    LOS                        0            0  OK
    LOF                        0            0  OK
```

```
    ES-S                    14
    SES-S                    0
    SEFS-S                   0
  SONET line:
    BIP-B2                  14          162
    REI-L                    0            0
    RDI-L                    3            1  OK
    AIS-L                    0            0  OK
    BERR-SF                  0            0  OK
    BERR-SD                  0            0  OK
    ES-L                    14
    SES-L                    0
    UAS-L                    0
    ES-LFE                   3
    SES-LFE                  3
    UAS-LFE                  0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00
```

SONET OC3

```
user@RouterA> show interfaces extensive so-4/2/0:8

 Physical interface: so-4/2/0:8, Enabled, Physical link is Up
  Interface index: 440, SNMP ifIndex: 2640, Generation: 787
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3, Loopback: None, FCS: 16,
  Payload scrambler: Enabled, Parent: coc12-4/2/0 (Index 266)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Conf-ack-sent
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-10-09 17:45:18 PDT (00:11:45 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 5967                   56 bps
   Output bytes  :                12672                  128 bps
   Input  packets:                  351                    0 pps
   Output packets:                  704                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
    HS link FIFO overflows: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0 best-effort                704                    0                    0
    1 expedited-fo                 0                    0                    0
    2 assured-forw                 0                    0                    0
    3 network-cont                 0                    0                    0
  SONET alarms   : None
```

```
  SONET defects  : None
  SONET path:
    BIP-B3                    0            0
    REI-P                     0            0
    LOP-P                     0            0  OK
    AIS-P                     0            0  OK
    RDI-P                     0            0  OK
    UNEQ-P                    0            0  OK
    PLM-P                     0            0  OK
    ES-P                      0
    SES-P                     0
    UAS-P                     0
    ES-PFE                    0
    SES-PFE                   0
    UAS-PFE                   0
  Received SONET overhead:
    C2      : 0xcf, C2(cmp) : 0xcf, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    C2      : 0xcf, F2      : 0x00, Z3      : 0x00, Z4      : 0x00
  Received path trace: RouterB so-2/2/0:8
    61 72 6d 61 67 6e 61 63 20 73 6f 2d 32 2f 32 2f   RouterB so-2/2/
    30 3a 38 00 00 00 00 00 00 00 00 00 00 00 00 00   0:8.............
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a   ................
  Transmitted path trace: RouterA so-4/2/0:8
    74 69 6d 6d 65 73 73 71 75 61 72 65 20 73 6f 2d   RouterA so-
    34 2f 32 2f 30 3a 38 00 00 00 00 00 00 00 00 00   4/2/0:8.........
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 0, Runt threshold: 0
  Packet Forwarding Engine configuration:
    Destination slot: 4, PLP byte: 4 (0x2a)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                                 %          bps   %        bytes
    0 best-effort               95    147744000  95            0      low    none
    3 network-control            5      7776000   5            0      low    none
  Logical interface so-4/2/0:8.0 (Index 180) (SNMP ifIndex 2641) (Generation 512)
    Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 4470, Generation: 519, Route table: 0
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.255.2.172/30, Local: 10.255.2.174, Broadcast: Unspecified, Generation: 1029
```

T3

```
user@RouterA> show interfaces extensive t3-4/2/0:2

Physical interface: t3-4/2/0:2, Enabled, Physical link is Up
  Interface index: 274, SNMP ifIndex: 1982, Generation: 609
  Link-level type: PPP, MTU: 4474, Clocking: Internal, Speed: T3, Loopback:None,
FCS: 16,
  Mode: C/Bit parity, Parent: coc12-4/2/0 (Index 266)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
```



```
Keepalive statistics:
  Input : 85 (last seen 00:00:00 ago)
  Output: 82 (last sent 00:00:01 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
CHAP state: Not-configured
Last flapped   : 2002-10-09 17:45:15 PDT (00:13:24 ago)
Statistics last cleared: Never
Traffic statistics:
 Input  bytes  :                 2546                   56 bps
 Output bytes  :                 2732                   56 bps
 Input  packets:                  170                    0 pps
 Output packets:                  171                    0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
Queue counters:       Queued packets  Transmitted packets      Dropped packets
  0 best-effort                  171                  171                    0
  1 expedited-fo                   0                    0                    0
  2 assured-forw                   0                    0                    0
  3 network-cont                   0                    0                    0
Active alarms  : None
Active defects : None
DS3 media:            Seconds        Count  State
  PLL Lock                  0            0  OK
  Reframing                 0            0  OK
  AIS                       0            0  OK
  LOF                       0            0  OK
  LOS                       0            0  OK
  IDLE                      0            0  OK
  YELLOW                    0            0  OK
  BPV                       0            0
  EXZ                       0            0
  LCV                       0            0
  PCV                       1         6827
  CCV                       0            0
  LES                       0
  PES                       1
  PSES                      1
  CES                       0
  CSES                      0
  SEFS                      0
  UAS                       0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 4484, Runt threshold: 0
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
SONET alarms   : None
SONET defects  : None
SONET path:
  BIP-B3                    0            0
  REI-P                     0            0
  LOP-P                     0            0  OK
```

```
    AIS-P                       0            0  OK
    RDI-P                       0            0  OK
    UNEQ-P                      0            0  OK
    PLM-P                       0            0  OK
    ES-P                        0
    SES-P                       0
    UAS-P                       0
    ES-PFE                      0
    SES-PFE                     0
    UAS-PFE                     0
  Received SONET overhead:
    C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    C2      : 0x04, F2      : 0x00, Z3      : 0x00, Z4      : 0x00
  Received path trace:
    5d 14 d6 ef 81 93 78 71 98 ec 55 27 35 84 3a 2c   ].Vo..xq.lU'5.:,
  Transmitted path trace: t3-4/2/0:2
    74 33 2d 34 2f 32 2f 30 3a 32 00 00 00 00 00 00   t3-4/2/0:2......
  Packet Forwarding Engine configuration:
    Destination slot: 4, PLP byte: 4 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95     42499200  95            0      low    none
    3 network-control         5      2236800   5            0      low    none
  Logical interface t3-4/2/0:2.0 (Index 10) (SNMP ifIndex 1983) (Generation 340)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 4470, Generation: 347, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.255.0.4/30, Local: 10.255.0.6, Broadcast: Unspecified, Generation: 685
```

Channelized T3

```
user@RouterA> show interfaces extensive ct3-4/2/0:4

Physical interface: ct3-4/2/0:4, Enabled, Physical link is Up
  Interface index: 304, SNMP ifIndex: 2409, Generation: 639
  Link-level type: Controller, MTU: 4474, Clocking: Internal, Speed: T3, Loopback: None, FCS: 16,
  Mode: C/Bit parity, Parent: coc12-4/2/0 (Index 266)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-09 17:45:16 PDT (00:12:56 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0, Policed discards: 0, L3 incompletes: 0,
    L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  Active alarms  : None
  Active defects : None
  DS3 media:            Seconds        Count  State
    PLL Lock                  0            0  OK
```

```
  Reframing                 0            0  OK
  AIS                       0            0  OK
  LOF                       0            0  OK
  LOS                       0            0  OK
  IDLE                      0            0  OK
  YELLOW                    0            0  OK
  BPV                       0            0
  EXZ                       0            0
  LCV                       0            0
  PCV                       1            1
  CCV                       1            1
  LES                       0
  PES                       1
  PSES                      0
  CES                       1
  CSES                      0
  SEFS                      0
  UAS                       0
HDLC configuration:
  Policing bucket: Disabled
  Shaping bucket : Disabled
  Giant threshold: 0, Runt threshold: 0
DSU configuration:
  Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
  FEAC loopback: Inactive, Response: Disabled, Count: 0
DS-3 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
SONET alarms    : None
SONET defects   : None
SONET PHY:            Seconds        Count  State
  PLL Lock                  0            0  OK
  PHY Light                 0            0  OK
SONET section:
  BIP-B1                   14           83
  SEF                       0            0  OK
  LOS                       0            0  OK
  LOF                       0            0  OK
  ES-S                     14
  SES-S                     0
  SEFS-S                    0
SONET line:
  BIP-B2                   14          162
  REI-L                     0            0
  RDI-L                     3            1  OK
  AIS-L                     0            0  OK
  BERR-SF                   0            0  OK
  BERR-SD                   0            0  OK
  ES-L                     14
  SES-L                     0
  UAS-L                     0
  ES-LFE                    3
  SES-LFE                   3
  UAS-LFE                   0
SONET path:
  BIP-B3                    0            0
  REI-P                     0            0
  LOP-P                     0            0  OK
  AIS-P                     0            0  OK
  RDI-P                     0            0  OK
  UNEQ-P                    0            0  OK
```

```
    PLM-P                    0            0  OK
    ES-P                     0
    SES-P                    0
    UAS-P                    0
    ES-PFE                   0
    SES-PFE                  0
    UAS-PFE                  0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x04, C2(cmp) : 0x04, F2      : 0x00
    Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x04, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00
  Received path trace:
    39 b8 27 50 44 b6 5f c3 f3 de 27 9a a0 31 40 5c   98'PD6_Cs^'. 1@\
  Transmitted path trace: RouterA ct3-4/2/0:4
    74 69 6d 6d 65 73 73 71 75 61 72 65 20 63 74 33   RouterA ct3
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95     42499200  95            0      low    none
    3 network-control         5      2236800   5            0      low    none
```

Channelized OC1

```
user@RouterA> show interfaces extensive coc1-4/2/0:7

Physical interface: coc1-4/2/0:7, Enabled, Physical link is Up
  Interface index: 381, SNMP ifIndex: 2524, Generation: 728
  Link-level type: Controller, MTU: 4474, Clocking: Internal, SONET mode, Speed: 51840kbps, Loopback:
None,
  FCS: 16, Payload scrambler: Disabled, Parent: coc12-4/2/0 (Index 266)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-09 17:45:31 PDT (00:12:11 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
    HS link FIFO overflows: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO underflows: 0
  SONET alarms   : None
  SONET defects  : None
  SONET section:
    BIP-B1                  14           83
    SEF                      0            0  OK
    LOS                      0            0  OK
    LOF                      0            0  OK
    ES-S                    14
    SES-S                    0
```

```
    SEFS-S                    0
  SONET line:
    BIP-B2                   14          162
    REI-L                     0            0
    RDI-L                     3            1  OK
    AIS-L                     0            0  OK
    BERR-SF                   0            0  OK
    BERR-SD                   0            0  OK
    ES-L                     14
    SES-L                     0
    UAS-L                     0
    ES-LFE                    3
    SES-LFE                   3
    UAS-LFE                   0
  SONET path:
    BIP-B3                    0            0
    REI-P                     0            0
    LOP-P                     0            0  OK
    AIS-P                     0            0  OK
    RDI-P                     0            0  OK
    UNEQ-P                    3            1  OK
    PLM-P                     3            1  OK
    ES-P                      3
    SES-P                     3
    UAS-P                     0
    ES-PFE                    0
    SES-PFE                   0
    UAS-PFE                   0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x00, C2(cmp) : 0x00, F2      : 0x00
    Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00, C2      : 0x00, F2      : 0x00, Z3      : 0x00
    Z4      : 0x00
  Received path trace:
    a0 6a b2 b6 97 aa 25 5e 54 e3 59 2a 80 84 dd fa    j26.*%^TcY*..]z
    af ec 42 d3 21 45 5d 48 f4 5a dd e5 1c be e7 65   /lBS!E]HtZ]e.>ge
    e7 f2 94 71 f1 d7 d7 86 98 83 d5 e2 ec 67 1d db   gr.qqWW...Ublg.[
    5b 72 29 b3 b9 97 98 c9 c1 a3 af e2 ab db d0 be   [r)39..IA#/b+[P>
  Transmitted path trace: RouterA coc1-4/2/0:7
    74 69 6d 6d 65 73 73 71 75 61 72 65 20 63 6f 63   RouterA coc
    31 2d 34 2f 32 2f 30 3a 37 00 00 00 00 00 00 00   1-4/2/0:7.......
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 0, Runt threshold: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
    CoS transmit queue              Bandwidth           Buffer Priority   Limit
                              %           bps   %        bytes
    0 best-effort            95      49248000  95            0      low    none
    3 network-control         5       2592000   5            0      low    none
```

Channelized T1

```
user@RouterA> show interfaces extensive ct1-4/2/0:4:1
```

```
Physical interface: ct1-4/2/0:4:1, Enabled, Physical link is Up
  Interface index: 305, SNMP ifIndex: 2410, Generation: 640
  Link-level type: Controller, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16,
  Framing: ESF, Parent: ct3-4/2/0:4 (Index 304)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-09 17:45:19 PDT (00:16:49 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes:0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1   alarms   : None
  DS1   defects  : None
  T1  media:            Seconds        Count  State
    SEF                       1            1  OK
    BEE                       1            1  OK
    AIS                       0            0  OK
    LOF                       1            1  OK
    LOS                       0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                       0            0
    CS                        0            0
    LES                       1
    ES                        1
    SES                       2
    SEFS                      2
    BES                       0
    UAS                       0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 0, Runt threshold: 0
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K
    Buildout       : 0 to 132 feet
    Data inversion: Disabled
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95      1459200  95            0      low    none
    3 network-control         5        76800   5            0      low    none
```

T1

```
user@RouterA> show interfaces extensive t1-4/2/0:7:3

Physical interface: t1-4/2/0:7:3, Enabled, Physical link is Up
  Interface index: 414, SNMP ifIndex: 2587, Generation: 761
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: T1, Loopback: None, FCS: 16, Framing:ESF,
  Parent: coc1-4/2/0:7 (Index 381)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Conf-ack-sent
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-10-09 17:45:34 PDT (00:10:33 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                10778                 112 bps
   Output bytes  :                11412                 128 bps
   Input  packets:                  634                   0 pps
   Output packets:                  634                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0 best-effort                 633                  633                    0
    1 expedited-fo                  0                    0                    0
    2 assured-forw                  0                    0                    0
    3 network-cont                  0                    0                    0
  DS1   alarms   : None
  DS1   defects  : None
  T1  media:            Seconds        Count  State
    SEF                       1            1  OK
    BEE                       1            1  OK
    AIS                       3            1  OK
    LOF                      17            1  OK
    LOS                       0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                       0            0
    CS                        0            0
    LES                      17
    ES                       17
    SES                      34
    SEFS                     34
    BES                       0
    UAS                      14
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 0
```

```
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K
    Buildout       : 0 to 132 feet
    Data inversion: Disabled
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  SONET alarms   : None
  SONET defects  : None
  SONET vt:
    BIP-BIP2               648            0
    REI-V                  651            1
    LOP-V                    0            0  OK
    AIS-V                    0            0  OK
    RDI-V                  651            1  Defect Active
    UNEQ-V                   0            0  OK
    PLM-V                    0            0  OK
    ES-V                   651
    SES-V                    3
    UAS-V                    0
    ES-VFE                   0
    SES-VFE                  0
    UAS-VFE                  0
  Received SONET overhead:
    V5      : 0x02, V5(cmp) : 0x02
  Transmitted SONET overhead:
    V5      : 0x02
  Packet Forwarding Engine configuration:
    Destination slot: 4, PLP byte: 4 (0x24)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95      1459200  95            0      low    none
    3 network-control         5        76800   5            0      low    none
  Logical interface t1-4/2/0:7:3.0 (Index 152) (SNMP ifIndex 2588)
(Generation 484)
    Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500, Generation: 491, Route table: 0
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.255.2.68/30, Local: 10.255.2.70, Broadcast: Unspecified, Generation: 973
```

DS0

```
user@RouterA> show interfaces extensive ds-4/2/0:4:1:1

Physical interface: ds-4/2/0:4:1:1, Enabled, Physical link is Up
  Interface index: 306, SNMP ifIndex: 2411, Generation: 641
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 64kbps, Loopback: None, FCS: 16,
  Parent: ct1-4/2/0:4:1 (Index 305)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 98 (last seen 00:00:01 ago)
    Output: 100 (last sent 00:00:00 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls: Not-configured
  CHAP state: Not-configured
```



```
  Last flapped   : 2002-10-09 17:45:15 PDT (00:16:20 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                3013                    0 bps
   Output bytes  :                3228                    0 bps
   Input  packets:                 201                    0 pps
   Output packets:                 202                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0 best-effort                202                  202                    0
    1 expedited-fo                 0                    0                    0
    2 assured-forw                 0                    0                    0
    3 network-cont                 0                    0                    0
  Interface transmit queues:
              B/W  WRR       Packets        Bytes        Drops       Errors
    Queue0      0    0             0            0            0            0
    Queue1      0    0             0            0            0            0
  HDLC configuration:
    Giant threshold: 0, Runt threshold: 0
    Timeslots      : 1
    Byte encoding: Nx64K, Data inversion: Disabled
    Idle cycle flag: flags, Start end flag: shared
  Packet Forwarding Engine configuration:
    Destination slot: 4, PLP byte: 4 (0x07)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %        bytes
    0 best-effort            95        60800  95            0      low    none
    3 network-control         5         3200   5            0      low    none
  Logical interface ds-4/2/0:4:1:1.0 (Index 39) (SNMP ifIndex 2412)
(Generation 369)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500, Generation: 376, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.255.0.120/30, Local: 10.255.0.122, Broadcast: Unspecified, Generation: 743
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Converting a Channelized OC12 IQ PIC to a Channelized STM4 IQ Interface

The JUNOS software allows you to convert a Channelized OC12 IQ PIC into a channelized STM4 IQ interface. The conversion process enables the Channelized OC12 IQ PIC to interconnect with European SDH telecommunications equipment at the STM4 and STM1 levels, then channelize the data into North American T3, T1, and *N*xDS0 interfaces. To place the Channelized OC12 IQ PIC in SDH mode, include the **sdh** option at the **[edit chassis fpc *slot-number* pic *pic-number* framing]** hierarchy level.

Figure 3: Channelized OC12 IQ Interface in SDH Mode Example

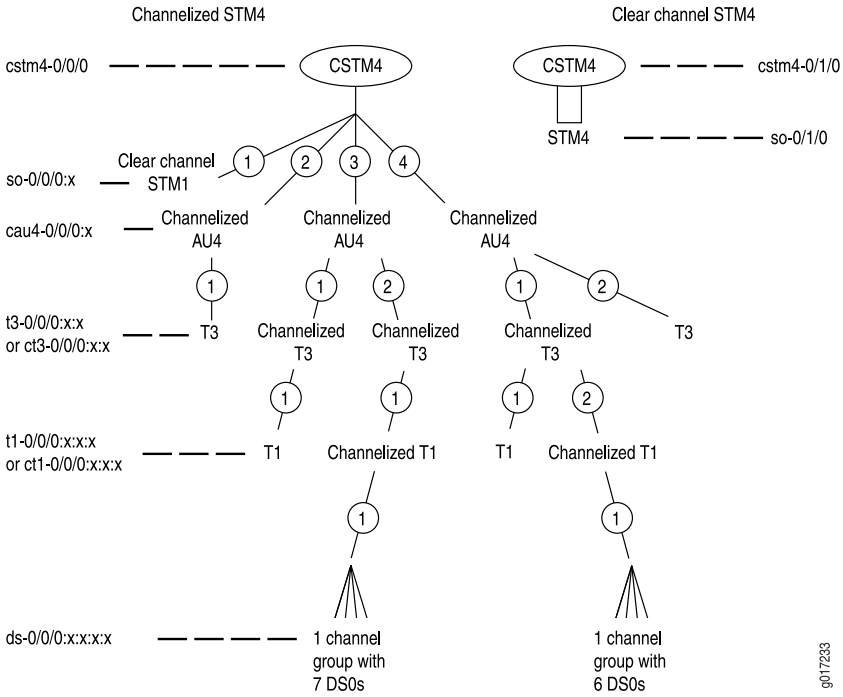


Figure 3 on page 58 and the following configuration example show how the converted channelized STM4 IQ interface can be turned into a clear channel STM4 (VC4-4c) SDH interface, or further subdivided into STM1 (VC4) interfaces and channelized administrative unit 4 (CAU4) interfaces, T3 and channelized T3 interfaces, T1 and channelized T1 interfaces, and *N*xDS0 channels.

Router A

```
[edit]
chassis {
  fpc 0 {
    pic 0 {
      framing sdh;# Converts the Channelized OC12 IQ PIC
    }          # into a channelized STM4 SDH interface.
  }
}
interfaces {
  cstm4-0/0/0 {
    partition 1 oc-slice 1-3 interface-type so; # Creates an STM1 SDH interface.
    partition 2 oc-slice 4-6 interface-type cau4; # Partitions 2, 3, and 4 create
    partition 3 oc-slice 7-9 interface-type cau4; # three channelized AU4 channels.
    partition 4 oc-slice 10-12 interface-type cau4;
  }
  so-0/0/0:1 { # A clear channel STM1 SDH (VC4) interface.
    encapsulation frame-relay;
    unit 0 {
      dlci 16;
      family inet {
        address 10.0.0.1/30;
      }
      family inet6 {
        address abcd::10.0.0.1/126;
```

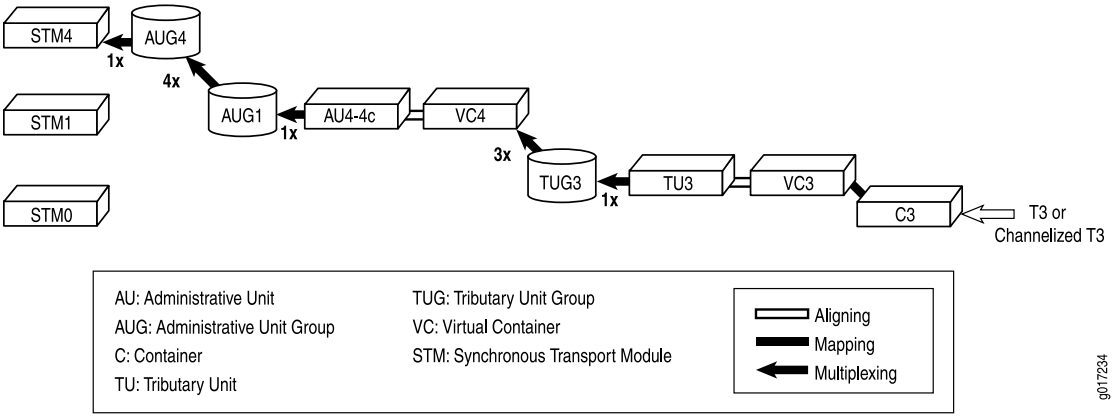
```
    }
  }
}
cau4-0/0/0:2 {
  partition 1 interface-type t3; # Creates a T3 interface from the
}           # channelized AU4 interface.
t3-0/0/0:2:1 {
  encapsulation frame-relay;
  unit 0 {
    dlci 16;
    family inet {
      address 10.0.0.5/30;
    }
    family inet6 {
      address abcd::10.0.0.5/126;
    }
  }
}
cau4-0/0/0:3 {
  partition 1 interface-type ct3; # Creates channelized T3 interfaces from the
  partition 2 interface-type ct3; # second channelized AU4.
}
ct3-0/0/0:3:1 {
  partition 1 interface-type t1; # Creates a T1 interface from the channelized T3.
}
t1-0/0/0:3:1:1 {
  encapsulation frame-relay;
  unit 0 {
    dlci 16;
    family inet {
      address 10.0.0.9/30;
    }
    family inet6 {
      address abcd::10.0.0.9/126;
    }
  }
}
ct3-0/0/0:3:2 {
  partition 1 interface-type ct1; # Creates a channelized T1 interface
}           # from the channelized T3.
ct1-0/0/0:3:2:1 {
  partition 1 timeslots 1,3-7,24 interface-type ds; # Creates an Nx DS0 channel
}           # group with seven time slots.
ds-0/0/0:3:2:1:1 {
  encapsulation frame-relay;
  unit 0 {
    dlci 16;
    family inet {
      address 10.0.0.13/30;
    }
    family inet6 {
      address abcd::10.0.0.13/126;
    }
  }
}
cau4-0/0/0:4 {
```

```
    partition 2 interface-type t3; # Creates a T3 interface.
    partition 1 interface-type ct3; # Creates a channelized T3 interface
}           # from the channelized AU4.
ct3-0/0/0:4:1 {
    partition 1 interface-type t1; # Creates a T1 interface.
    partition 2 interface-type ct1; # Creates a channelized T1 interface
}           # from the channelized T3.
t1-0/0/0:4:1:1 {
    encapsulation frame-relay;
    unit 0 {
        dlci 16;
        family inet {
            address 10.0.0.21/30;
        }
        family inet6 {
            address abcd::10.0.0.21/126;
        }
    }
}
ct1-0/0/0:4:1:2 {
    partition 1 timeslots 6,8-11,7 interface-type ds; # Creates an NxDS0 channel
}           # group with six time slots.
ds-0/0/0:4:1:2:1 {
    encapsulation frame-relay;
    unit 0 {
        dlci 16;
        family inet {
            address 10.0.0.25/30;
        }
        family inet6 {
            address abcd::10.0.0.25/126;
        }
    }
}
t3-0/0/0:4:2 {
    encapsulation frame-relay;
    unit 0 {
        dlci 16;
        family inet {
            address 10.0.0.17/30;
        }
        family inet6 {
            address abcd::10.0.0.17/126;
        }
    }
}
cstm4-0/1/0 {
    no-partition interface-type so; # Creates a clear channel SDH STM4 interface.
}
so-0/1/0 { # This is the clear channel SDH STM4 (VC4-4c) interface so-0/1/0.
    unit 0 {
        family inet {
            address 10.22.22.1/30;
        }
    }
}
```

```
}
```

Figure 4 on page 61 shows a visual representation of the T3/channelized T3-to-STM4 SDH mapping method used by the JUNOS Software for channelized OC12 IQ interfaces configured in SDH mode.

Figure 4: Converted Channelized OC12 IQ Interface SDH Mapping Method



Verifying Your Configuration

To verify correct operation of a Channelized OC12 IQ PIC converted to a channelized STM4 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**

To view the interface names of the physical channelized STM4 IQ interface and the resulting interfaces configured on the channelized IQ interface, use the **show interfaces controller** and **show interfaces terse** commands:

```
user@host> show interfaces controller cstm4-0/0/0
Controller                                                    Admin Link
cstm4-0/0/0                                                    up    up
     so-0/0/0:1                                                up    up
     cau4-0/0/0:2                                              up    up
         t3-0/0/0:2:1                                          up    up
     cau4-0/0/0:3                                              up    up
         ct3-0/0/0:3:1                                         up    up
             t1-0/0/0:3:1:1                                    up    up
         ct3-0/0/0:3:2                                         up    up
             ct1-0/0/0:3:2:1                                   up    up
                 ds-0/0/0:3:2:1:1                              up    up
     cau4-0/0/0:4                                              up    up
         ct3-0/0/0:4:1                                         up    up
             t1-0/0/0:4:1:1                                    up    up
             ct1-0/0/0:4:1:2                                   up    up
                 ds-0/0/0:4:1:2:1                              up    up
         t3-0/0/0:4:2                                          up    up


user@host> show interfaces terse *-0/0/0*
```

```
Interface               Admin Link Proto    Local                 Remote
cstm4-0/0/0             up    up
so-0/0/0:1              up    up
so-0/0/0:1.0            up    up   inet     10.0.0.1/30
                                   inet6    abcd::a00:1/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
cau4-0/0/0:2            up    up
t3-0/0/0:2:1            up    up
t3-0/0/0:2:1.0          up    up   inet     10.0.0.5/30
                                   inet6    abcd::a00:5/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
cau4-0/0/0:3            up    up
ct3-0/0/0:3:1           up    up
t1-0/0/0:3:1:1          up    up
t1-0/0/0:3:1:1.0        up    up   inet     10.0.0.9/30
                                   inet6    abcd::a00:9/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
ct3-0/0/0:3:2           up    up
ct1-0/0/0:3:2:1         up    up
ds-0/0/0:3:2:1:1        up    up
ds-0/0/0:3:2:1:1.0      up    up   inet     10.0.0.13/30
                                   inet6    abcd::a00:d/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
cau4-0/0/0:4            up    up
ct3-0/0/0:4:1           up    up
t1-0/0/0:4:1:1          up    up
t1-0/0/0:4:1:1.0        up    up   inet     10.0.0.21/30
                                   inet6    abcd::a00:15/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
ct1-0/0/0:4:1:2         up    up
ds-0/0/0:4:1:2:1        up    up
ds-0/0/0:4:1:2:1.0      up    up   inet     10.0.0.25/30
                                   inet6    abcd::a00:19/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
t3-0/0/0:4:2            up    up
t3-0/0/0:4:2.0          up    up   inet     10.0.0.17/30
                                   inet6    abcd::a00:11/126
                                            fe80::2a0:a5ff:fe5c:15a6/64
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Channelized OC3 IQ Interface Configuration

Figure 5: Channelized OC3 IQ Interface Example

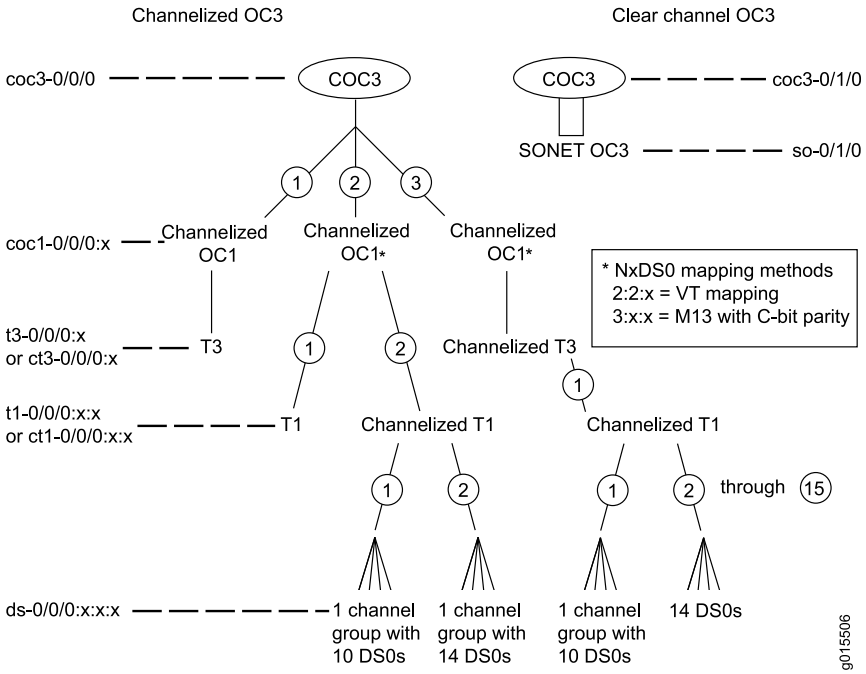


Figure 5 on page 63 shows a sample channelization structure for a channelized OC3 IQ interface. Top-level partitions **1**, **2**, and **3** create channelized OC1 interfaces. The first channelized OC1 interface, **coc1-0/0/0:1**, is converted directly into the T3 interface **t3-0/0/0:1**. The second channelized OC1 interface, **coc1-0/0/0:2**, is partitioned into a T1 interface and a channelized T1 interface. The channelized T1 interface, **t1-0/0/0:2:2**, is then further subdivided into two *N*xDS0 channel groups: **ds-0/0/0:2:2:1** and **ds-0/0/0:2:2:2**.

The remaining channelized OC1 interface, **coc1-0/0/0:3**, is converted to a channelized T3 interface, then to a channelized T1 interface, and ultimately to 14 individual *N*xDS0 channels and a channel group containing 10 *N*xDS0 channels. Additionally, channelized OC3 IQ interface **coc3-0/1/0** uses the **no-partition** statement at the **[edit interface *interface-name*]** hierarchy level to create a clear channel SONET OC3 interface **so-0/1/0**. This example shows two *N*xDS0 mapping methods. Partition 2:*x*:*x* uses VT mapping for SONET/SDH equipment, while partition 3:*x*:*x* uses M13 mapping for North American T-carrier equipment.

This example also assumes corresponding interfaces. For example, for every sublevel T1 interface you configure on Router A, assume you have configured a matching sublevel or physical T1 interface on a neighboring router.

Router A

```
[edit]
interfaces {
   coc3-0/0/0 {
      partition 1 oc-slice 1 interface-type coc1; # Creates three channelized OC1
      partition 2 oc-slice 2 interface-type coc1; # interfaces: coc1-0/0/0:1 through
```

```
    partition 3 oc-slice 3 interface-type coc1; # coc1-0/0/0:3.
}
coc1-0/0/0:1 {
    no-partition interface-type t3; # This converts the COC1 interface into
}               # T3 interface t3-0/0/0:1.
t3-0/0/0:1 {
    no-keepalives;
    encapsulation cisco-hdlc;
    t3-options {
        fcs 32;
        feac-loop-respond;
    }
    unit 0 {
        family inet {
            address 10.21.21.2/30;
        }
    }
}
coc1-0/0/0:2 {
    partition 1 interface-type t1; # Creates the T1 interface t1-0/0/0:2:1.
    partition 2 interface-type ct1; # Creates the channelized T1 interface
}                       # ct1-0/0/0:2:2.
t1-0/0/0:2:1 {
    no-keepalives;
    encapsulation cisco-hdlc;
    t1-options {
        fcs 32;
    }
    unit 0 {
        family inet {
            address 10.12.12.2/30;
        }
    }
}
ct1-0/0/0:2:2 {
    partition 1 timeslots 1-10 interface-type ds; # This converts the channelized T1
    partition 2 timeslots 11-24 interface-type ds; # interface into two channel
}                     # groups: ds-0/0/0:2:2:1 and ds-0/0/0:2:2:2.
ds-0/0/0:2:2:1 {  # This is a channel group with 10 NxDS0s bundled as one.
    no-keepalives;
    encapsulation cisco-hdlc;
    unit 0 {
        family inet {
            address 10.13.13.2/30;
        }
    }
}
ds-0/0/0:2:2:2 { # This is a channel group with 14 NxDS0s bundled as one.
    encapsulation frame-relay;
    unit 0 {
        dlci 10;
        family inet {
            address 10.14.14.2/30;
        }
    }
}
```

```
coc1-0/0/0:3 {
  partition 1 interface-type ct3; # Creates the channelized T3 interface
}               # ct3-0/0/0:3.
ct1-0/0/0:3:1 {
  partition 1 timeslots 1-10 interface-type ds; # Creates a channel group.
  partition 2 timeslots 11 interface-type ds; # Creates single NxDS0 channels.
  partition 3 timeslots 12 interface-type ds;
  partition 4 timeslots 13 interface-type ds;
  partition 5 timeslots 14 interface-type ds;
  partition 6 timeslots 15 interface-type ds;
  partition 7 timeslots 16 interface-type ds;
  partition 8 timeslots 17 interface-type ds;
  partition 9 timeslots 18 interface-type ds;
  partition 10 timeslots 19 interface-type ds;
  partition 11 timeslots 20 interface-type ds;
  partition 12 timeslots 21 interface-type ds;
  partition 13 timeslots 22 interface-type ds;
  partition 14 timeslots 23 interface-type ds;
  partition 15 timeslots 24 interface-type ds;
}
ds-0/0/0:3:1:1 { # This is a channel group with 10 NxDS0s bundled as one.
  no-keepalives;
  encapsulation cisco-hdlc;
  unit 0 {
    family inet {
      address 10.31.31.2/30;
    }
  }
}
ds-0/0/0:3:1:2 { # ds-0/0/0:3:1:2 through :15 are single NxDS0s channels.
  encapsulation frame-relay;
  unit 0 {
    dlci 10;
    family inet {
      address 10.32.32.2/30;
    }
  }
}
# Assume ds-0/0/0:3:1:3 through :14 are configured here.
ds-0/0/0:3:1:15 { # ds-0/0/0:3:1:2 through :15 are single NxDS0s channels.
  encapsulation frame-relay;
  unit 0 {
    dlci 10;
    family inet {
      address 10.45.45.2/30;
    }
  }
}
coc3-0/1/0 {
  no-partition interface-type so; # Creates a clear channel SONET OC3 interface.
}
so-0/1/0 { # This is the clear channel SONET OC3 interface so-0/1/0.
  dce;
  encapsulation frame-relay;
  unit 1 {
    dlci 11;
```

```
        family inet {
          address 10.22.22.1/30;
        }
      }
    }
  }
```

Verifying Your Work

To verify correct operation of a channelized OC3 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**
- **show interfaces interval** (for channelized OC3, OC3, T3, channelized T3, T1, and channelized T1 channels)

To view the interface names of the physical channelized OC3 IQ interface and the resulting interfaces configured on the channelized IQ interface, use the **show interfaces controller** command:

```
user@host> show interfaces controller coc3-0/0/0
Controller                                                      Admin Link
coc3-0/0/0                                                      up    up
    coc1-0/0/0:1                                                up    up
    t3-0/0/0:1                                                  up    up
    coc1-0/0/0:2                                                up    up
        t1-0/0/0:2:1                                            up    up
        ct1-0/0/0:2:2                                           up    up
            ds-0/0/0:2:2:1                                      up    up
            ds-0/0/0:2:2:2                                      up    up
    coc1-0/0/0:3                                                up    up
    ct3-0/0/0:3                                                 up    up
        ct1-0/0/0:3:1                                           up    up
            ds-0/0/0:3:1:1                                      up    up
            ds-0/0/0:3:1:2                                      up    up
            ds-0/0/0:3:1:3                                      up    up
            ds-0/0/0:3:1:4                                      up    up
            ds-0/0/0:3:1:5                                      up    up
            ds-0/0/0:3:1:6                                      up    up
            ds-0/0/0:3:1:7                                      up    up
            ds-0/0/0:3:1:8                                      up    up
            ds-0/0/0:3:1:9                                      up    up
            ds-0/0/0:3:1:10                                     up    up
            ds-0/0/0:3:1:11                                     up    up
            ds-0/0/0:3:1:12                                     up    up
            ds-0/0/0:3:1:13                                     up    up
            ds-0/0/0:3:1:14                                     up    up
            ds-0/0/0:3:1:15                                     up    up
```

To verify that your channelized IQ interfaces are working as expected, use the **show interfaces** command. Use the **show interfaces controller** command to find the name of the channelized interface you want to view; then include this channelized name (for example, **ct3-0/0/0:3**) as an option with the **show interfaces** command.

The next sections provide sample **show interfaces** output for each of the major interface types configured in this example:

Channelized OC3

```
user@host> show interfaces coc3-0/0/0
Physical interface: coc3-0/0/0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 1954
  Link-level type: Controller, Clocking: Internal, SONET mode,
  Speed: OC3, Loopback: None, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  CoS queues     : 4 supported
  Last flapped   : 2005-02-15 20:35:24 PST (22:10:54 ago)
  SONET alarms   : None
  SONET defects  : None
```

Channelized OC1

```
user@host> show interfaces coc1-0/0/0:1
Physical interface: coc1-0/0/0:1, Enabled, Physical link is Up
  Interface index: 226, SNMP ifIndex: 1957
  Link-level type: Controller, Clocking: Internal, SONET mode, Speed: 51840kbps,
 Loopback: None,
  Parent: coc3-0/0/0 Interface index 138
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  CoS queues     : 4 supported
  Last flapped   : 2004-11-04 10:55:50 PST (05:38:36 ago)
  SONET alarms   : None
  SONET defects  : None
```

T3

```
user@host> show interfaces t3-0/0/0:1
Physical interface: t3-0/0/0:1, Enabled, Physical link is Up
  Interface index: 227, SNMP ifIndex: 43
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, Speed: T3, Loopback:
 None, FCS: 16, Mode: C/Bit parity,
  Parent: coc1-0/0/0:1 Interface index 226
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : No-Keepalives
  CoS queues     : 4 supported
```

```
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  DS3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^15 - 1, O.151, Pseudorandom (9), Induced error rate: 10e-0
  Logical interface t3-0/0/0:1.0 (Index 69) (SNMP ifIndex 1960)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 4470
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.21.21.0/30, Local: 10.21.21.2, Broadcast: 10.21.21.3
```

Channelized T3

```
user@host> show interfaces ct3-0/0/0:3
Physical interface: ct3-0/0/0:3, Enabled, Physical link is Up
  Interface index: 234, SNMP ifIndex: 2218
  Link-level type: Controller, Clocking: Internal, Speed: T3, Loopback: None,
Mode: C/Bit parity,
  Parent: coc1-0/0/0:3 Interface index 233
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  CoS queues     : 4 supported
  Last flapped   : Never
  Active alarms  : None
  Active defects : None
  DS3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^15 - 1, O.151, Pseudorandom (9), Induced error rate: 10e-0
```

T1

```
user@host> show interfaces t1-0/0/0:2:1
Physical interface: t1-0/0/0:2:1, Enabled, Physical link is Up
  Interface index: 229, SNMP ifIndex: 2091
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: T1,
Loopback: None, FCS: 32, Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 228
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : No-Keepalives
  CoS queues     : 4 supported
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
  SONET alarms   : None
  SONET defects  : None
  Logical interface t1-0/0/0:2:1.0 (Index 70) (SNMP ifIndex 2092)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500
      Flags: None
```

```
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.12.12.0/30, Local: 10.12.12.2, Broadcast: 10.12.12.3
```

Channelized T1

```
user@host> show interfaces ct1-0/0/0:2:2
Physical interface: ct1-0/0/0:2:2, Enabled, Physical link is Up
  Interface index: 230, SNMP ifIndex: 13985
  Link-level type: Controller, Clocking: Internal, Speed: T1, Loopback: None,
Framing: ESF,
  Parent: coc1-0/0/0:2 Interface index 228
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  CoS queues     : 4 supported
  Last flapped   : Never
  DS1   alarms   : None
  DS1   defects  : None
  SONET alarms   : None
  SONET defects  : None
```

NxDS0

```
user@host> show interfaces ds-0/0/0:2:2:1
Physical interface: ds-0/0/0:2:2:1, Enabled, Physical link is Up
  Interface index: 231, SNMP ifIndex: 14016
  Link-level type: Cisco-HDLC, MTU: 1504, Clocking: Internal, Speed: 640kbps,
Loopback: None, FCS: 16,
  Parent: ct1-0/0/0:2:2 Interface index 230
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : No-Keepalives
  CoS queues     : 8 maximum usable queues, 4 in use
  Egress queues  : 8 supported, 4 in use4 supported
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS0 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  Logical interface ds-0/0/0:2:2:1.0 (Index 71) (SNMP ifIndex 20889)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.13.13.0/30, Local: 10.13.13.2, Broadcast: 10.13.13.3
```

Clear Channel SONET OC3

```
user@host> show interfaces so-0/1/0
Physical interface: so-0/1/0, Enabled, Physical link is Down
  Interface index: 128, SNMP ifIndex: 15684
  Link-level type: Cisco-HDLC, MTU: 4474, Clocking: Internal, SONET mode, Speed:
 OC3, Loopback: None, FCS: 16,
  Payload scrambler: Enabled
  Parent: coc3-0/1/0 Interface index 142
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives
  CoS queues     : 4 supported
```

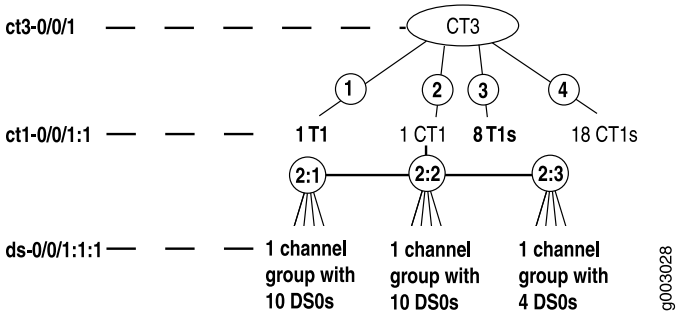
```
Last flapped   : 2004-11-04 10:53:54 PST (05:51:04 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
SONET alarms   : PLM-P
SONET defects  : PLM-P
Logical interface so-0/1/0.0 (Index 67) (SNMP ifIndex 15686)
  Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol inet, MTU: 4470
    Flags: None
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
      Destination: 10.22.22.0/30, Local: 10.22.22.1, Broadcast: 10.22.22.3
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Channelized DS3 IQ Interface Configuration

Figure 6: Channelized DS3 IQ Interface Example



This example shows how to configure a channelized DS3 IQ interface. Figure 6 on page 70 shows the breakdown of a DS3 interface into a variety of channels. The path that leads to *N*xDS0 channels is similar to the M13 with C-bit parity method seen previously in the complex OC12 configuration example (see "Example: Complex Configuration for a Channelized OC12 IQ Interface" on page 36). This method breaks the channelized DS3 IQ interface into channelized T1s before additional splits create DS0 time slots.

To create T1 channels, include the **partition** statement at the [**edit interfaces ct3-*fpc/pic/port***] hierarchy level with the **interface-type t1** option. To create channelized T1 channels, include the **partition** statement at the [**edit interfaces ct3-*fpc/pic/port***] hierarchy level with the **interface-type ct1** option.

After you have established a channelized T1 channel, you can split it into a maximum of 24 *N*xDS0 channels. To configure *N*xDS0 channels, include the **partition** statement at the **[edit interfaces ct1-*fpc/pic/port:channel*]** hierarchy level with the **timeslots** and **interface-type ds** options to create the desired number of *N*xDS0 channels or channel groups.

Although it is not part of the example shown, you can also create a clear channel T3 or a fractional T3 interface on a channelized DS3 IQ interface. To configure a clear channel T3 or fractional T3 interface, include the **no-partition** statement at the **[edit interfaces ct3-*fpc/pic /port*]** hierarchy level. After you commit this part of the configuration, a clear channel T3 interface is established. You can configure standard T3 options on this interface. To fractionalize the T3 interface, include the **timeslots** statement at the **[edit interfaces t3-*fpc/pic/port* t3-options]** hierarchy level.

Router A

```
[edit]
interfaces {
   ct3-0/0/1 { # This is the controller level for the channelized DS3 IQ interface.
      partition 1 interface-type t1; # This creates the t1-0/0/1:1 channel.
      partition 2 interface-type ct1; # This creates the ct1-0/0/1:2 channel.
      partition 3-10 interface-type t1; # This creates channels t1-0/0/1:3 through :10.
      partition 11-28 interface-type ct1; # This creates channels ct1-0/0/1:11 to :28.
   }
   t1-0/0/1:1 {
      ...
   }
   ct1-0/0/1:2 {
      partition 1 timeslots 1-10 interface-type ds; # These statements create
      partition 2 timeslots 11-20 interface-type ds; # three channel groups.
      partition 3 timeslots 21-24 interface-type ds;
   }
   ds-0/0/1:2:1 { # This channel group contains 10 Nx DS0s.
      unit 0 {
         family inet {
            address 10.25.1.2/24;
         }
      }
   }
   ds-0/0/1:2:2 { # This channel group contains 10 Nx DS0s.
      unit 0 {
         family inet {
            address 10.25.2.2/24;
         }
      }
   }
   ds-0/0/1:2:3 { # This channel group contains 4 Nx DS0s.
      unit 0 {
         family inet {
            address 10.25.3.2/24;
         }
      }
   }
   t1-0/0/1:3 {
      ...
   }
   t1-0/0/1:10 {
      ...
   }
   ct1-0/0/1:11 {
      ...
   }
   ct1-0/0/1:28 {
```

```
    ...
  }
}
```

Verifying Your Work

To verify correct operation of a channelized DS3 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**
- **show interfaces interval** (for T3, channelized T3, T1, and channelized T1 channels)

To view the interface names of the physical channelized DS3 IQ interface and the channels configured on this interface, use the **show interfaces controller** command:

```
user@RouterA> show interfaces controller ct3-0/0/1
Controller                                                      Admin Link
ct3-0/0/1                                                       up    up
# This is the physical channelized DS3 (channelized T3) IQ interface.
    t1-0/0/1:1                                                  up    up
# Channel 1 is a channelized T1 interface.
    ct1-0/0/1:2                                                 up    up
        ds-0/0/1:2:1                                            up    up
        ds-0/0/1:2:2                                            up    up
        ds-0/0/1:2:3                                            up    up
    t1-0/0/1:3                                                  up    down
    t1-0/0/1:4                                                  up    up
    t1-0/0/1:5                                                  up    up
    t1-0/0/1:6                                                  up    up
    t1-0/0/1:7                                                  up    up
    t1-0/0/1:8                                                  up    up
    t1-0/0/1:9                                                  up    up
    t1-0/0/1:10                                                 up    up
# Channels 3 through 10 are T1 interfaces.
    ct1-0/0/1:11                                                up    up
    ct1-0/0/1:12                                                up    up
    ct1-0/0/1:13                                                up    up
    ct1-0/0/1:14                                                up    up
    ct1-0/0/1:15                                                up    up
    ct1-0/0/1:16                                                up    up
    ct1-0/0/1:17                                                up    up
    ct1-0/0/1:18                                                up    up
    ct1-0/0/1:19                                                up    up
    ct1-0/0/1:20                                                up    up
    ct1-0/0/1:21                                                up    up
    ct1-0/0/1:22                                                up    up
    ct1-0/0/1:23                                                up    up
    ct1-0/0/1:24                                                up    up
    ct1-0/0/1:25                                                up    up
    ct1-0/0/1:26                                                up    up
    ct1-0/0/1:27                                                up    up
    ct1-0/0/1:28                                                up    up
# Channels 11 through 28 are channelized T1 interfaces.
```

To view information about the physical channelized interface, include the **ct3-*fpc/pic/port*** option with the **show interfaces** command:

```
user@RouterA> show interfaces extensive ct3-0/0/1
```

```
Physical interface: ct3-0/0/1, Enabled, Physical link is Up
  Interface index: 30, SNMP ifIndex: 317, Generation: 29
  Link-level type: Controller, MTU: 4474, Clocking: Internal, Speed: T3,
  Loopback: None, FCS: 16, Mode: C/Bit parity, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-04 10:24:18 PDT (01:40:40 ago)
  Statistics last cleared: 2002-10-04 11:47:27 PDT (00:17:31 ago)
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Bucket drops: 0,
    Policed discards: 0, L3 incompletes: 0, L2 channel errors: 0,
    L2 mismatch timeouts: 0, HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  Active alarms  : None
  Active defects : None
  DS3 media:            Seconds        Count  State
    PLL Lock                  0            0  OK
    Reframing                 0            0  OK
    AIS                       0            0  OK
    LOF                       0            0  OK
    LOS                       0            0  OK
    IDLE                      0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                       0            0
    CCV                       0            0
    LES                       0
    PES                       0
    PSES                      0
    CES                       0
    CSES                      0
    SEFS                      0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 0, Runt threshold: 0
  DSU configuration:
    Compatibility mode: None, Scrambling: Disabled, Subrate: Disabled
    FEAC loopback: Inactive, Response: Disabled, Count: 0
  DS-3 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Algorithm: 2^3 - 1, Pseudorandom (1), Induced error rate: 10e-0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
    CoS transmit queue              Bandwidth           Buffer Priority   Limit
                              %          bps   %         bytes
    0 best-effort            95     42499200  95             0      low    none
    3 network-control         5      2236800   5             0      low    none
```

To view information about a channelized T1 channel, include the **ct1-*fpc/pic /port:channel*** option with the **show interfaces** command:

```
user@RouterA> show interfaces extensive ct1-0/0/1:2
Physical interface: ct1-0/0/1:2, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 1505, Generation: 174
  Link-level type: Controller, MTU: 1504, Clocking: Internal, Speed: T1,
  Loopback: None, FCS: 16, Framing: ESF, Parent: ct3-0/0/1 (Index 32)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-04 12:08:23 PDT (00:05:57 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0, SRAM errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0
  DS1   alarms   : None
  DS1   defects  : AIS, LOF
  T1  media:            Seconds        Count  State
    SEF                       0            0  OK
    BEE                       1            1  OK
    AIS                     355            1  Defect Active
    LOF                     355            1  Defect Active
    LOS                       0            0  OK
    YELLOW                    0            0  OK
    BPV                       0            0
    EXZ                       0            0
    LCV                       0            0
    PCV                       0            0
    CS                        0            0
    LES                     355
    ES                      355
    SES                     355
    SEFS                    355
    BES                       0
    UAS                       0
  HDLC configuration:
    Policing bucket: Disabled
    Shaping bucket : Disabled
    Giant threshold: 1514, Runt threshold: 0
    Timeslots      : All active
    Line encoding: B8ZS, Byte encoding: Nx64K
    Buildout       : 0 to 132 feet
    Data inversion: Disabled
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %         bytes
    0 best-effort            95      1459200  95             0      low    none
    3 network-control         5        76800   5             0      low    none
```

To view information about an *N*xDS0 interface, include the **ds-*fpc/pic/port:channel*** option with the **show interfaces** command. In this case, the speed is 640 Kbps because this channel contains 10 DS0s (**64 x 10 = 640**).

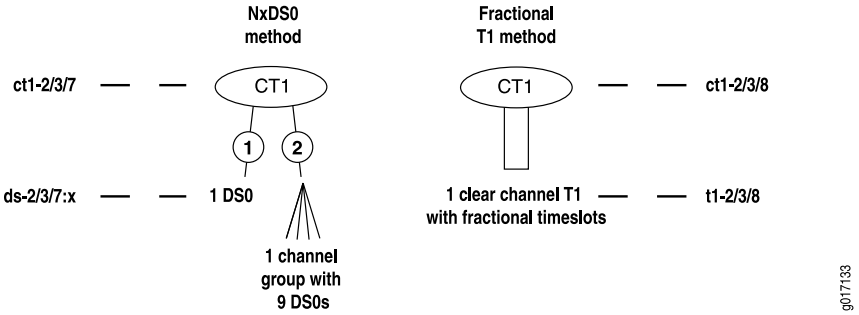
```
user@RouterA> show interfaces extensive ds-0/0/1:2:1
Physical interface: ds-0/0/1:2:1, Enabled, Physical link is Up
  Interface index: 176, SNMP ifIndex: 1563, Generation: 175
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
  Loopback: None, FCS: 16, Parent: ct1-0/0/1:2 (Index 175)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : 2002-10-04 12:09:06 PDT (00:05:54 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Policed discards: 0,
    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    HS link CRC errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Interface transmit queues:
              B/W  WRR       Packets        Bytes        Drops       Errors
    Queue0      0    0             0            0            0            0
    Queue1      0    0             0            0            0            0
  HDLC configuration:
    Giant threshold: 0, Runt threshold: 0
    Timeslots      : 1-10
    Byte encoding: Nx64K, Data inversion: Disabled
  Packet Forwarding Engine configuration:
    Destination slot: 0, PLP byte: 4 (0x10)
    CoS transmit queue             Bandwidth           Buffer Priority   Limit
                              %          bps   %         bytes
    0 best-effort            95       608000  95             0      low    none
    3 network-control         5        32000   5             0      low    none
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Channelized T1 IQ Interface Configuration

Figure 7: Channelized T1 IQ Interface Example



The following example shows two ways to configure a channelized T1 IQ interface. Figure 7 on page 76 shows a fractional T1 method and the *N*xDS0 method seen previously in the complex OC12 configuration example (see "Example: Complex Configuration for a Channelized OC12 IQ Interface" on page 36). The *N*xDS0 method breaks the channelized T1 IQ interface into discrete DS0 blocks, whereas the fractional method creates a clear channel T1 that is segmented by time slots.

To configure *N*xDS0 channels, include the **partition** statement at the **[edit interfaces ct1-*fpc/pic/port*]** hierarchy level. Include the **timeslots** and **interface-type ds** options to create the desired number of *N*xDS0 interfaces in time slots 1 through 24.

To configure a clear channel T1 on a channelized T1 IQ interface, include the **no-partition** statement with the **interface-type t1** option at the **[edit interfaces ct1-*fpc/pic/port*]** hierarchy level. After you commit this configuration, you can create a fractional T1 on the clear channel T1 interface. To do so, include the **timeslots** statement at the **[edit interfaces t1-*fpc/pic/port* t1-options]** hierarchy level and specify the number of DS0 blocks to be allowed in the fractional T1 interface. The minimum number of 64-Kbps DS0 blocks you can configure is 1 and the maximum is 24.

Usually, you configure loopback statements at the controller level for all IQ-based channelized interfaces. One exception for channelized T1 IQ interfaces is that you must configure a payload loopback on a T1 IQ interface instead of the controller-level channelized T1 IQ interface. To configure, include the **payload** option at the **[edit interfaces t1-*fpc/pic/port* t1-options loopback]** hierarchy level.

Router A—NxDS0 Method

```
[edit]
interfaces {
   ct1-2/3/7 {
      partition 1 timeslots 10 interface-type ds; # Creates NxDS0 channel ds-2/3/7:1.
      partition 2 timeslots 1-9 interface-type ds; # Creates a channel group with
   }          # 9 NxDS0s.
   ds-2/3/7:1 {
      unit 0 {
         family inet {
            address 10.25.1.2/24;
         }
      }
   }
```

```
    ds-2/3/7:2 {
      unit 0 {
        family inet {
          address 10.25.2.2/24;
        }
      }
    }
}
```

Router A—Fractional T1 Method

```
[edit]
interfaces {
  ct1-2/3/8 {
    no-partition interface-type t1; # This creates a single T1 channel: t1-2/3/8.
  }
  t1-2/3/8 {
    t1-options {
      timeslots 1-2; # This statement enables only 2 of the 24 NxDS0 time slots
    }        # available on t1-2/3/8.
    unit 0 {
      family inet {
        address 10.255.126.2/24;
      }
    }
  }
}
```

Verifying Your Work

To verify correct operation of a channelized T1 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**

To view the interface names of the physical channelized T1 IQ interface and the resulting interfaces configured on the channelized IQ interface, use the **show interfaces controller** command:

```
user@RouterA> show interfaces controller ct1-2/3/7
Controller                                                      Admin Link
ct1-2/3/7                                                        up    up
     ds-2/3/7:1                                                  up    up
     ds-2/3/7:2                                                  up    up
# ct1-2/3/7 is the physical channelized T1 IQ interface, and ds-2/3/7:1 and
ds-2/3/7:2 are the resulting  N xDS0 interfaces.
user@RouterA>  show interfaces controller ct1-2/3/8
Controller                                                      Admin Link
ct1-2/3/8                                                       up    up
t1-2/3/8                                                         up    up
# ct1-2/3/8 is the physical channelized T1 IQ interface, and t1-2/3/8 is the
resulting T1 interface.
```

To view information about the physical channelized interface, include the **ct1-*fpc/pic/port*** option with the **show interfaces** command:

```
user@RouterA> show interfaces ct1-2/3/7
```

```
Physical interface: ct1-2/3/7, Enabled, Physical link is Up
  Interface index: 18, SNMP ifIndex: 1128, Generation: 27
  Link-level type: Controller, Clocking: Internal, Speed: T1,
  Loopback: None, Framing: ESF, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2005-08-01 18:00:12 PDT (1d 00:31 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Statistics last cleared: Never
  DS1   alarms   : None
  DS1   defects  : None
    Line encoding: B8ZS
```

```
user@RouterA> show interfaces ct1-2/3/8
Physical interface: ct1-2/3/8, Enabled, Physical link is Up
  Interface index: 25, SNMP ifIndex: 1134, Generation: 28
  Link-level type: Controller, Clocking: Internal, Speed: T1,
  Loopback: None, Framing: ESF, Parent: None
  FCS: 16, Framing: G704, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2005-08-01 18:00:11 PDT (1d 00:30 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Statistics last cleared: Never
  DS1   alarms   : None
  DS1   defects  : None
    Line encoding: B8ZS
```

To view information about an *N*xDS0 interface, include the **ds-*fpc/pic/port:channel*** option with the **show interfaces** command:

```
user@RouterA> show interfaces ds-2/3/7:1 detail

Physical interface: ds-2/3/7:1, Enabled, Physical link is Up
  Interface index: 73, SNMP ifIndex: 1202, Generation: 325
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 64kbps, Loopback: None,
  FCS: 16, Parent: ct1-2/3/7 Interface index 18
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 11 (last seen 00:00:02 ago)
    Output: 10 (last sent 00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Opened, iso: Opened, mpls: Not-configured
  CHAP state: Not-configured
  CoS queues     : 4 supported
  Last flapped   : 2005-08-03 12:30:37 PDT (00:10:26 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 559                   56 bps
   Output bytes  :                 656                   56 bps
```



```
  Input  packets:                  33                    0 pps
  Output packets:                  36                    0 pps
Queue counters:       Queued packets  Transmitted packets      Dropped packets
  0 best-effort                  40                   40                    0
  1 expedited-fo                  0                    0                    0
  2 assured-forw                  0                    0                    0
  3 network-cont                  0                    0                    0
Logical interface ds-2/3/7:1.0 (Index 36) (SNMP ifIndex 1266) (Generation 153)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 352, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.25.1/24, Local: 10.25.1.2, Broadcast: 10.25.1.255,
      Generation: 445
  Protocol iso, MTU: 1500, Generation: 353, Route table: 0
    Flags: Is-Primary
  Protocol inet6, MTU: 1500, Generation: 354, Route table: 0
    Flags: Is-Primary
    Addresses, Flags: Is-Preferred
      Destination: fe80::/64, Local: fe80::2a0:a5ff:fe3d:ac6, Broadcast: Unspecified,
      Generation: 446
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: feee::10:25:1:0/126, Local: feee::10:25:1:2,
      Broadcast: Unspecified, Generation: 448
```

To view information about a T1 or fractional T1 interface, include the **t1-*fpc/pic /port*** option with the **show interfaces** command. The **Speed:** field shows if the interface is a full T1(**T1**) or a fractional T1 (increments of 64 Kbps). In this case, **t1-2/3/8** is a fractional T1 using two 64-Kbps time slots for a total speed of 128 Kbps.

```
user@RouterA> show interfaces t1-2/3/8 detail
Physical interface: t1-2/3/8, Enabled, Physical link is Up
  Interface index: 89, SNMP ifIndex: 1278, Generation: 341
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 128kbps,
  Loopback: None, FCS: 16, Parent: ct1-2/3/8 Interface index 25
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 4 (last seen 00:00:05 ago)
    Output: 3 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues     : 4 supported
  Last flapped   : 2005-08-03 12:30:37 PDT (01:17:36 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 189                    0 bps
   Output bytes  :                 478                    0 bps
   Input  packets:                  13                    0 pps
   Output packets:                  28                    0 pps
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                  28                   28                    0

    1 expedited-fo                  0                    0                    0
```

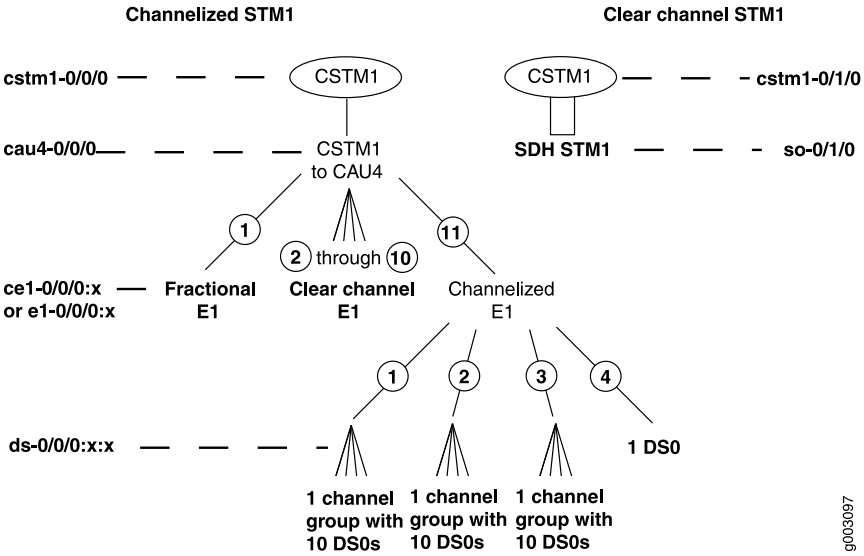
```
  2 assured-forw                 0                 0                 0

  3 network-cont                 0                 0                 0

DS1   alarms   : None
DS1   defects  : None
Logical interface t1-2/3/8.0 (Index 52) (SNMP ifIndex 1279) (Generation 169)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 1500, Generation: 401, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.255.126/24, Local: 10.255.126.2,
      Broadcast: 10.255.126.255, Generation: 525
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Channelized STM1 IQ Interface Configuration

Figure 8: Channelized STM1 IQ Interface Example



This example shows how to configure a channelized STM1 IQ interface on M-series or T-series routing platforms. Figure 8 on page 80 shows the breakdown of one channelized STM1 IQ interface into a variety of channels and the conversion of the second interface into a clear channel STM1.

For the first interface, you must first convert the STM1 interface into a channelized Administrative Unit 4 (AU-4) interface with the **no-partition** and **interface-type cau-4** statements at the [**edit interfaces cstm1-*fpc/pic/port***] hierarchy level. You must specify KLM or ITU-T AU-4 formatting with the **vtmapping** statement at the **[edit interfaces cau4-*fpc/pic/port* sonet-options**] hierarchy level. From the channelized AU-4 interface,

you can create E1 channels or channelized E1 channels. The channelized E1 channels can be further broken into DS0 time slots.

To create E1 channels, include the **partition** statement at the **[edit interfaces cau4-*fpc/pic/port*]** hierarchy level with the **interface-type e1** option. To create channelized E1 channels, include the **partition** statement at the **[edit interfaces cau4-*fpc/pic/port*]** hierarchy level with the **interface-type ce1** option.

After you have established a channelized E1 channel, you can split it into a maximum of 31 *N*xDS0 channels. To create the desired number of *N*xDS0 channels, include the **partition** statement with the **timeslots** and **interface-type ds** options at the **[edit interfaces ce1-*fpc/pic/port:channel*]** hierarchy level. Time slot **1** is reserved in an *N*xDS0-based channelized E1 channel, so you can use time slots **2** through **32**.
To create an *N*xDS0 channel group, include a range of time slots after the **timeslots** option.

You can also create fractional E1 interfaces on a channelized STM1 IQ interface. To configure a fractional E1 interface, include the **partition** statement at the **[edit interfaces cau4-*fpc/pic/port*]** hierarchy level and select the **interface-type e1** option. After you commit this part of the configuration, a clear channel E1 interface is established. You can configure standard E1 options on this interface. To fractionalize the E1 interface, include the **timeslots** statement at the **[edit interfaces e1-*fpc/pic/port* e1-options]** hierarchy level. Time slot **1** is reserved in a fractional E1 channel, so you can use time slots **2** through **32**.

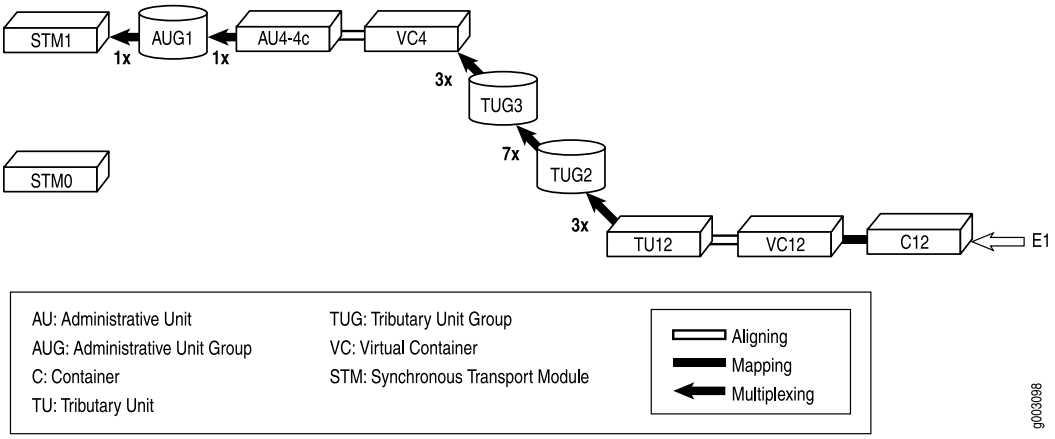
In the second interface shown in Figure 8 on page 80, you convert the channelized STM1 IQ interface into a clear channel STM1 interface. To configure, include the **no-partition** and **interface-type so** statements at the **[edit interfaces cstm1-*fpc/pic/port*]** hierarchy level.

```
[edit]
interfaces {
   cau4-0/0/0 {
      partition 1-10 interface-type e1; # Creates interfaces e1-0/0/0:1 through :10.
      partition 11 interface-type ce1; # Creates a single channelized E1 interface:
      sonet-options {              # e1-0/0/0:11.
         vtmapping itu-t; # This selects ITU-T as the VT mapping frame format.
      }
   }
   cstm1-0/0/0 {
      no-partition interface-type cau4; # Creates a channelized AU-4 interface:
   }          # cau4-0/0/0.
   e1-0/0/0:1 {      # Channel e1-0/0/0:1 is a fractional E1 interface.
      encapsulation ppp;
      e1-options {
         timeslots 2-21; # Setting time slots on an E1 channel makes a fractional E1.
      }
      unit 0 {
         family inet {
            address 10.133.0.1/30;
         }
      }
   }
   e1-0/0/0:2 { # Channels e1-0/0/0:2 through :10 are standard E1 interfaces.
```

```
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.133.0.5/30;
      }
    }
  }
  ...
  e1-0/0/0:10 {
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.133.0.37/30;
      }
    }
  }
  ce1-0/0/0:11 { # Channel ce1-0/0/0:11 is a channelized E1 interface.
    partition 1 timeslots 2-11 interface-type ds; # These statements
    partition 2 timeslots 12-21 interface-type ds; # create channel groups.
    partition 3 timeslots 22-31 interface-type ds;
    partition 4 timeslots 32 interface-type ds; # This statement creates a single NXDS0
      channel.
  }
  ds-0/0/0:11:1 { # This channel group contains 10 DS0s.
    unit 0 {
      family inet {
        address 10.134.1.1/30;
      }
    }
  }
  ds-0/0/0:11:2 { # This channel group contains 10 DS0s.
    unit 0 {
      family inet {
        address 10.134.2.1/30;
      }
    }
  }
  ds-0/0/0:11:3 { # This channel group contains 10 DS0s.
    unit 0 {
      family inet {
        address 10.134.3.1/30;
      }
    }
  }
  ds-0/0/0:11:4 { # Channel ds-0/0/0:11:4 is a standard DS0 interface.
    unit 0 {
      family inet {
        address 10.134.4.1/30;
      }
    }
  }
}
```

Figure 9 on page 83 shows a visual representation of the E1-to-STM1 SDH mapping method used by Juniper Networks in its channelized STM1 IQ interface.

Figure 9: Channelized STM1 IQ Interface SDH Mapping Method



Verifying Your Work

To verify correct operation of a channelized STM1 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**
- **show interfaces interval** (for channelized STM1, E1, and channelized E1 channels)

To view the interface names of the physical channelized STM1 IQ interface and the channels configured on this interface, use the **show interfaces controller** command:

```
user@router> show interfaces controller cstm1-0/0/0
Controller                                                      Admin Link
cstm1-0/0/0                                                     up    up
cau4-0/0/0                                                      up    up
    e1-0/0/0:1                                                  up    up
    e1-0/0/0:2                                                  up    up
    e1-0/0/0:3                                                  up    up
    e1-0/0/0:4                                                  up    up
    e1-0/0/0:5                                                  up    up
    e1-0/0/0:6                                                  up    up
    e1-0/0/0:7                                                  up    up
    e1-0/0/0:8                                                  up    up
    e1-0/0/0:9                                                  up    up
    e1-0/0/0:10                                                 up    up
    ce1-0/0/0:11                                                up    up
        ds-0/0/0:11:1                                           up    up
        ds-0/0/0:11:2                                           up    up
        ds-0/0/0:11:3                                           up    up
        ds-0/0/0:11:4                                           up    up
```

To view information about the physical channelized interface, include the **cstm1-*fpc/pic/port*** option with the **show interfaces** command:

```
user@router> show interfaces cstm1-0/0/0
Physical interface: cstm1-0/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 35
  Link-level type: Controller, Clocking: Internal, SDH mode, Speed: OC3,
Loopback: None, Parent: None
```

```
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Last flapped   : 2003-02-06 15:01:56 PST (07:15:06 ago)
  SDH   alarms   : None
  SDH   defects  : None
```

To view information about the channelized AU-4 channel, include the **cau4-*fpc/pic/port*** option with the **show interfaces** command:

```
user@router> show interfaces cau4-0/0/0
Physical interface: cau4-0/0/0, Enabled, Physical link is Up
  Interface index: 147, SNMP ifIndex: 36
  Link-level type: Controller, Clocking: Internal, SDH mode, Speed: OC3,
Loopback: None, Parent: cstm1-0/0/0 Interface index 146
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Last flapped   : 2003-02-06 19:36:31 PST (02:40:42 ago)
  SDH   alarms   : None
  SDH   defects  : None
```

To view information about an E1 channel, include the **e1-*fpc/pic/port:channel*** option with the **show interfaces** command. In this case, the fractional E1 appears as channel **e1-0/0/0:1** and the normal E1 appears as channel **e1-0/0/0:2**.

```
user@router> show interfaces e1-0/0/0:1
Physical interface: e1-0/0/0:1, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 33
  Link-level type: PPP, MTU: 1504, Clocking: Internal,  Speed: 1280kbps ,
# Because the fractional E1 uses 20 time slots, 20 x 64 Kbps = 1280 Kbps.
Loopback: None, FCS: 16, Framing: G704,
  Parent: cau4-0/0/0 Interface index 147
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1055 (00:00:03 ago), Output: 1059 (00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : Never
  Input rate     : 16 bps (0 pps)
  Output rate    : 16 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
  SDH   alarms   : None
  SDH   defects  : None
  Logical interface e1-0/0/0:1.0 (Index 67) (SNMP ifIndex 169)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.133.0.0/30, Local: 10.133.0.1

user@router> show interfaces e1-0/0/0:2
Physical interface: e1-0/0/0:2, Enabled, Physical link is Up
  Interface index: 149, SNMP ifIndex: 34
  Link-level type: PPP, MTU: 1504, Clocking: Internal,  Speed: E1,
```

```
Loopback: None, FCS: 16, Framing: G704,
  Parent: cau4-0/0/0 Interface index 147
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 917 (00:00:05 ago), Output: 915 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : Never
  Input rate     : 16 bps (0 pps)
  Output rate    : 16 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
  SDH   alarms   : None
  SDH   defects  : None
  Logical interface e1-0/0/0:2.0 (Index 68) (SNMP ifIndex 170)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.133.0.4/30, Local: 10.133.0.5
```

To view information about a CE1 channel, include the **ce1-*fpc/pic/port:channel*** option with the **show interfaces** command:

```
user@router> show interfaces ce1-0/0/0:11
Physical interface: ce1-0/0/0:11, Enabled, Physical link is Up
  Interface index: 169, SNMP ifIndex: 288
  Link-level type: Controller, Clocking: Internal, Speed: E1, Loopback: None,
Framing: G704, Parent: cau4-0/0/0 Interface index 147
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Last flapped   : 2003-02-06 22:05:23 PST (00:13:45 ago)
  DS1   alarms   : None
  DS1   defects  : None
  SDH   alarms   : None
  SDH   defects  : None
```

To view information about an *N*xDS0 interface, include the **ds-*fpc/pic/port:channel:channel*** option with the **show interfaces** command. For channel group **ds-0/0/0:11:1**, the speed of the link is 640 Kbps because it contains 10 DS0s (**64 x 10 = 640**). For single DS0 channel **ds-0/0/0:11:4**, the speed of the link is the standard 64 Kbps.

```
user@router> show interfaces ds-0/0/0:11:1
Physical interface: ds-0/0/0:11:1, Enabled, Physical link is Up
  Interface index: 170, SNMP ifIndex: 289
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 640kbps,
Loopback: Illegal, FCS: 16,
  Parent: ce1-0/0/0:11 Interface index 169
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)
  LCP state: Conf-req-sent
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
```

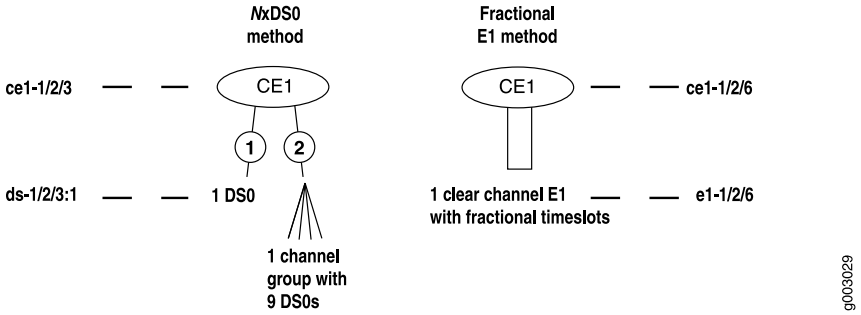
```
Not-configured
  CHAP state: Not-configured
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS0 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  Logical interface ds-0/0/0:11:1.0 (Index 77) (SNMP ifIndex 290)
    Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.134.1.0/30, Local: 10.134.1.1
user@router>  show interfaces ds-0/0/0:11:4
Physical interface: ds-0/0/0:11:4, Enabled, Physical link is Up
  Interface index: 173, SNMP ifIndex: 295
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 64kbps, Loopback:
Illegal, FCS: 16,
  Parent: ce1-0/0/0:11 Interface index 169
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)
  LCP state: Conf-req-sent
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Not-configured
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS0 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  Logical interface ds-0/0/0:11:4.0 (Index 80) (SNMP ifIndex 296)
    Flags: Hardware-Down Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.134.4.0/30, Local: 10.134.4.1
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: Channelized E1 IQ Interface Configuration

Figure 10: Channelized E1 IQ Interface Example



This example shows two ways to configure a channelized E1 IQ interface. Figure 10 on page 87 shows a fractional E1 method and the *N*xDS0 method seen previously in the complex OC12 configuration example (see "Example: Complex Configuration for a Channelized OC12 IQ Interface" on page 36). The *N*xDS0 method breaks the channelized E1 IQ interface into discrete DS0 blocks, whereas the fractional method creates a clear channel E1 that is segmented by time slots.

To configure *N*xDS0 channels, include the **partition** statement at the **[edit interfaces ce1-*fpc /pic/port*]** hierarchy level. Include the **timeslots** and **interface-type ds** options to create the desired number of *N*xDS0 interfaces in time slots 2 through 32.

To configure a fractional E1 on a channelized E1 IQ interface, include the **no-partition** statement at the **[edit interfaces ce1-*fpc/pic/port*]** hierarchy level. After you commit this configuration, configure standard E1 options on the clear channel E1 interface. Include the **timeslots** statement at the **[edit interfaces e1-*fpc/pic/port* e1-options]** hierarchy level. Time slot **1** is reserved; use time slots **2** through **32**.

Router A—NxDS0 Method

```
[edit]
interfaces {
   ce1-1/2/3 {
      partition 1 timeslots 11 interface-type ds; # Creates NxDS0 channel ds-1/2/3:1.
      partition 2 timeslots 2-10 interface-type ds; # Creates a channel group with
   }                    # 9 NxDS0s.
   ds-1/2/3:1 {
      unit 0 {
         family inet {
            address 10.25.1.2/24;
         }
      }
   }
   ds-1/2/3:2 {
      unit 0 {
         family inet {
            address 10.25.2.2/24;
         }
      }
```

```
  }
}
```

Router A—Fractional E1 Method

```
[edit]
interfaces {
  ce1-1/2/6 {
    no-partition interface-type e1; # This creates a single E1 channel: e1-1/2/6.
  }
  e1-1/2/6 {
    e1-options {
      timeslots 2-3; # This statement enables only 2 of the 31 NxDS0 time slots
    }      # available on e1-1/2/6. You can use time slots 2 through 32.
    unit 0 {
      family inet {
        address 10.255.126.2/24;
      }
    }
  }
}
```

Verifying Your Work

To verify correct operation of a channelized E1 IQ interface, use the following commands:

- **show interfaces**
- **show interfaces controller**
- **show interfaces interval** (for E1 and channelized E1 channels)

To view the interface names of the physical channelized E1 IQ interface and the resulting interfaces configured on the channelized IQ interface, use the **show interfaces controller** command:

```
user@RouterA> show interfaces controller ce1-1/2/3
Controller                                                      Admin Link
ce1-1/2/3                                                        up    up
# This is the physical channelized E1 IQ interface.
     ds-1/2/3:1                                                  up    up
     ds-1/2/3:2                                                  up    up
# These are the resulting  N xDS0 interfaces.
user@RouterA>  show interfaces controller ce1-1/2/6
Controller                                                      Admin Link
ce1-1/2/6                                                       up    up
# This is the physical channelized E1 IQ interface.
e1-1/2/6                                                         up    up
# This is the resulting E1 interface.
```

To view information about the physical channelized interface, include the **ce1-*fpc/pic/port*** option with the **show interfaces** command:

```
user@RouterA> show interfaces ce1-1/2/3
Physical interface: ce1-1/2/3, Enabled, Physical link is Up
  Interface index: 18, SNMP ifIndex: 1128
  Link-level type: Controller, MTU: 1504, Clocking: Internal, Speed: E1,
  Loopback: None, FCS: 16, Framing: G704, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
```

```
  Link flags     : None
  Last flapped   : 2002-10-04 17:52:51 PDT (00:32:57 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
user@RouterA>  show interfaces ce1-1/2/6
Physical interface: ce1-1/2/6, Enabled, Physical link is Up
  Interface index: 25, SNMP ifIndex: 1134
  Link-level type: Controller, MTU: 1504, Clocking: Internal, Speed: E1, Loopback:
 None,
  FCS: 16, Framing: G704, Parent: None
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Last flapped   : 2002-10-04 17:52:51 PDT (00:34:49 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DS1   alarms   : None
  DS1   defects  : None
```

To view information about an *N*xDS0 interface, include the **ds-*fpc/pic/port:channel*** option with the **show interfaces** command:

```
user@RouterA> show interfaces ds-1/2/3:1 detail

Physical interface: ds-1/2/3:1, Enabled, Physical link is Up
  Interface index: 73, SNMP ifIndex: 1202, Generation: 325
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 64kbps, Loopback: None,
  FCS: 16, Parent: ce1-1/2/3 (Index 18)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 11 (last seen 00:00:02 ago)
    Output: 10 (last sent 00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Opened, iso: Opened, mpls: Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-10-04 18:24:32 PDT (00:01:46 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 559                   56 bps
   Output bytes  :                 656                   56 bps
   Input  packets:                  33                    0 pps
   Output packets:                  36                    0 pps
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
    0 best-effort                  40                   40                    0
    1 expedited-fo                  0                    0                    0
    2 assured-forw                  0                    0                    0
    3 network-cont                  0                    0                    0
  Logical interface ds-1/2/3:1.0 (Index 36) (SNMP ifIndex 1266) (Generation 153)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Protocol inet, MTU: 1500, Generation: 352, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.25.1/24, Local: 10.25.1.2, Broadcast: Unspecified,
        Generation: 445
    Protocol iso, MTU: 1500, Generation: 353, Route table: 0
```

```
  Flags: Is-Primary
Protocol inet6, MTU: 1500, Generation: 354, Route table: 0
  Flags: Is-Primary
  Addresses, Flags: Is-Preferred
    Destination: fe80::/64, Local: fe80::2a0:a5ff:fe3d:ac6, Broadcast: Unspecified,
    Generation: 446
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: feee::10:25:1:0/126, Local: feee::10:25:1:2,
    Broadcast: Unspecified, Generation: 448
```

To view information about the fractional E1 interface, include the **e1-*fpc/pic/port*** option with the **show interfaces** command:

```
user@RouterA> show interfaces e1-1/2/6 detail
Physical interface: e1-1/2/6, Enabled, Physical link is Up
  Interface index: 89, SNMP ifIndex: 1278, Generation: 341
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: E1, Loopback:None,

  FCS: 16, Framing: G704, Parent: ce1-1/2/6 (Index 25)
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 4 (last seen 00:00:05 ago)
    Output: 3 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  Last flapped   : 2002-10-04 18:28:27 PDT (00:01:07 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 189                    0 bps
   Output bytes  :                 478                    0 bps
   Input  packets:                  13                    0 pps
   Output packets:                  28                    0 pps
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                  28                   28                    0

    1 expedited-fo                  0                    0                    0

    2 assured-forw                  0                    0                    0

    3 network-cont                  0                    0                    0

  DS1   alarms   : None
  DS1   defects  : None
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: Unknown (0)
  Logical interface e1-1/2/6.0 (Index 52) (SNMP ifIndex 1279) (Generation 169)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
    Bandwidth: 0
    Protocol inet, MTU: 1500, Generation: 401, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.255.126/24, Local: 10.255.126.2, Broadcast: Unspecified,
```



```
Generation: 525
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

Example: DLCI Class of Service on a Channelized IQ Interface Configuration

This example applies class of service at the logical interface level on a clear channel T3 interface derived from a channelized DS3 IQ interface. (For more information on configuring a channelized DS3 IQ interface, see "Example: Channelized DS3 IQ Interface Configuration" on page 70.)

Configure a scheduler map, complete with the desired transmit rates, buffer sizes, and service classes. Once the scheduler map is ready, enable logical interface-level class of service with the **per-unit-scheduler** statement at the [**edit interfaces** *interface-name*] hierarchy level. Also, configure a DLCI for each logical interface with the **dlci** *dlci-number* statement at the [**edit interfaces** *interface-name* **unit** *unit-number*] hierarchy level. Finally, configure the logical interfaces for class of service with the **scheduler-map** and **shaping-rate** statements at the [**edit class-of-service interfaces** *interface-name* **unit** *unit-number*] hierarchy level. These statements specify which scheduler map to associate with each logical interface and how much bandwidth to reserve for the DLCI queues.

```
[edit]
interfaces {
  ct3-3/1/0 {
    no-partition interface-type t3; # This converts the channelized DS3 IQ
  }
  t3-3/1/0 {
    per-unit-scheduler; # This enables scheduling at the logical interface level.
    encapsulation frame-relay;
    unit 0 {# The logical interface where scheduler map sched-0 takes effect.
      dlci 100; # The DLCI affected by scheduler map sched-0.
      family inet {
        address 10.40.1.1/30;
      }
    }
    unit 1 {# The logical interface where scheduler map sched-1 takes effect.
      dlci 101; # The DLCI affected by scheduler map sched-1.
      family inet {
        address 10.40.2.1/30;
      }
    }
  }
}
class-of-service {
  interfaces {
    t3-3/1/0 { # This specifies the channel where the scheduled DLCI is located.
      unit 0 { # This specifies the logical interface for the first scheduled DLCI.
        scheduler-map sched-0; # This applies a scheduler map to the first DLCI.
```

```
            shaping-rate 10m; # This reserves bandwidth for scheduler map sched-0.
          }
          unit 1 { # This specifies the logical interface for the second scheduled DLCI.
            scheduler-map sched-1; # Applies a scheduler map to the second DLCI.
            shaping-rate 10m; # This reserves bandwidth for scheduler map sched-1.
          }
        }
      }
      scheduler-maps {
        sched-0 { # This is where classes of service are associated with a scheduler.
          forwarding-class assured-forwarding scheduler af;
          forwarding-class best-effort scheduler be;
          forwarding-class expedited-forwarding scheduler ef;
        }
        sched-1 { # This is where classes of service are associated with a scheduler.
          forwarding-class assured-forwarding scheduler af-1;
          forwarding-class best-effort scheduler be-1;
          forwarding-class expedited-forwarding scheduler ef-1;
        }
      }
      schedulers {
        af {
          transmit-rate percent 10;
          buffer-size percent 10;
        }
        be {
          transmit-rate percent 20;
          buffer-size percent 20;
        }
        ef {
          transmit-rate percent 70;
          buffer-size percent 70;
        }
        af-1 {
          transmit-rate percent 10;
          buffer-size percent 10;
        }
        be-1 {
          transmit-rate percent 30;
          buffer-size percent 30;
        }
        ef-1 {
          transmit-rate percent 60;
          buffer-size percent 60;
        }
      }
    }
```

Verifying Your Work

To verify correct operation of class-of-service schedulers on a channelized IQ interface, use the following commands:

- **show class-of-service forwarding-table**
- **show class-of-service interface**

```
user@router> show class-of-service interface t3-3/1/0
Physical interface: t3-3/1/0, Index: 169
  Scheduler map: <default>, Index: 1
  Logical interface: t3-3/1/0.0, Index: 68
    Object         Name                  Type                       Index
    Scheduler-map  sched-0                                          11204
    Rewrite        exp-default           exp                            2
    Classifier     ipprec-compatibility  ip                             5
  Logical interface: t3-3/1/0.1, Index: 69
    Object         Name                  Type                       Index
    Scheduler-map  sched-1                                           7038
    Rewrite        exp-default           exp                            2
    Classifier     ipprec-compatibility  ip                             5
```

Related Documentation

- Channelized IQ Interfaces Solutions Page
- Roadmap for Channelized IQ Interface Configuration Examples on page 29
- Roadmap for Configuring Channelized IQ Interfaces on page 17

PART 4

Administration

CHAPTER 9

Commands

show class-of-service interface

Syntax show class-of-service interface
<*interface-name* | **detail** | **comprehensive**>

Release Information 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.
Options **detail** and **comprehensive** introduced in Junos OS Release 11.4.

Description Display the logical and physical interface associations for the classifier, rewrite rules, and scheduler map objects.

Options

comprehensive—(M Series, MX Series, and T Series routers) (Optional) Display comprehensive quality-of-service (QoS) information about all physical and logical interfaces.

detail—(M Series, MX Series, and T Series routers) (Optional) Display QoS and CoS information based on the interface.

If the **interface** *interface-name* is a physical interface, the output includes:

- Brief QoS information about the physical interface
- Brief QoS information about the logical interface
- CoS information about the physical interface
- Brief information about filters or policers of the logical interface
- Brief CoS information about the logical interface

If the **interface** *interface-name* is a logical interface, the output includes:

- Brief QoS information about the logical interface
- Information about filters or policers for the logical interface
- CoS information about the logical interface

interface-name—(Optional) Display class-of-service (CoS) associations for the specified interface.

none—Display CoS associations for all physical and logical interfaces.

Required Privilege Level view

List of Sample Output

show class-of-service interface comprehensive on page 111

Output Fields Table 4 on page 99 describes the output fields for the **show class-of-service interface** command. Output fields are listed in the approximate order in which they appear.

Table 4: show class-of-service interface Output Fields

Field Name	Field Description
Physical interface	Name of a physical interface.
Index	Index of this interface or the internal index of this object.
Dedicated Queues	Status of dedicated queues configured on an interface. Supported only on Trio MPC/MIC interfaces on MX Series routers.
Queues supported	Number of queues you can configure on the interface.
Queues in use	Number of queues currently configured.
Total non-default queues created	Number of queues created in addition to the default queues. Supported only on Trio MPC/MIC interfaces on MX Series routers.
Shaping rate	Maximum transmission rate on the physical interface. You can configure the shaping rate on the physical interface, or on the logical interface, but not on both. Therefore, the **Shaping rate** field is displayed for either the physical interface or the logical interface.
Scheduler map	Name of the output scheduler map associated with this interface.
Input shaping rate	For Gigabit Ethernet IQ2 PICs, maximum transmission rate on the input interface.
Input scheduler map	For Gigabit Ethernet IQ2 PICs, name of the input scheduler map associated with this interface.
Chassis scheduler map	Name of the scheduler map associated with the packet forwarding component queues.
Rewrite	Name and type of the rewrite rules associated with this interface.
Classifier	Name and type of classifiers associated with this interface.
Forwarding-class-map	Name of the forwarding map associated with this interface.
Congestion-notification	Congestion notification state, **enabled** or **disabled** (QFX Series only).
Logical interface	Name of a logical interface.
Object	Category of an object: **Classifier**, **Fragmentation-map** (for LSQ interfaces only), **Scheduler-map**, **Rewrite**, or **Translation Table** (for IQE PICs only).
Name	Name of an object.
Type	Type of an object: **dscp**, **dscp-ipv6**, **exp**, **ieee-802.1**, **ip**, or **inet-precedence**.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Link-level type	Encapsulation on the physical interface.
MTU	MTU size on the physical interface.
Speed	Speed at which the interface is running.
Loopback	Whether loopback is enabled and the type of loopback.
Source filtering	Whether source filtering is enabled or disabled.
Flow control	Whether flow control is enabled or disabled.
Auto-negotiation	(Gigabit Ethernet interfaces) Whether autonegotiation is enabled or disabled.
Remote-fault	(Gigabit Ethernet interfaces) Remote fault status. • **Online**—Autonegotiation is manually configured as online. • **Offline**—Autonegotiation is manually configured as offline.
Device flags	The **Device flags** field provides information about the physical device and displays one or more of the following values: • **Down**—Device has been administratively disabled. • **Hear-Own-Xmit**—Device receives its own transmissions. • **Link-Layer-Down**—The link-layer protocol has failed to connect with the remote endpoint. • **Loopback**—Device is in physical loopback. • **Loop-Detected**—The link layer has received frames that it sent, thereby detecting a physical loopback. • **No-Carrier**—On media that support carrier recognition, no carrier is currently detected. • **No-Multicast**—Device does not support multicast traffic. • **Present**—Device is physically present and recognized. • **Promiscuous**—Device is in promiscuous mode and recognizes frames addressed to all physical addresses on the media. • **Quench**—Transmission on the device is quenched because the output buffer is overflowing. • **Recv-All-Multicasts**—Device is in multicast promiscuous mode and therefore provides no multicast filtering. • **Running**—Device is active and enabled.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description

Interface flags	The **Interface flags** field provides information about the physical interface and displays one or more of the following values:
	• **Admin-Test**—Interface is in test mode and some sanity checking, such as loop detection, is disabled.
	• **Disabled**—Interface is administratively disabled.
	• **Down**—A hardware failure has occurred.
	• **Hardware-Down**—Interface is nonfunctional or incorrectly connected.
	• **Link-Layer-Down**—Interface keepalives have indicated that the link is incomplete.
	• **No-Multicast**—Interface does not support multicast traffic.
	• **No-receive No-transmit**—Passive monitor mode is configured on the interface.
	• **Point-To-Point**—Interface is point-to-point.
	• **Pop all MPLS labels from packets of depth**—MPLS labels are removed as packets arrive on an interface that has the **pop-all-labels** statement configured. The depth value can be one of the following:
	  ◦ **1**—Takes effect for incoming packets with one label only.
	  ◦ **2**—Takes effect for incoming packets with two labels only.
	  ◦ **[1 2]**—Takes effect for incoming packets with either one or two labels.
	• **Promiscuous**—Interface is in promiscuous mode and recognizes frames addressed to all physical addresses.
	• **Recv-All-Multicasts**—Interface is in multicast promiscuous mode and provides no multicast filtering.
	• **SNMP-Traps**—SNMP trap notifications are enabled.
	• **Up**—Interface is enabled and operational.

Flags	The **Logical interface flags** field provides information about the logical interface and displays one or more of the following values: • **ACFC Encapsulation**—Address control field Compression (ACFC) encapsulation is enabled (negotiated successfully with a peer). • **Device-down**—Device has been administratively disabled. • **Disabled**—Interface is administratively disabled. • **Down**—A hardware failure has occurred. • **Clear-DF-Bit**—GRE tunnel or IPsec tunnel is configured to clear the Don't Fragment (DF) bit. • **Hardware-Down**—Interface protocol initialization failed to complete successfully. • **PFC**—Protocol field compression is enabled for the PPP session. • **Point-To-Point**—Interface is point-to-point. • **SNMP-Traps**—SNMP trap notifications are enabled. • **Up**—Interface is enabled and operational.
Encapsulation	Encapsulation on the logical interface.
Admin	Administrative state of the interface (**Up** or **Down**)
Link	Status of physical link (**Up** or **Down**).
Proto	Protocol configured on the interface.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Input Filter	Names of any firewall filters to be evaluated when packets are received on the interface, including any filters attached through activation of dynamic service.
Output Filter	Names of any firewall filters to be evaluated when packets are transmitted on the interface, including any filters attached through activation of dynamic service.
Link flags	Provides information about the physical link and displays one or more of the following values: • **ACFC**—Address control field compression is configured. The Point-to-Point Protocol (PPP) session negotiates the ACFC option. • **Give-Up**—Link protocol does not continue connection attempts after repeated failures. • **Loose-LCP**—PPP does not use the Link Control Protocol (LCP) to indicate whether the link protocol is operational. • **Loose-LMI**—Frame Relay does not use the Local Management Interface (LMI) to indicate whether the link protocol is operational. • **Loose-NCP**—PPP does not use the Network Control Protocol (NCP) to indicate whether the device is operational. • **Keepalives**—Link protocol keepalives are enabled. • **No-Keepalives**—Link protocol keepalives are disabled. • **PFC**—Protocol field compression is configured. The PPP session negotiates the PFC option.
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.
CoS queues	Number of CoS queues configured.
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped: *year-month-day hour*:*minute*:*second*:*timezone* (*hour*:*minute*:*second* ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago).**
Statistics last cleared	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.
IPv6 transit statistics	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Input errors	Input errors on the interface. The labels are explained in the following list: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Giants**—Number of frames received that are larger than the giant threshold. • **Bucket Drops**—Drops resulting from the traffic load exceeding the interface transmit or receive leaky bucket configuration. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. Layer 3 incomplete errors can be ignored by configuring the **ignore-l3-incompletes** statement. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **HS link CRC errors**—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • **HS link FIFO overflows**—Number of FIFO overflows on the high-speed links between the ASICs responsible for handling the router interfaces.
Output errors	Output errors on the interface. The labels are explained in the following list: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Aged packets**—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • **HS link FIFO underflows**—Number of FIFO underflows on the high-speed links between the ASICs responsible for handling the router interfaces. • **MTU errors**—Number of packets whose size exceeds the MTU of the interface.
Egress queues	Total number of egress queues supported on the specified interface.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Queue counters	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.
SONET alarms **SONET defects**	(SONET) SONET media-specific alarms and defects that prevent the interface from passing packets. When a defect persists for a certain period, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or light the red or yellow alarm LED on the craft interface. See these fields for possible alarms and defects: **SONET PHY**, **SONET section**, **SONET line**, and **SONET path**.
SONET PHY	Counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The **SONET PHY** field has the following subfields: • **PLL Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal
SONET section	Counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The **SONET section** field has the following subfields: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOS**—Loss of signal • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
SONET line	Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The **SONET line** field has the following subfields: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)
SONET path	Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. A state other than **OK** indicates a problem. The **SONET path** field has the following subfields: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload (signal) label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **ES-PFE**—Errored seconds (far-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Received SONET overhead **Transmitted SONET overhead**	Values of the received and transmitted SONET overhead: • **C2**—Signal label. Allocated to identify the construction and content of the STS-level SPE and for PDI-P. • **F1**—Section user channel byte. This byte is set aside for the purposes of users. • **K1** and **K2**—These bytes are allocated for APS signaling for the protection of the multiplex section. • **J0**—Section trace. This byte is defined for STS-1 number 1 of an STS-*N* signal. Used to transmit a 1-byte fixed-length string or a 16-byte message so that a receiving terminal in a section can verify its continued connection to the intended transmitter. • **S1**—Synchronization status. The S1 byte is located in the first STS-1 number of an STS-*N* signal. • **Z3** and **Z4**—Allocated for future use.
Received path trace **Transmitted path trace**	SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the router at the other end of the fiber. The transmitted path trace value is the message that this router transmits.
HDLC configuration	Information about the HDLC configuration. • **Policing bucket**—Configured state of the receiving policer. • **Shaping bucket**—Configured state of the transmitting shaper. • **Giant threshold**—Giant threshold programmed into the hardware. • **Runt threshold**—Runt threshold programmed into the hardware.
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number. • **PLP byte**—Packet Level Protocol byte.
CoS information	Information about the CoS queue for the physical interface. • **CoS transmit queue**—Queue number and its associated user-configured forwarding class name. • **Bandwidth %**—Percentage of bandwidth allocated to the queue. • **Bandwidth bps**—Bandwidth allocated to the queue (in bps). • **Buffer %**—Percentage of buffer space allocated to the queue. • **Buffer usec**—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • **Priority**—Queue priority: **low** or **high**. • **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.
Forwarding classes	Total number of forwarding classes supported on the specified interface.
Egress queues	Total number of egress queues supported on the specified interface.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Queue	Queue number.
Forwarding classes	Forwarding class name.
Queued Packets	Number of packets queued to this queue.
Queued Bytes	Number of bytes queued to this queue. The byte counts vary by PIC type.
Transmitted Packets	Number of packets transmitted by this queue. When fragmentation occurs on the egress interface, the first set of packet counters shows the postfragmentation values. The second set of packet counters (displayed under the **Packet Forwarding Engine Chassis Queues** field) shows the prefragmentation values.
Transmitted Bytes	Number of bytes transmitted by this queue. The byte counts vary by PIC type.
Tail-dropped packets	Number of packets dropped because of tail drop.

RED-dropped packets	Number of packets dropped because of random early detection (RED).
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, the total number of dropped packets is displayed. On all other M Series routers, the output classifies dropped packets into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP packets dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP packets dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP packets dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP packets dropped because of RED.
	• (MX Series routers with enhanced DPCs, and T Series routers with enhanced FPCs only) The output classifies dropped packets into the following categories:
	  • **Low**—Number of low-loss priority packets dropped because of RED.
	  • **Medium-low**—Number of medium-low loss priority packets dropped because of RED.
	  • **Medium-high**—Number of medium-high loss priority packets dropped because of RED.
	  • **High**—Number of high-loss priority packets dropped because of RED.

RED-dropped bytes	Number of bytes dropped because of RED. The byte counts vary by PIC type.
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, only the total number of dropped bytes is displayed. On all other M Series routers, the output classifies dropped bytes into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP bytes dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP bytes dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP bytes dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP bytes dropped because of RED.

Transmit rate	Configured transmit rate of the scheduler. The rate is a percentage of the total interface bandwidth.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description
Rate Limit	Rate limiting configuration of the queue. Possible values are : • **None**—No rate limit. • **exact**—Queue transmits at the configured rate.
Buffer size	Delay buffer size in the queue.
Priority	Scheduling priority configured as **low** or **high**.
Excess Priority	Priority of the excess bandwidth traffic on a scheduler: **low**, **medium-low**, **medium-high**, **high**, or **none**.
Drop profiles	Display the assignment of drop profiles. • **Loss priority**—Packet loss priority for drop profile assignment. • **Protocol**—Transport protocol for drop profile assignment. • **Index**—Index of the indicated object. Objects that have indexes in this output include schedulers and drop profiles. • **Name**—Name of the drop profile. • **Type**—Type of the drop profile: **discrete** or **interpolated**. • **Fill Level**—Percentage fullness of a queue. • **Drop probability**—Drop probability at this fill level.
Excess Priority	Priority of the excess bandwidth traffic on a scheduler.
Drop profiles	Display the assignment of drop profiles. • **Loss priority**—Packet loss priority for drop profile assignment. • **Protocol**—Transport protocol for drop profile assignment. • **Index**—Index of the indicated object. Objects that have indexes in this output include schedulers and drop profiles. • **Name**—Name of the drop profile. • **Type**—Type of the drop profile: **discrete** or **interpolated**. • **Fill Level**—Percentage fullness of a queue. • **Drop probability**—Drop probability at this fill level.

Table 4: show class-of-service interface Output Fields *(continued)*

Field Name	Field Description

Adjustment information	Display the assignment of shaping-rate adjustments on a scheduler node or queue.
	• **Adjusting application**—Application that is performing the shaping-rate adjustment.
	  ◦ The adjusting application can appear as **ancp LS-0**, which is the Junos OS Access Node Control Profile process (**ancpd**) that performs shaping-rate adjustments on schedule nodes.
	  ◦ The adjusting application can also appear as **pppoe**, which adjusts the shaping-rate and overhead-accounting class-of-service attributes on dynamic subscriber interfaces in a broadband access network based on access line parameters in Point-to-Point Protocol over Ethernet (PPPoE) Tags [TR-101]. This feature is supported on MPC/MIC interfaces on MX Series routers. The shaping rate is based on the actual-data-rate-downstream attribute. The overhead accounting value is based on the access-loop-encapsulation attribute and specifies whether the access loop uses Ethernet (frame mode) or ATM (cell mode).
	• **Adjustment type**—Type of adjustment: **absolute** or **delta**.
	• **Configured shaping rate**—Shaping rate configured for the scheduler node or queue.
	• **Adjustment value**—Value of adjusted shaping rate.
	• **Adjustment mode**—Level of shaping-rate adjustment performed: **node** or **queue**.

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 interface (PPPoE Interface)

```
user@host> show class-of-service interface pp0.1
Logical interface: pp0.1, Index: 85
    Object                  Name                    Type           Index
    Traffic-control-profile tcp-pppoe.o.pp0.1       Output         2726446535
    Classifier              ipprec-compatibility    ip             13

    Adjusting application: PPPoE
      Adjustment type: absolute
      Adjustment value: 5000000
      Adjustment overhead-accounting mode: cell
      Adjustment target: node
```

show class-of-service interface detail

```
user@host> show class-of-service interface ge-0/3/0 detail

Physical interface: ge-0/3/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 1518, Speed: 1000mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000

  Physical interface: ge-0/3/0, Index: 138
  Queues supported: 4, Queues in use: 5
  Shaping rate: 50000 bps
  Scheduler map: interface-schedular-map, Index: 58414
  Input shaping rate: 10000 bps
  Input scheduler map: schedular-map, Index: 15103
  Chassis scheduler map: <default-chassis>, Index: 4
  Congestion-notification: Disabled

  Logical interface ge-0/3/0.0
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.1 ]  Encapsulation: ENET2
    inet
    mpls
Interface       Admin Link Proto Input Filter         Output Filter
ge-0/3/0.0      up    up   inet
                           mpls
Interface       Admin Link Proto Input Policer         Output Policer
ge-0/3/0.0      up    up   inet
                           mpls

  Logical interface: ge-0/3/0.0, Index: 68
    Object                  Name                    Type               Index
    Rewrite                 exp-default             exp (mpls-any)       33
    Classifier              exp-default             exp                  10
    Classifier              ipprec-compatibility    ip                   13


  Logical interface ge-0/3/0.1
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.2 ]  Encapsulation: ENET2
    inet
Interface       Admin Link Proto Input Filter         Output Filter
ge-0/3/0.1      up    up   inet
Interface       Admin Link Proto Input Policer         Output Policer
ge-0/3/0.1      up    up   inet

  Logical interface: ge-0/3/0.1, Index: 69
    Object                  Name                    Type            Index
    Classifier              ipprec-compatibility    ip               13
```

show class-of-service interface comprehensive

```
user@host> show class-of-service interface so-1/3/0 comprehensive
Physical interface: ge-0/3/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 601, Generation: 141
  Link-level type: Ethernet, MTU: 1518, Speed: 1000mbps, BPDU Error: None,
MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled, Flow
control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Schedulers     : 256
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:14:f6:f4:b4:5d, Hardware address: 00:14:f6:f4:b4:5d
  Last flapped   : 2010-09-07 06:35:22 PDT (15:14:42 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                   0 bps
   Output bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Output packets:                   0                   0 pps
   IPv6 total statistics:
    Input  bytes  :                  0
    Output bytes  :                  0
    Input  packets:                  0
    Output packets:                  0
  Ingress traffic statistics at Packet Forwarding Engine:
   Input  bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
   Drop   bytes  :                   0                   0 bps
   Drop   packets:                   0                   0 pps
  Label-switched interface (LSI) traffic statistics:
   Input  bytes  :                   0                   0 bps
   Input  packets:                   0                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 5, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
 FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
  Ingress queues: 4 supported, 5 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 af3                            0                   0                   0

    1 af2                            0                   0                   0

    2 ef2                            0                   0                   0

    3 ef1                            0                   0                   0

  Egress queues: 4 supported, 5 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 af3                            0                   0                   0

    1 af2                            0                   0                   0

    2 ef2                            0                   0                   0

    3 ef1                            0                   0                   0
```

```
  Active alarms  : None
  Active defects : None
  MAC statistics:                      Receive         Transmit
    Total octets                             0                0
    Total packets                            0                0
    Unicast packets                          0                0
    Broadcast packets                        0                0
    Multicast packets                        0                0
    CRC/Align errors                         0                0
    FIFO errors                              0                0
    MAC control frames                       0                0
    MAC pause frames                         0                0
    Oversized frames                         0
    Jabber frames                            0
    Fragment frames                          0
    VLAN tagged frames                       0
    Code violations                          0
  Filter statistics:
    Input packet count                       0
    Input packet rejects                     0
    Input DA rejects                         0
    Input SA rejects                         0
    Output packet count                                       0
    Output packet pad count                                   0
    Output packet error count                                 0
    CAM destination filters: 0, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Complete
    Link partner:
       Link mode: Full-duplex, Flow control: Symmetric/Asymmetric, Remote fault:
 OK
    Local resolution:
      Flow control: Symmetric, Remote fault: Link OK
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    2 ef2                    39          19500     0            120     high
none
    Direction : Input
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 af3                    30           3000    45              0      low
none

Physical interface: ge-0/3/0, Enabled, Physical link is Up
  Interface index: 138, SNMP ifIndex: 601
Forwarding classes: 16 supported, 5 in use
Ingress queues: 4 supported, 5 in use
Queue: 0, Forwarding classes: af3
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                    0 bps
```

```
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: af2
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: ef2
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: ef1
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Forwarding classes: 16 supported, 5 in use
Egress queues: 4 supported, 5 in use
Queue: 0, Forwarding classes: af3
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: af2
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: ef2
  Queued:
```

```
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                     0                     0 pps
    RL-dropped bytes     :                     0                     0 bps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Queue: 3, Forwarding classes: ef1
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                     0                     0 pps
    RL-dropped bytes     :                     0                     0 bps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps

Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 5 in use
Queue: 0, Forwarding classes: af3
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  : Not Available
    RED-dropped bytes    : Not Available
Queue: 1, Forwarding classes: af2
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  : Not Available
    RED-dropped bytes    : Not Available
Queue: 2, Forwarding classes: ef2
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  : Not Available
    RED-dropped bytes    : Not Available
Queue: 3, Forwarding classes: ef1
  Queued:
    Packets              :                108546                     0 pps
    Bytes                :              12754752                   376 bps
  Transmitted:
    Packets              :                108546                     0 pps
```

```
    Bytes                :              12754752                    376 bps
    Tail-dropped packets :                     0                      0 pps
    RED-dropped packets  : Not Available
    RED-dropped bytes    : Not Available

Physical interface: ge-0/3/0, Index: 138
Queues supported: 4, Queues in use: 5
  Shaping rate: 50000 bps

Scheduler map: interface-schedular-map, Index: 58414

  Scheduler: ef2, Forwarding class: ef2, Index: 39155
    Transmit rate: 39 percent, Rate Limit: none, Buffer size: 120 us, Buffer
Limit: none, Priority: high
    Excess Priority: unspecified
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    < default-drop-profile>
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any             1    < default-drop-profile>
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
  Input shaping rate: 10000 bps
  Input scheduler map: schedular-map

Scheduler map: schedular-map, Index: 15103

  Scheduler: af3, Forwarding class: af3, Index: 35058
    Transmit rate: 30 percent, Rate Limit: none, Buffer size: 45 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: unspecified
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any         40582    green
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any         18928    yellow
Drop profile: green, Type: discrete, Index: 40582
  Fill level    Drop probability
          50                   0
         100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
         100                 100
Drop profile: yellow, Type: discrete, Index: 18928
  Fill level    Drop probability
          50                   0
```

```
        100                 100
  Chassis scheduler map: < default-drop-profile>
Scheduler map: < default-drop-profile>, Index: 4

  Scheduler: < default-drop-profile>, Forwarding class: af3, Index: 25
    Transmit rate: 25 percent, Rate Limit: none, Buffer size: 25 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    < default-drop-profile>
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any             1    < default-drop-profile>
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100

  Scheduler: < default-drop-profile>, Forwarding class: af2, Index: 25
    Transmit rate: 25 percent, Rate Limit: none, Buffer size: 25 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    < default-drop-profile>
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any             1    < default-drop-profile>
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100

  Scheduler: < default-drop-profile>, Forwarding class: ef2, Index: 25
    Transmit rate: 25 percent, Rate Limit: none, Buffer size: 25 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    < default-drop-profile>
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any             1    < default-drop-profile>
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
```

```
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100

  Scheduler: < default-drop-profile>, Forwarding class: ef1, Index: 25
    Transmit rate: 25 percent, Rate Limit: none, Buffer size: 25 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    < default-drop-profile>
      Medium low      any             1    < default-drop-profile>
      Medium high     any             1    < default-drop-profile>
      High            any             1    < default-drop-profile>
Drop profile: , Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
Drop profile: < default-drop-profile>, Type: discrete, Index: 1
  Fill level    Drop probability
        100                 100
  Congestion-notification: Disabled
Forwarding class                      ID      Queue  Restricted queue  Fabric
priority  Policing priority
  af3                                  0       0          0             low
          normal
  af2                                  1       1          1             low
          normal
  ef2                                  2       2          2             high
          normal
  ef1                                  3       3          3             high
          normal
  af1                                  4       4          0             low
          normal

  Logical interface ge-0/3/0.0 (Index 68) (SNMP ifIndex 152) (Generation 159)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.1 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
```

```
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol inet, MTU: 1500, Generation: 172, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Input Filters: filter-in-ge-0/3/0.0-i,
      Policer: Input: p1-ge-0/3/0.0-inet-i
    Protocol mpls, MTU: 1488, Maximum labels: 3, Generation: 173, Route table: 0

      Flags: Is-Primary
      Output Filters: exp-filter,,,,,

  Logical interface ge-0/3/0.0 (Index 68) (SNMP ifIndex 152)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.1 ]  Encapsulation: ENET2
    Input packets : 0
    Output packets: 0

Interface       Admin Link Proto Input Filter         Output Filter
ge-0/3/0.0      up    up   inet  filter-in-ge-0/3/0.0-i
                           mpls                       exp-filter
Interface       Admin Link Proto Input Policer         Output Policer
ge-0/3/0.0      up    up
                           inet  p1-ge-0/3/0.0-inet-i
                           mpls

Filter: filter-in-ge-0/3/0.0-i
Counters:
Name                                                Bytes              Packets
count-filter-in-ge-0/3/0.0-i                            0                    0

Filter: exp-filter
Counters:
Name                                                Bytes              Packets
count-exp-seven-match                                   0                    0
count-exp-zero-match                                    0                    0
Policers:
Name                                               Packets
p1-ge-0/3/0.0-inet-i                                    0


  Logical interface: ge-0/3/0.0, Index: 68
    Object                 Name                   Type                    Index

    Rewrite                exp-default            exp (mpls-any)            33

Rewrite rule: exp-default, Code point type: exp, Index: 33
  Forwarding class                    Loss priority      Code point
  af3                                 low                000
  af3                                 high               001
  af2                                 low                010
  af2                                 high               011
  ef2                                 low                100
  ef2                                 high               101
  ef1                                 low                110
  ef1                                 high               111
    Object                 Name                   Type                    Index

    Classifier             exp-default            exp                       10

Classifier: exp-default, Code point type: exp, Index: 10
```

```
  Code point         Forwarding class                    Loss priority
  000                af3                                 low
  001                af3                                 high
  010                af2                                 low
  011                af2                                 high
  100                ef2                                 low
  101                ef2                                 high
  110                ef1                                 low
  111                ef1                                 high
    Object                 Name                   Type                    Index

    Classifier             ipprec-compatibility   ip                        13

Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 13
  Code point         Forwarding class                    Loss priority
  000                af3                                 low
  001                af3                                 high
  010                af3                                 low
  011                af3                                 high
  100                af3                                 low
  101                af3                                 high
  110                ef1                                 low
  111                ef1                                 high
Forwarding class                        ID      Queue  Restricted queue  Fabric
priority  Policing priority
  af3                                    0       0          0             low
            normal
  af2                                    1       1          1             low
            normal
  ef2                                    2       2          2             high
            normal
  ef1                                    3       3          3             high
            normal
  af1                                    4       4          0             low
            normal

  Logical interface ge-0/3/0.1 (Index 69) (SNMP ifIndex 154) (Generation 160)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.2 ]  Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0                  0 bps
     Output bytes  :                   0                  0 bps
     Input  packets:                   0                  0 pps
     Output packets:                   0                  0 pps
    Protocol inet, MTU: 1500, Generation: 174, Route table: 0
      Flags: Sendbcast-pkt-to-re

  Logical interface ge-0/3/0.1 (Index 69) (SNMP ifIndex 154)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.2 ]  Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
```

```
Interface       Admin Link Proto Input Filter         Output Filter
ge-0/3/0.1      up    up   mpls
Interface       Admin Link Proto Input Policer         Output Policer
ge-0/3/0.1      up    up
                           mpls

  Logical interface: ge-0/3/0.1, Index: 69
    Object                  Name                    Type                    Index

    Classifier              ipprec-compatibility    ip                         13

Classifier: ipprec-compatibility, Code point type: inet-precedence, Index: 13
  Code point         Forwarding class                    Loss priority
  000                af3                                 low
  001                af3                                 high
  010                af3                                 low
  011                af3                                 high
  100                af3                                 low
  101                af3                                 high
  110                ef1                                 low
  111                ef1                                 high
Forwarding class                        ID      Queue  Restricted queue  Fabric
priority  Policing priority
  af3                                    0       0          0             low
            normal
  af2                                    1       1          1             low
            normal
  ef2                                    2       2          2             high
            normal
  ef1                                    3       3          3             high
            normal
  af1                                    4       4          0             low
            normal
```

show class-of-service forwarding-table

Syntax show class-of-service forwarding-table

Syntax (TX Matrix and TX Matrix Plus Router) show class-of-service forwarding-table <lcc *number*>

Release Information Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description Display the entire class-of-service (CoS) configuration as it exists in the forwarding table. Executing this command is equivalent to executing all **show class-of-service forwarding-table** commands in succession.

Options

lcc ***number***—(TX Matrix and TX Matrix Plus router only) (Optional) On a TX Matrix router, display the forwarding table configuration for a specific T640 router (or line-card chassis) configured in a routing matrix. On a TX Matrix Plus router, display the forwarding table configuration for a specific T1600 router (or line-card chassis) configured in the routing matrix. Replace ***number*** with a value from **0** through **3**.

Required Privilege Level view

List of Sample Output

show class-of-service forwarding-table on page 121
show class-of-service forwarding-table lcc (TX Matrix Plus Router) on page 122

Output Fields See the output field descriptions for **show class-of-service forwarding-table** commands:

- show class-of-service forwarding-table classifier
- show class-of-service forwarding-table classifier mapping
- show class-of-service forwarding-table drop-profile
- show class-of-service forwarding-table fabric scheduler-map
- show class-of-service forwarding-table loss-priority-map
- show class-of-service forwarding-table loss-priority-map mapping
- show class-of-service forwarding-table rewrite-rule
- show class-of-service forwarding-table rewrite-rule mapping
- show class-of-service forwarding-table scheduler-map

Sample Output

show class-of-service forwarding-table

```
user@host> show class-of-service forwarding-table
Classifier table index: 9, # entries: 8, Table type: EXP
Entry #   Code point   Forwarding-class #   PLP
   0          000        0                 0
   1          001        0                 1
   2          010        1                 0
   3          011        1                 1
```

```
   4           100        2                0
   5           101        2                1
   6           110        3                0
   7           111        3                1

                       Table Index/
Interface      Index      Q num      Table type
sp-0/0/0.1001     66         11      IPv4 precedence
sp-0/0/0.2001     67         11      IPv4 precedence
sp-0/0/0.16383    68         11      IPv4 precedence
fe-0/0/0.0        69         11      IPv4 precedence

Interface: sp-0/0/0 (Index: 129, Map index: 2, Map type: FINAL,
 Num of queues: 2):
  Entry 0 (Scheduler index: 16, Forwarding-class #: 0):
    Tx rate: 0 Kb (95%), Buffer size: 95 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1
  Entry 1 (Scheduler index: 18, Forwarding-class #: 3):
    Tx rate: 0 Kb (5%), Buffer size: 5 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1

Interface: fe-0/0/0 (Index: 137, Map index: 2, Map type: FINAL,
 Num of queues: 2):
  Entry 0 (Scheduler index: 16, Forwarding-class #: 0):
    Tx rate: 0 Kb (95%), Buffer size: 95 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1
  Entry 1 (Scheduler index: 18, Forwarding-class #: 3):
    Tx rate: 0 Kb (5%), Buffer size: 5 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1
Interface: fe-0/0/1 (Index: 138, Map index: 2, Map type: FINAL,
 Num of queues: 2):
  Entry 0 (Scheduler index: 16, Forwarding-class #: 0):
    Tx rate: 0 Kb (95%), Buffer size: 95 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1
  Entry 1 (Scheduler index: 18, Forwarding-class #: 3):
    Tx rate: 0 Kb (5%), Buffer size: 5 percent
Priority low
    PLP high: 1, PLP low: 1, PLP medium-high: 1, PLP medium-low: 1

...

RED drop profile index: 1, # entries: 1
                             Drop
Entry      Fullness(%)   Probability(%)
    0              100              100
```

show class-of-service forwarding-table lcc (TX Matrix Plus Router)

```
user@host> show class-of-service forwarding-table lcc 0
lcc0-re0:
--------------------------------------------------------------------------

Classifier table index: 9, # entries: 64, Table type: IPv6 DSCP
Entry #   Code point   Forwarding-class #   PLP
   0        000000        0       0
   1        000001        0       0
   2        000010        0       0
   3        000011        0       0
```

```
   4          000100          0          0
   5          000101          0          0
   6          000110          0          0
   7          000111          0          0
   8          001000          0          0
   9          001001          0          0
  10          001010          0          0
  11          001011          0          0
  12          001100          0          0
  13          001101          0          0
  14          001110          0          0
  15          001111          0          0
  16          010000          0          0
  17          010001          0          0
  18          010010          0          0
  19          010011          0          0
  20          010100          0          0
  21          010101          0          0
  22          010110          0          0
  23          010111          0          0
  24          011000          0          0
  25          011001          0          0
  26          011010          0          0
  27          011011          0          0
  28          011100          0          0
  29          011101          0          0
  30          011110          0          0
  31          011111          0          0
  32          100000          0          0
  33          100001          0          0
  34          100010          0          0
  35          100011          0          0
  36          100100          0          0
  37          100101          0          0
  38          100110          0          0
  39          100111          0          0
  40          101000          0          0
  41          101001          0          0
  42          101010          0          0
  43          101011          0          0
  44          101100          0          0
  45          101101          0          0
  46          101110          0          0
...
```

show interfaces controller (Channelized E1 IQ)

Syntax show interfaces controller ce1-*fpc/pic/port*

Release Information Command introduced before Junos OS Release 7.4.

Description Display the interface names of the physical channelized E1 IQ interface and the channels configured on each interface.

Options **ce1-*fpc/pic/port***—Basic Rate Interface (BRI) interface name.

Required Privilege Level view

List of Sample Output
show interfaces controller (Channelized E1 IQ with Logical E1) on page 124
show interfaces controller (Channelized E1 IQ with Logical DS0) on page 124

Output Fields Table 5 on page 124 lists the output fields for the **show interfaces controller** (Channelized E1 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 5: Channelized E1 IQ show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (Channelized E1 IQ with Logical E1)

```
user@host> show interfaces controller ce1-1/2/6

Controller                                                Admin Link
ce1-1/2/6                                                 up    up
e1-1/2/6                                                  up    up
```

show interfaces controller (Channelized E1 IQ with Logical DS0)

```
user@host> show interfaces controller ce1-1/2/3

Controller                                                Admin Link
ce1-1/2/3                                                 up    up

ds-1/2/3:1                                                up    up

ds-1/2/3:2                                                up    up
```

show interfaces controller (Channelized OC12 IQ and IQE)

Syntax show interfaces controller coc12-*fpc/pic/port*

Release Information Command introduced before Junos OS Release 7.4.

Description Display a list of channels configured on a channelized OC12 IQ or IQE interface.

Options **coc12-*fpc/pic/slot***—Channelized OC12 IQ or IQE interface name.

Required Privilege Level view

List of Sample Output show interfaces controller (Channelized OC12 IQ) on page 125

Output Fields Table 6 on page 125 lists the output fields for the **show interfaces controller** (Channelized OC12 IQ and IQE) command. Output fields are listed in the approximate order in which they appear.

Table 6: Channelized OC12 IQ and IQE show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (Channelized OC12 IQ)

```
user@host> show interfaces controller
Controller                                                      Admin Link
coc12-4/2/0                                                     up    up
    so-4/2/0:1                                                  up    up
    t3-4/2/0:2                                                  up    up
    ct3-4/2/0:3                                                 up    up
        t1-4/2/0:3:1                                            up    up
        t1-4/2/0:3:2                                            up    up
      ...
        t1-4/2/0:3:28                                           up    up
    ct3-4/2/0:4                                                 up    up
        ct1-4/2/0:4:1                                           up    up
            ds-4/2/0:4:1:1                                      up    up
            ds-4/2/0:4:1:2                                      up    up
          ...
            ds-4/2/0:4:1:24                                     up    up
        ct1-4/2/0:4:2                                           up    up
            ds-4/2/0:4:2:1                                      up    up
            ds-4/2/0:4:2:2                                      up    up
          ...
            ds-4/2/0:4:2:6                                      up    up
```

```
    t1-4/2/0:4:3                                                  up    up
    t1-4/2/0:4:4                                                  up    up
  ...
    t1-4/2/0:4:28                                                 up    up
t3-4/2/0:5                                                        up    up
coc1-4/2/0:6                                                      up    up
    t1-4/2/0:6:1                                                  up    up
    t1-4/2/0:6:2                                                  up    up
  ...
    t1-4/2/0:6:28                                                 up    up
coc1-4/2/0:7                                                      up    up
    ct1-4/2/0:7:1                                                 up    up
        ds-4/2/0:7:1:1                                            up    up
        ds-4/2/0:7:1:2                                            up    up
      ...
        ds-4/2/0:7:1:24                                           up    up
    ct1-4/2/0:7:2                                                 up    up
        ds-4/2/0:7:2:1                                            up    up
        ds-4/2/0:7:2:2                                            up    up
      ...
        ds-4/2/0:7:2:6                                            up    up
    t1-4/2/0:7:3                                                  up    up
    t1-4/2/0:7:4                                                  up    up
  ...
    t1-4/2/0:7:28                                                 up    up
so-4/2/0:8                                                        up    up
```

show interfaces controller (Channelized OC3 IQ and IQE)

Syntax show interfaces controller coc3-*fpc/pic/slot*

Release Information Command introduced before Junos OS Release 7.4.

Description Display a list of channels configured on a channelized OC3 IQ and IQE interface.

Options **coc3-*fpc/pic/slot***—channelized OC3 IQ or IQE interface name.

Required Privilege Level view

List of Sample Output show interfaces controller (Channelized OC3 IQ) on page 127

Output Fields Table 7 on page 127 lists the output fields for the **show interfaces controller** (Channelized OC3 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 7: Channelized OC3 IQ and IQE show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (Channelized OC3 IQ)

```
user@host> show interfaces controller coc3-4/2/0
Controller                                                      Admin Link
coc3-4/2/0                                                      up    up
    coc1-4/2/0:1                                                up    up
        ct1-4/2/0:1:1                                           up    up
            ds-4/2/0:1:1:1                                      up    up
ct3-0/2/0                                                       up    up
ct3-0/2/1                                                       up    up
ct3-0/2/2                                                       up    up
ct3-0/2/3                                                       up    up
```

show interfaces controller (Channelized STM1 IQ)

Syntax show interfaces controller cstm1-*fpc/pic/port*

Release Information Command introduced before Junos OS Release 7.4.

Description (M Series and T Series routers only) Display the interface names of the physical channelized STM1 IQ interface and the channels configured on each interface.

Options **cstm1-*fpc/pic/slot***—Channelized STM1 IQ interface name.

Required Privilege Level view

List of Sample Output show interfaces controller (Physical Channelized STM1 IQ with Logical E1) on page 128

Output Fields Table 8 on page 128 lists the output fields for the **show interfaces controller** (Channelized STM1 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 8: Channelized STM1 IQ show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (Physical Channelized STM1 IQ with Logical E1)

```
user@host> show interfaces controller cstm1-0/0/0
Controller                                                      Admin Link
cstm1-0/0/0                                                     up    up
cau4-0/0/0                                                      up    up
    e1-0/0/0:1                                                  up    up
    e1-0/0/0:2                                                  up    up
    e1-0/0/0:3                                                  up    up
    e1-0/0/0:4                                                  up    up
    e1-0/0/0:5                                                  up    up
    e1-0/0/0:6                                                  up    up
    e1-0/0/0:7                                                  up    up
    e1-0/0/0:8                                                  up    up
    e1-0/0/0:9                                                  up    up
    e1-0/0/0:10                                                 up    up
    ce1-0/0/0:11                                                up    up
        ds-0/0/0:11:1                                           up    up
        ds-0/0/0:11:2                                           up    up
        ds-0/0/0:11:3                                           up    up
        ds-0/0/0:11:4                                           up    up
```

show interfaces controller (Channelized T1 IQ)

Syntax show interfaces controller ct1-*fpc/pic/slot*

Release Information Command introduced before Junos OS Release 7.4.

Description (M Series and T Series routers only) Display the interface names of the specified physical channelized T1 IQ interface and the channels configured on it.

Options **ct1-*fpc/pic/slot***—Channelized T1 IQ interface name.

Required Privilege Level view

List of Sample Output
show interfaces controller (T1 IQ) (Clear-Channel T1) on page 129
show interfaces controller (T1 IQ) (Channelized DS) on page 129

Output Fields Table 9 on page 129 lists the output fields for the **show interfaces controller** (Channelized T1 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 9: Channelized T1 IQ show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (T1 IQ) (Clear-Channel T1)

The following sample output displays the channelized T1 IQ interface when it is configured as a clear-channel T1 interface:

```
user@host> show interfaces controller ct1-0/2/0

Controller                                                    Admin Link
ct1-0/2/0                                                     up    up
t1-0/2/0                                                      up    up
```

show interfaces controller (T1 IQ) (Channelized DS)

The following sample output displays the channelized T1 IQ interfaces when it is configured down to the channelized DS level:

```
user@host> show interfaces controller ct1-0/2/1
Controller                                                    Admin Link
ct1-0/2/1                                                     up    up
    ds-0/2/1:1                                                up    up
    ds-0/2/1:2                                                up    up
```

show interfaces controller (Channelized T3 IQ)

Syntax show interfaces controller ct3-*fpc/pic/slot*

Release Information Command introduced before Junos OS Release 7.4.

Description (M Series and T Series routers only) Display the interface names of the specified physical channelized T3 IQ interface and the channels configured on it.

Options **ct3-*fpc/pic /slot***—Channelized T3 IQ interface name.

Required Privilege Level view

List of Sample Output show interfaces controller (T3 IQ) on page 130

Output Fields Table 10 on page 130 lists the output fields for the **show interfaces controller** (Channelized T3 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 10: Channelized T3 IQ show interfaces controller Output Fields

Field Name	Field Description
Controller	Physical channelized interface name and the names of any channels configured on it.
Admin	Administrative status of the interface.
Link	Link status of the interface.

Sample Output

show interfaces controller (T3 IQ)

```
user@host> show interfaces controller ct3-0/0/1
Controller                                                Admin Link
ct3-0/0/1                                                 up    up
    t1-0/0/1:1                                            up    up
    ct1-0/0/1:2                                           up    up
        ds-0/0/1:2:1                                      up    up
        ds-0/0/1:2:2                                      up    up
        ds-0/0/1:2:3                                      up    up
    t1-0/0/1:3
  ...                                                     up    down
    t1-0/0/1:10                                           up    up
    ct1-0/0/1:11                                          up    up
  ...
    ct1-0/0/1:28                                          up    up
```

PART 5

Index

Index

C

F

S