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Junos<sup>®</sup> OS

Channelized IQ Interfaces



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# About the Documentation

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- Supported Platforms on page xi
- Using the Examples in This Manual on page xi
- Documentation Conventions on page xiii
- Documentation Feedback on page xv
- Requesting Technical Support on page xv

## Documentation and Release Notes

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To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

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

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

## Supported Platforms

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

- MX Series
- T Series
- M Series

## Using the Examples in This Manual

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If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

## Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

## Documentation Conventions

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

Table 1: Notice Icons





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

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active

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

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"><li>Introduces or emphasizes important new terms.</li><li>Identifies guide names.</li><li>Identifies RFC and Internet draft titles.</li></ul>	<ul style="list-style-type: none"><li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li><li><i>Junos OS CLI User Guide</i></li><li>RFC 1997, <i>BGP Communities Attribute</i></li></ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"><li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li><li>The console port is labeled <b>CONSOLE</b>.</li></ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast</b>   <b>multicast</b>  ( <i>string1</i>   <i>string2</i>   <i>string3</i> )
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp</b> { # Required for dynamic MPLS only
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members</b> [ <i>community-ids</i> ]
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"><li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li><li>To cancel the configuration, click <b>Cancel</b>.</li></ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

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We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net), or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

## Requesting Technical Support

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Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

## Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:  
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://tools.juniper.net/SerialNumberEntitlementSearch/>

## Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <http://www.juniper.net/support/requesting-support.html>.

## PART 1

# Overview

- [Product Overview on page 3](#)
- [System Requirements on page 9](#)
- [Glossary on page 11](#)



## CHAPTER 1

# Product Overview

- [Overview of Channelized IQ Interfaces on page 3](#)
- [Guidelines for Configuring Channelized IQ Interfaces on page 5](#)
- [Frame Relay DLCI Limitations for Channelized IQ Interfaces on page 7](#)

## Overview of Channelized IQ Interfaces

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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 NxDS0 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 15](#)
  - [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## 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.
  - NxDS0 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.
  - NxDS0 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 cstml-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 NxDS0 interface, and you are running a BERT test from the local NxDS0 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 NxDS0 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 15](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## 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 3: Frame Relay DLCI Limitations for Channelized Interfaces**

Channelized PIC Type	Number of DLCIs per Level	Range
<b>Original Channelized PICs</b>		
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)
<b>Channelized IQ PICs</b>		
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)
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 15](#)
  - [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## CHAPTER 2

# System Requirements

- [System Requirements for Channelized IQ Interfaces on page 9](#)

### System Requirements for Channelized IQ Interfaces

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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 15](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## CHAPTER 3

# Glossary

- [Terms and Acronyms for Channelized IQ Interfaces on page 11](#)

### Terms and Acronyms for Channelized IQ Interfaces

#### P

<b>Performance Processor (QPP) ASIC</b>	A next-generation processor that provides enhanced capabilities for channelized IQ interfaces.
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## PART 2

# Configuration

- [Configuration Overview on page 15](#)
- [Basic Configuration Steps on page 17](#)
- [Configuring Class of Service on a Channelized IQ Interface on page 21](#)



## CHAPTER 4

# Configuration Overview

- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

### 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 17](#).

- 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 18](#).

- 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 18](#).

- 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 21](#).

#### Related Documentation

- [Channelized IQ Interfaces Solutions Page](#)
- [Overview of Channelized IQ Interfaces on page 3](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)



## CHAPTER 5

# Basic Configuration Steps

- [Configuring a Clear Channel on a Channelized IQ Interface on page 17](#)
- [Configuring Single-Level Channels on a Channelized IQ Interface on page 18](#)
- [Configuring Multilevel Channels on a Channelized IQ Interface on page 18](#)

### Configuring a Clear Channel on a Channelized IQ Interface

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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 cxx-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 15](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## Configuring Single-Level Channels on a Channelized IQ Interface

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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*×DS0 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 15](#)
- [Overview of Channelized IQ Interfaces on page 3](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## Configuring Multilevel Channels on a Channelized IQ Interface

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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 cxx-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 cxx-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 15](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## CHAPTER 6

# Configuring Class of Service on a Channelized IQ Interface

- [Configuring a Class-of-Service Scheduler Map on page 21](#)
- [Associating the Scheduler with a DLCI on a Channelized IQ Interface on page 22](#)
- [Scheduler Limitations for Channelized IQ Interfaces on page 22](#)
- [Verifying Class-of-Service Schedulers on Channelized IQ Interfaces on page 23](#)

## 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 9](#)
  - [Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 89](#)

---

## 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 15](#)
  - [Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 89](#)

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## 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 4 on page 22](#) shows the number of schedulers you can apply at each channel level.

**Table 4: 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 4: 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 15](#)
  - [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

## 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 15](#)
  - [Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 89](#)



## PART 3

# Examples

- [Example Overview on page 27](#)
- [Examples on page 29](#)



## CHAPTER 7

# Example Overview

- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)

### 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:

- [Example: OC12 Clear Channel on a Channelized OC12 IQ Interface on page 30](#)
- [Example: Complex Configuration for a Channelized OC12 IQ Interface on page 34](#)
- [Example: Converting a Channelized OC12 IQ PIC to a Channelized STM4 IQ Interface on page 55](#)
- [Example: Channelized OC3 IQ Interface Configuration on page 61](#)
- [Example: Channelized DS3 IQ Interface Configuration on page 68](#)
- [Example: Channelized T1 IQ Interface Configuration on page 74](#)
- [Example: Channelized STM1 IQ Interface Configuration on page 78](#)
- [Example: Channelized E1 IQ Interface Configuration on page 85](#)
- [Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 89](#)

#### **Related Documentation**

- [Channelized IQ Interfaces Solutions Page](#)
- [Overview of Channelized IQ Interfaces on page 3](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)



## CHAPTER 8

# Examples

- [Merging Examples on page 29](#)
- [Example: OC12 Clear Channel on a Channelized OC12 IQ Interface on page 30](#)
- [Example: Complex Configuration for a Channelized OC12 IQ Interface on page 34](#)
- [Example: Converting a Channelized OC12 IQ PIC to a Channelized STM4 IQ Interface on page 55](#)
- [Example: Channelized OC3 IQ Interface Configuration on page 61](#)
- [Example: Channelized DS3 IQ Interface Configuration on page 68](#)
- [Example: Channelized T1 IQ Interface Configuration on page 74](#)
- [Example: Channelized STM1 IQ Interface Configuration on page 78](#)
- [Example: Channelized E1 IQ Interface Configuration on page 85](#)
- [Example: DLCI Class of Service on a Channelized IQ Interface Configuration on page 89](#)

## 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.xml; }

```

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

```

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

```

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

```

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

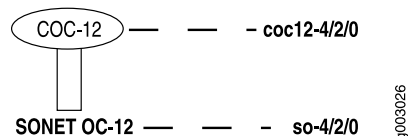
```

#### Related Documentation

- For more information about the load command, see the *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
coc12-4/2/0                               Admin Link
                                         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 **cxx-fpc/pic/O** 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, 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      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** • [Channelized IQ Interfaces Solutions Page](#)  
**Documentation**

- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## Example: Complex Configuration for a Channelized OC12 IQ Interface

Figure 2: Complex Configuration for a Channelized OC12 IQ Interface

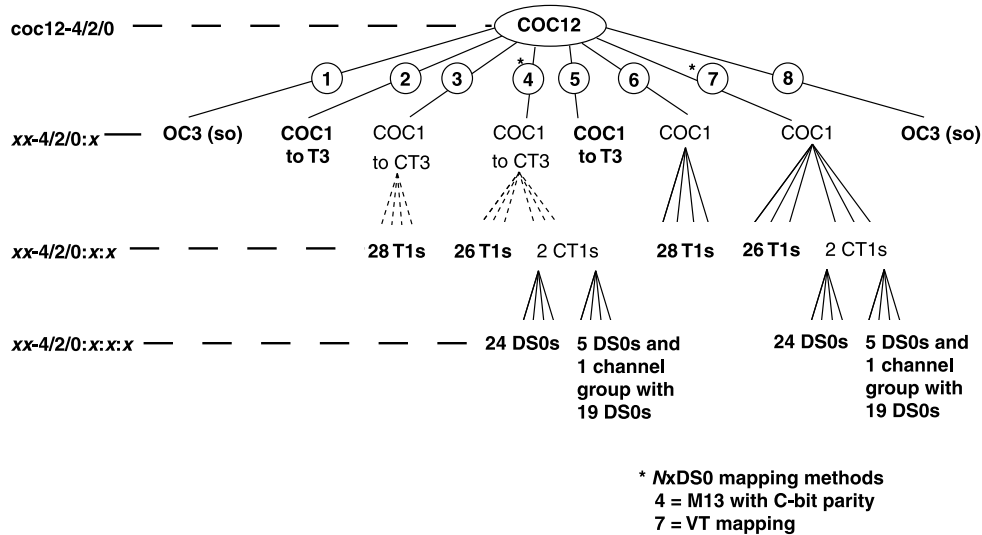


Table 5: Complex Channelization for a Channelized OC12 IQ Interface

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 5: 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 34 and Table 5 on page 34 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  $N \times \text{DS0}$  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 DSO 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;
        }
    }
}
```

```

...
tl-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 DSO 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
coc12-4/2/0
  so-4/2/0:1
  t3-4/2/0:2
  ct3-4/2/0:3
    t1-4/2/0:3:1
    t1-4/2/0:3:2
    t1-4/2/0:3:3
    t1-4/2/0:3:4
    t1-4/2/0:3:5
    t1-4/2/0:3:6
    t1-4/2/0:3:7
    t1-4/2/0:3:8
    t1-4/2/0:3:9
    t1-4/2/0:3:10
    t1-4/2/0:3:11
    t1-4/2/0:3:12
    t1-4/2/0:3:13
    t1-4/2/0:3:14
    t1-4/2/0:3:15
    t1-4/2/0:3:16
    t1-4/2/0:3:17
    t1-4/2/0:3:18
    t1-4/2/0:3:19
    t1-4/2/0:3:20
    t1-4/2/0:3:21
    t1-4/2/0:3:22
    t1-4/2/0:3:23
    t1-4/2/0:3:24
    t1-4/2/0:3:25
    t1-4/2/0:3:26
    t1-4/2/0:3:27
    t1-4/2/0:3:28
  ct3-4/2/0:4
    ct1-4/2/0:4:1
      ds-4/2/0:4:1:1
      ds-4/2/0:4:1:2
      ds-4/2/0:4:1:3
      ds-4/2/0:4:1:4
      ds-4/2/0:4:1:5
      ds-4/2/0:4:1:6
      ds-4/2/0:4:1:7
      ds-4/2/0:4:1:8
      ds-4/2/0:4:1:9
      ds-4/2/0:4:1:10
      ds-4/2/0:4:1:11
      ds-4/2/0:4:1:12
      ds-4/2/0:4:1:13
      ds-4/2/0:4:1:14
      ds-4/2/0:4:1:15
      ds-4/2/0:4:1:16
      ds-4/2/0:4:1:17
```

	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 on page 44](#)
- [SONET OC3 on page 45](#)
- [T3 on page 46](#)
- [Channelized T3 on page 48](#)
- [Channelized OC1 on page 50](#)
- [Channelized T1 on page 51](#)
- [T1 on page 53](#)
- [DS0 on page 54](#)

### 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.1U'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		
CSSES	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...Ub1g.[
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, 0.151, Pseudorandom (9)

Packet Forwarding Engine configuration:  
 Destination slot: 0 (0x00)

CoS transmit queue	%	Bandwidth bps	%	Buffer bytes	Priority	Limit
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, 0.151, 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 27](#)
  - [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## 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 NxDS0 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

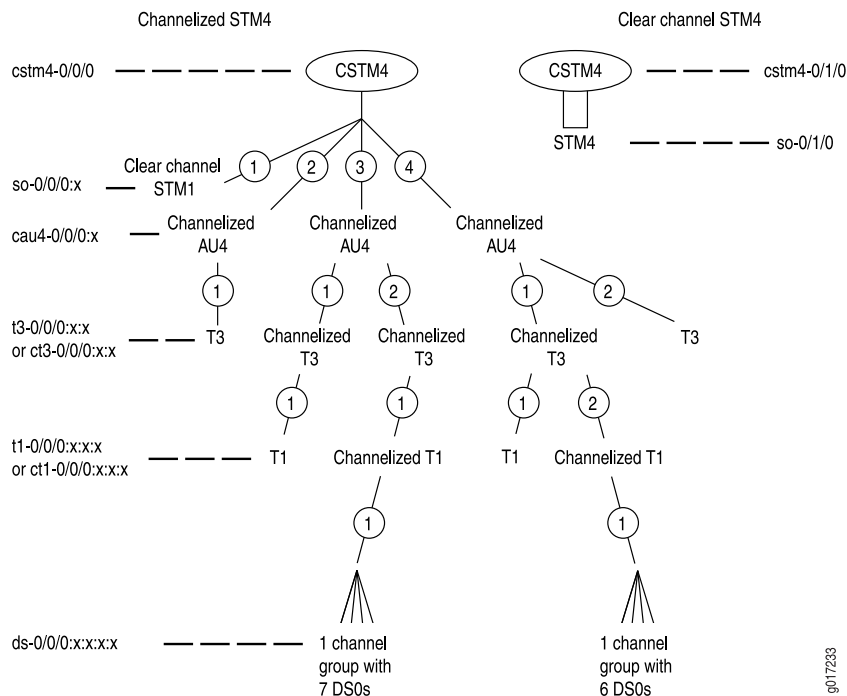


Figure 3 on page 56 and the following configuration example show how the converted channelized STM4 IQ interface can be turned into a clear channel STM4 (VC4-4c) SDH interface, or further subdivided into STM1 (VC4) interfaces and channelized administrative unit 4 (CAU4) interfaces, T3 and channelized T3 interfaces, T1 and channelized T1 interfaces, and NxDS0 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 NxDSO 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 {

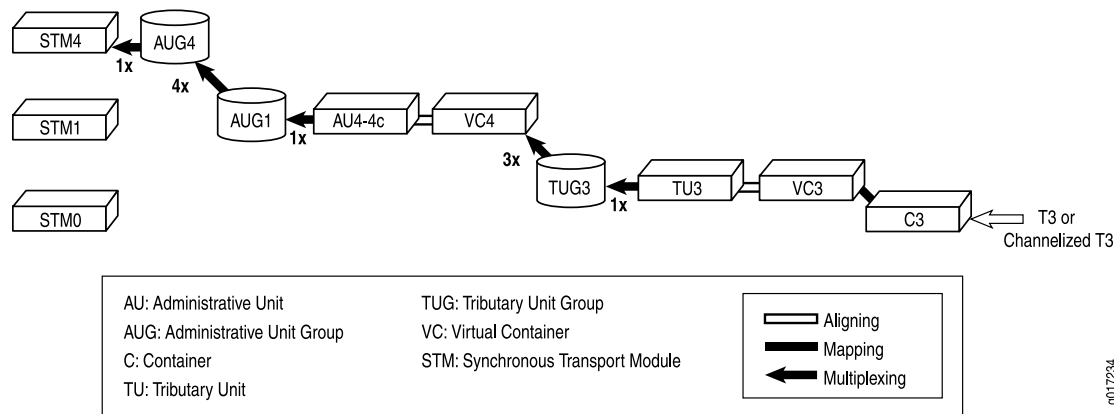
```

```
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 59 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
cstm4-0/0/0
  so-0/0/0:1
  cau4-0/0/0:2
    t3-0/0/0:2:1
  cau4-0/0/0:3
    ct3-0/0/0:3:1
      t1-0/0/0:3:1:1
    ct3-0/0/0:3:2
      ct1-0/0/0:3:2:1
        ds-0/0/0:3:2:1:1
  cau4-0/0/0:4
    ct3-0/0/0:4:1
      t1-0/0/0:4:1:1
    ct1-0/0/0:4:1:2
      ds-0/0/0:4:1:2:1
  t3-0/0/0:4:2
```

	Admin	Link
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 inet6	10.0.0.1/30 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 inet6	10.0.0.5/30 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 inet6	10.0.0.9/30 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 inet6	10.0.0.13/30 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 inet6	10.0.0.21/30 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 inet6	10.0.0.25/30 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 inet6	10.0.0.17/30 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 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## Example: Channelized OC3 IQ Interface Configuration

Figure 5: Channelized OC3 IQ Interface Example

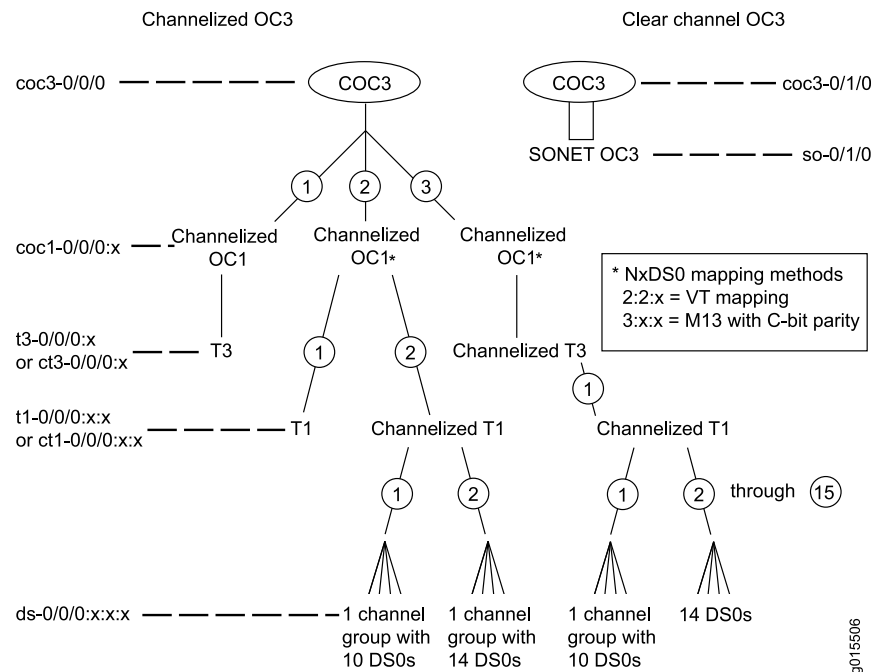


Figure 5 on page 61 shows a sample channelization structure for a channelized OC3 IQ interface. Top-level partitions 1, 2, and 3 create channelized OC1 interfaces. The first channelized OC1 interface, **coc1-0/0/0:1**, is converted directly into the T3 interface **t3-0/0/0:1**. The second channelized 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 NxDS0 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 NxDS0 channels and a channel group containing 10 NxDS0 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 NxDS0 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 NxDSOs 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 NxDSOs 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
coc3-0/0/0
    coc1-0/0/0:1
    t3-0/0/0:1
    coc1-0/0/0:2
        t1-0/0/0:2:1
        ct1-0/0/0:2:2
            ds-0/0/0:2:2:1
            ds-0/0/0:2:2:2
    coc1-0/0/0:3
    ct3-0/0/0:3
        ct1-0/0/0:3:1
            ds-0/0/0:3:1:1
            ds-0/0/0:3:1:2
            ds-0/0/0:3:1:3
            ds-0/0/0:3:1:4
            ds-0/0/0:3:1:5
            ds-0/0/0:3:1:6
            ds-0/0/0:3:1:7
            ds-0/0/0:3:1:8
            ds-0/0/0:3:1:9
            ds-0/0/0:3:1:10
            ds-0/0/0:3:1:11
            ds-0/0/0:3:1:12
            ds-0/0/0:3:1:13
            ds-0/0/0:3:1:14
            ds-0/0/0:3:1:15
```

	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 on page 65](#)
- [Channelized OC1 on page 65](#)
- [T3 on page 65](#)
- [Channelized T3 on page 66](#)
- [T1 on page 66](#)
- [Channelized T1 on page 67](#)
- [NxDS0 on page 67](#)
- [Clear Channel SONET OC3 on page 67](#)

### 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, 0.151, 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, 0.151, 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
```

### NxDSO

```
user@host> show interfaces ds-0/0/0:2:1
Physical interface: ds-0/0/0:2:1, 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)
  DSO BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
  Logical interface ds-0/0/0:2:1.0 (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
```

```

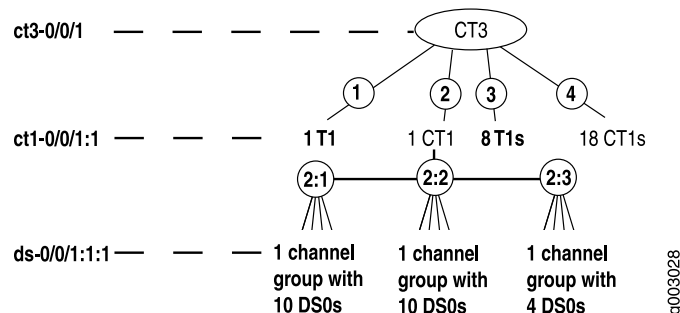
Last flapped   : 2004-11-04 10:53:54 PST (05:51:04 ago)
Input rate    : 0 bps (0 pps)
Output rate   : 0 bps (0 pps)
SONET alarms  : PLM-P
SONET defects : PLM-P
Logical interface so-0/1/0.0 (Index 67) (SNMP ifIndex 15686)
  Flags: Device-Down Point-To-Point SNMP-Traps Encapsulation: Cisco-HDLC
  Protocol 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 27](#)
  - [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## 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 68](#) shows the breakdown of a DS3 interface into a variety of channels. The path that leads to  $N \times$ DS0 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 34](#)). 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  $N \times$ DS0 channels. To configure  $N \times$ DS0 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  $N \times$ DS0 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 NxDS0s.
    unit 0 {
      family inet {
        address 10.25.1.2/24;
      }
    }
  }
  ds-0/0/1:2:2 { # This channel group contains 10 NxDS0s.
    unit 0 {
      family inet {
        address 10.25.2.2/24;
      }
    }
  }
  ds-0/0/1:2:3 { # This channel group contains 4 NxDS0s.
    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
ct3-0/0/1                               Admin Link
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, 0.151, 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 NxDSO 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 DSOs ( $64 \times 10 = 640$ ).

```

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
    %      bps      %      Buffer Priority Limit
    bytes
    0 best-effort      95      608000 95      0      low  none
    3 network-control  5       32000  5       0      low  none

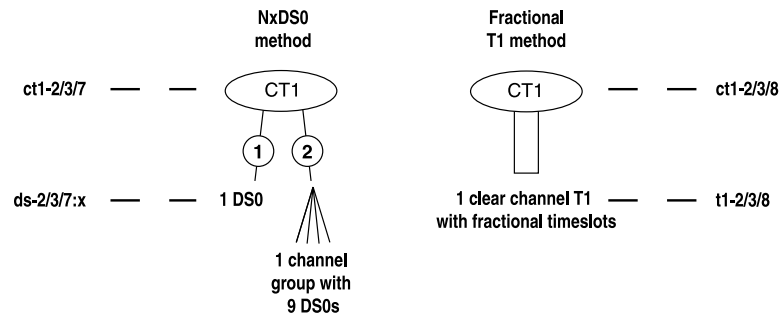
```

#### Related Documentation

- [Channelized IQ Interfaces Solutions Page](#)
- [Roadmap for Channelized IQ Interface Configuration Examples on page 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## 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 74 shows a fractional T1 method and the NxDS0 method seen previously in the complex OC12 configuration example (see “Example: Complex Configuration for a Channelized OC12 IQ Interface” on page 34). The NxDS0 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 NxDS0 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 NxDS0 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 NxDS0 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

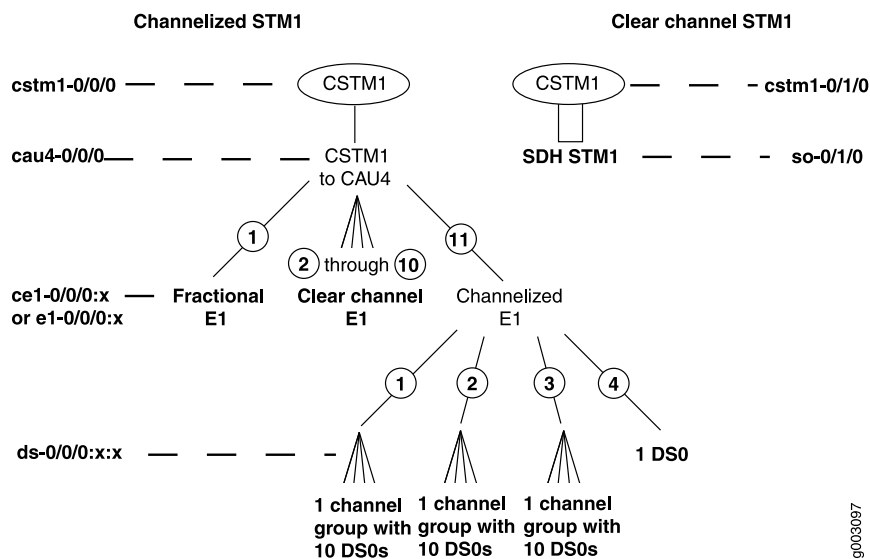
Addresses, Flags: Is-Preferred Is-Primary

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 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

**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 78](#) 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 NxDS0 channels. To create the desired number of NxDS0 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 NxDS0-based channelized E1 channel, so you can use time slots 2 through 32.

To create an NxDS0 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 78](#), 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 cstml-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.
    }
  }
  cstml-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.
```

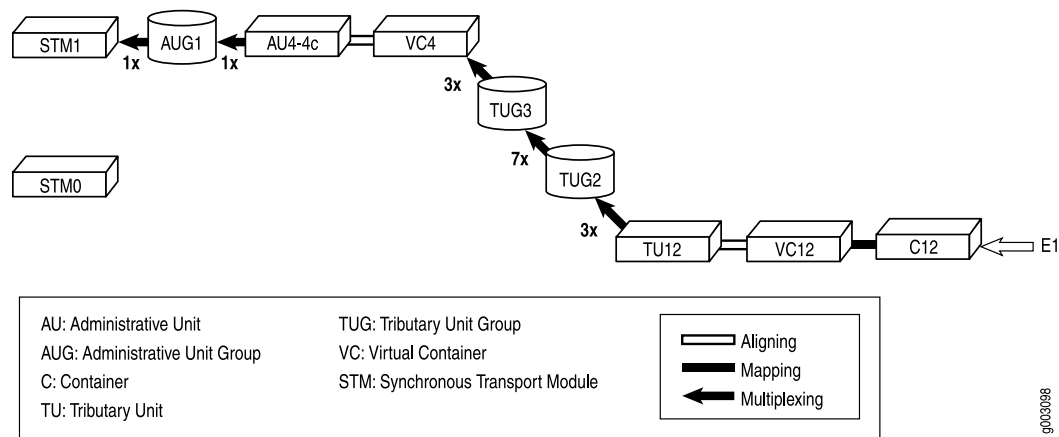
```

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 NXDSO
    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 81 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
cstm1-0/0/0
cau4-0/0/0
  e1-0/0/0:1
  e1-0/0/0:2
  e1-0/0/0:3
  e1-0/0/0:4
  e1-0/0/0:5
  e1-0/0/0:6
  e1-0/0/0:7
  e1-0/0/0:8
  e1-0/0/0:9
  e1-0/0/0:10
  ce1-0/0/0:11
    ds-0/0/0:11:1
    ds-0/0/0:11:2
    ds-0/0/0:11:3
    ds-0/0/0:11:4

```

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 NxDS0 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 ( $64 \times 10 = 640$ ). 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:

```

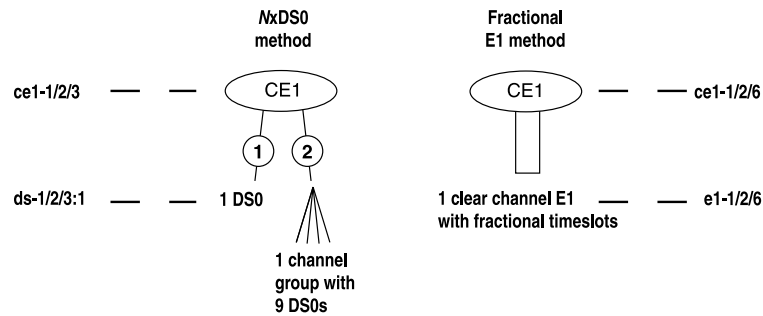
```
Not-configured
  CHAP state: Not-configured
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  DSO BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, Pseudorandom (9)
  Logical 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)
  DSO BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, 0.151, 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 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## 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 85 shows a fractional E1 method and the NxDS0 method seen previously in the complex OC12 configuration example (see “[Example: Complex Configuration for a Channelized OC12 IQ Interface](#)” on page 34). The NxDS0 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 NxDS0 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 NxDS0 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
ce1-1/2/3
# This is the physical channelized E1 IQ interface.
ds-1/2/3:1
ds-1/2/3:2
# These are the resulting N xDS0 interfaces.
user@RouterA> show interfaces controller ce1-1/2/6
Controller
ce1-1/2/6
# This is the physical channelized E1 IQ interface.
e1-1/2/6
# This is the resulting E1 interface.

```

	Admin Link
	up up
	up up
	up up
	up up

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 NxDSO 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, mp1s:
  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 27](#)
  - [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)

## 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 68.](#))

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 **dcli *dcli-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.
      dcli 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.
      dcli 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 27](#)
- [Roadmap for Configuring Channelized IQ Interfaces on page 15](#)



## PART 4

# Administration

- [Commands on page 95](#)



## CHAPTER 9

# Commands

## show class-of-service interface

---

<b>Syntax</b>	<code>show class-of-service interface</code> <code>&lt;comprehensive   detail&gt; &lt;interface-name&gt;</code>
<b>Release Information</b>	<p>Command introduced before Junos OS Release 7.4.</p> <p>Command introduced in Junos OS Release 9.0 for EX Series switches.</p> <p>Forwarding class map information added in Junos OS Release 9.4.</p> <p>Command introduced in Junos OS Release 11.1 for the QFX Series.</p> <p>Command introduced in Junos OS Release 12.1 for the PTX Series Packet Transport Routers.</p> <p>Command introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.</p> <p>Options <b>detail</b> and <b>comprehensive</b> introduced in Junos OS Release 11.4.</p>
<b>Description</b>	Display the logical and physical interface associations for the classifier, rewrite rules, and scheduler map objects.
<b>Options</b>	<p><b>none</b>—Display CoS associations for all physical and logical interfaces.</p> <p><b>comprehensive</b>—(M Series, MX Series, and T Series routers) (Optional) Display comprehensive quality-of-service (QoS) information about all physical and logical interfaces.</p> <p><b>detail</b>—(M Series, MX Series, and T Series routers) (Optional) Display QoS and CoS information based on the interface.</p> <p>If the <b>interface</b> <i>interface-name</i> is a physical interface, the output includes:</p> <ul style="list-style-type: none"><li>• Brief QoS information about the physical interface</li><li>• Brief QoS information about the logical interface</li><li>• CoS information about the physical interface</li><li>• Brief information about filters or policers of the logical interface</li><li>• Brief CoS information about the logical interface</li></ul> <p>If the <b>interface</b> <i>interface-name</i> is a logical interface, the output includes:</p> <ul style="list-style-type: none"><li>• Brief QoS information about the logical interface</li><li>• Information about filters or policers for the logical interface</li><li>• CoS information about the logical interface</li></ul> <p><b>interface-name</b>—(Optional) Display class-of-service (CoS) associations for the specified interface.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service interface (Physical) on page 107</a>

[show class-of-service interface \(Logical\) on page 108](#)  
[show class-of-service interface \(Gigabit Ethernet\) on page 108](#)  
[show class-of-service interface \(PPPoE Interface\) on page 108](#)  
[show class-of-service interface \(T4000 Routers with Type 5 FPCs\) on page 108](#)  
[show class-of-service interface detail on page 109](#)  
[show class-of-service interface comprehensive on page 109](#)  
[show class-of-service interface \(ACX Series Routers\) on page 119](#)

**Output Fields** Table 6 on page 97 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 6: 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.
Rewrite Input IEEE Code-point	(QFX Series only) IEEE 802.1p code point (priority) rewrite value. Incoming traffic from the Fibre Channel (FC) SAN is classified into the forwarding class specified in the native FC interface (NP_Port) fixed classifier and uses the priority specified as the IEEE 802.1p rewrite value.
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 <b>Shaping rate</b> field is displayed for either the physical interface or the logical interface.
Scheduler map	Name of the output scheduler map associated with this interface.
Scheduler map forwarding class sets	(QFX Series only) Name of the fabric forwarding class set scheduler map associated with a QFabric system Interconnect device 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.

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

Field Name	Field Description
<b>Forwarding-class-map</b>	Name of the forwarding map associated with this interface.
<b>Congestion-notification</b>	(QFX Series only) Congestion notification state, <b>enabled</b> or <b>disabled</b> .
<b>Logical interface</b>	Name of a logical interface.
<b>Object</b>	Category of an object: <b>Classifier</b> , <b>Fragmentation-map</b> (for LSQ interfaces only), <b>Scheduler-map</b> , <b>Rewrite</b> , or <b>Translation Table</b> (for IQE PICs only).
<b>Name</b>	Name of an object.
<b>Type</b>	Type of an object: <b>dscp</b> , <b>dscp-ipv6</b> , <b>exp</b> , <b>ieee-802.1</b> , <b>ip</b> , or <b>inet-precedence</b> .
<b>Link-level type</b>	Encapsulation on the physical interface.
<b>MTU</b>	MTU size on the physical interface.
<b>Speed</b>	Speed at which the interface is running.
<b>Loopback</b>	Whether loopback is enabled and the type of loopback.
<b>Source filtering</b>	Whether source filtering is enabled or disabled.
<b>Flow control</b>	Whether flow control is enabled or disabled.
<b>Auto-negotiation</b>	(Gigabit Ethernet interfaces) Whether autonegotiation is enabled or disabled.
<b>Remote-fault</b>	(Gigabit Ethernet interfaces) Remote fault status. <ul style="list-style-type: none"> <li>• <b>Online</b>—Autonegotiation is manually configured as online.</li> <li>• <b>Offline</b>—Autonegotiation is manually configured as offline.</li> </ul>

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

Field Name	Field Description
<b>Device flags</b>	<p>The <b>Device flags</b> field provides information about the physical device and displays one or more of the following values:</p> <ul style="list-style-type: none"> <li>• <b>Down</b>—Device has been administratively disabled.</li> <li>• <b>Hear-Own-Xmit</b>—Device receives its own transmissions.</li> <li>• <b>Link-Layer-Down</b>—The link-layer protocol has failed to connect with the remote endpoint.</li> <li>• <b>Loopback</b>—Device is in physical loopback.</li> <li>• <b>Loop-Detected</b>—The link layer has received frames that it sent, thereby detecting a physical loopback.</li> <li>• <b>No-Carrier</b>—On media that support carrier recognition, no carrier is currently detected.</li> <li>• <b>No-Multicast</b>—Device does not support multicast traffic.</li> <li>• <b>Present</b>—Device is physically present and recognized.</li> <li>• <b>Promiscuous</b>—Device is in promiscuous mode and recognizes frames addressed to all physical addresses on the media.</li> <li>• <b>Quench</b>—Transmission on the device is quenched because the output buffer is overflowing.</li> <li>• <b>Recv-All-Multicasts</b>—Device is in multicast promiscuous mode and therefore provides no multicast filtering.</li> <li>• <b>Running</b>—Device is active and enabled.</li> </ul>
<b>Interface flags</b>	<p>The <b>Interface flags</b> field provides information about the physical interface and displays one or more of the following values:</p> <ul style="list-style-type: none"> <li>• <b>Admin-Test</b>—Interface is in test mode and some sanity checking, such as loop detection, is disabled.</li> <li>• <b>Disabled</b>—Interface is administratively disabled.</li> <li>• <b>Down</b>—A hardware failure has occurred.</li> <li>• <b>Hardware-Down</b>—Interface is nonfunctional or incorrectly connected.</li> <li>• <b>Link-Layer-Down</b>—Interface keepalives have indicated that the link is incomplete.</li> <li>• <b>No-Multicast</b>—Interface does not support multicast traffic.</li> <li>• <b>No-receive No-transmit</b>—Passive monitor mode is configured on the interface.</li> <li>• <b>Point-To-Point</b>—Interface is point-to-point.</li> <li>• <b>Pop all MPLS labels from packets of depth</b>—MPLS labels are removed as packets arrive on an interface that has the <b>pop-all-labels</b> statement configured. The depth value can be one of the following: <ul style="list-style-type: none"> <li>• <b>1</b>—Takes effect for incoming packets with one label only.</li> <li>• <b>2</b>—Takes effect for incoming packets with two labels only.</li> <li>• <b>[ 1 2 ]</b>—Takes effect for incoming packets with either one or two labels.</li> </ul> </li> <li>• <b>Promiscuous</b>—Interface is in promiscuous mode and recognizes frames addressed to all physical addresses.</li> <li>• <b>Recv-All-Multicasts</b>—Interface is in multicast promiscuous mode and provides no multicast filtering.</li> <li>• <b>SNMP-Traps</b>—SNMP trap notifications are enabled.</li> <li>• <b>Up</b>—Interface is enabled and operational.</li> </ul>

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

Field Name	Field Description
<b>Flags</b>	<p>The <b>Logical interface flags</b> field provides information about the logical interface and displays one or more of the following values:</p> <ul style="list-style-type: none"> <li>• <b>ACFC Encapsulation</b>—Address control field Compression (ACFC) encapsulation is enabled (negotiated successfully with a peer).</li> <li>• <b>Device-down</b>—Device has been administratively disabled.</li> <li>• <b>Disabled</b>—Interface is administratively disabled.</li> <li>• <b>Down</b>—A hardware failure has occurred.</li> <li>• <b>Clear-DF-Bit</b>—GRE tunnel or IPsec tunnel is configured to clear the Don't Fragment (DF) bit.</li> <li>• <b>Hardware-Down</b>—Interface protocol initialization failed to complete successfully.</li> <li>• <b>PFC</b>—Protocol field compression is enabled for the PPP session.</li> <li>• <b>Point-To-Point</b>—Interface is point-to-point.</li> <li>• <b>SNMP-Traps</b>—SNMP trap notifications are enabled.</li> <li>• <b>Up</b>—Interface is enabled and operational.</li> </ul>
<b>Encapsulation</b>	Encapsulation on the logical interface.
<b>Admin</b>	Administrative state of the interface ( <b>Up</b> or <b>Down</b> )
<b>Link</b>	Status of physical link ( <b>Up</b> or <b>Down</b> ).
<b>Proto</b>	Protocol configured on the interface.
<b>Input Filter</b>	Names of any firewall filters to be evaluated when packets are received on the interface, including any filters attached through activation of dynamic service.
<b>Output Filter</b>	Names of any firewall filters to be evaluated when packets are transmitted on the interface, including any filters attached through activation of dynamic service.
<b>Link flags</b>	<p>Provides information about the physical link and displays one or more of the following values:</p> <ul style="list-style-type: none"> <li>• <b>ACFC</b>—Address control field compression is configured. The Point-to-Point Protocol (PPP) session negotiates the ACFC option.</li> <li>• <b>Give-Up</b>—Link protocol does not continue connection attempts after repeated failures.</li> <li>• <b>Loose-LCP</b>—PPP does not use the Link Control Protocol (LCP) to indicate whether the link protocol is operational.</li> <li>• <b>Loose-LMI</b>—Frame Relay does not use the Local Management Interface (LMI) to indicate whether the link protocol is operational.</li> <li>• <b>Loose-NCP</b>—PPP does not use the Network Control Protocol (NCP) to indicate whether the device is operational.</li> <li>• <b>Keepalives</b>—Link protocol keepalives are enabled.</li> <li>• <b>No-Keepalives</b>—Link protocol keepalives are disabled.</li> <li>• <b>PFC</b>—Protocol field compression is configured. The PPP session negotiates the PFC option.</li> </ul>
<b>Hold-times</b>	Current interface hold-time up and hold-time down, in milliseconds.
<b>CoS queues</b>	Number of CoS queues configured.

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

Field Name	Field Description
<b>Last flapped</b>	Date, time, and how long ago the interface went from down to up. The format is <b>Last flapped: year-month-day hour:minute:second:timezone (hour:minute:second ago)</b> . For example, <b>Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)</b> .
<b>Statistics last cleared</b>	Number and rate of bytes and packets received and transmitted on the physical interface. <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the interface.</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the interface.</li> <li>• <b>Input packets</b>—Number of packets received on the interface.</li> <li>• <b>Output packets</b>—Number of packets transmitted on the interface.</li> </ul>
<b>IPv6 transit statistics</b>	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.
<b>Input errors</b>	Input errors on the interface. The labels are explained in the following list: <ul style="list-style-type: none"> <li>• <b>Errors</b>—Sum of the incoming frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> <li>• <b>Framing errors</b>—Number of packets received with an invalid frame checksum (FCS).</li> <li>• <b>Runts</b>—Number of frames received that are smaller than the runt threshold.</li> <li>• <b>Giants</b>—Number of frames received that are larger than the giant threshold.</li> <li>• <b>Bucket Drops</b>—Drops resulting from the traffic load exceeding the interface transmit or receive leaky bucket configuration.</li> <li>• <b>Policed discards</b>—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.</li> <li>• <b>L3 incompletes</b>—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 <b>ignore-l3-incompletes</b> statement.</li> <li>• <b>L2 channel errors</b>—Number of times the software did not find a valid logical interface for an incoming frame.</li> <li>• <b>L2 mismatch timeouts</b>—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable.</li> <li>• <b>HS link CRC errors</b>—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces.</li> <li>• <b>HS link FIFO overflows</b>—Number of FIFO overflows on the high-speed links between the ASICs responsible for handling the router interfaces.</li> </ul>

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

Field Name	Field Description
<b>Output errors</b>	<p>Output errors on the interface. The labels are explained in the following list:</p> <ul style="list-style-type: none"> <li>• <b>Carrier transitions</b>—Number of times the interface has gone from <b>down</b> to <b>up</b>. 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.</li> <li>• <b>Errors</b>—Sum of the outgoing frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> </ul> <p><b>NOTE:</b> Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), the <b>Drops</b> field does not always use the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.</p> <ul style="list-style-type: none"> <li>• <b>Aged packets</b>—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.</li> <li>• <b>HS link FIFO underflows</b>—Number of FIFO underflows on the high-speed links between the ASICs responsible for handling the router interfaces.</li> <li>• <b>MTU errors</b>—Number of packets whose size exceeds the MTU of the interface.</li> </ul>
<b>Egress queues</b>	Total number of egress queues supported on the specified interface.
<b>Queue counters</b>	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul> <p><b>NOTE:</b> Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), the <b>Dropped packets</b> field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.</p>
<b>SONET alarms</b> <b>SONET defects</b>	<p>(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: <b>SONET PHY</b>, <b>SONET section</b>, <b>SONET line</b>, and <b>SONET path</b>.</p>
<b>SONET PHY</b>	<p>Counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. A state other than <b>OK</b> indicates a problem.</li> </ul> <p>The <b>SONET PHY</b> field has the following subfields:</p> <ul style="list-style-type: none"> <li>• <b>PLL Lock</b>—Phase-locked loop</li> <li>• <b>PHY Light</b>—Loss of optical signal</li> </ul>

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

Field Name	Field Description
<b>SONET section</b>	<p>Counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. A state other than <b>OK</b> indicates a problem.</li> </ul> <p>The <b>SONET section</b> field has the following subfields:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B1</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>SEF</b>—Severely errored framing</li> <li>• <b>LOS</b>—Loss of signal</li> <li>• <b>LOF</b>—Loss of frame</li> <li>• <b>ES-S</b>—Errored seconds (section)</li> <li>• <b>SES-S</b>—Severely errored seconds (section)</li> <li>• <b>SEFS-S</b>—Severely errored framing seconds (section)</li> </ul>
<b>SONET line</b>	<p>Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. A state other than <b>OK</b> indicates a problem.</li> </ul> <p>The <b>SONET line</b> field has the following subfields:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B2</b>—Bit interleaved parity for SONET line overhead</li> <li>• <b>REI-L</b>—Remote error indication (near-end line)</li> <li>• <b>RDI-L</b>—Remote defect indication (near-end line)</li> <li>• <b>AIS-L</b>—Alarm indication signal (near-end line)</li> <li>• <b>BERR-SF</b>—Bit error rate fault (signal failure)</li> <li>• <b>BERR-SD</b>—Bit error rate defect (signal degradation)</li> <li>• <b>ES-L</b>—Errored seconds (near-end line)</li> <li>• <b>SES-L</b>—Severely errored seconds (near-end line)</li> <li>• <b>UAS-L</b>—Unavailable seconds (near-end line)</li> <li>• <b>ES-LFE</b>—Errored seconds (far-end line)</li> <li>• <b>SES-LFE</b>—Severely errored seconds (far-end line)</li> <li>• <b>UAS-LFE</b>—Unavailable seconds (far-end line)</li> </ul>

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

Field Name	Field Description
<b>SONET path</b>	<p>Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. A state other than <b>OK</b> indicates a problem.</li> </ul> <p>The <b>SONET path</b> field has the following subfields:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B3</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>REI-P</b>—Remote error indication</li> <li>• <b>LOP-P</b>—Loss of pointer (path)</li> <li>• <b>AIS-P</b>—Path alarm indication signal</li> <li>• <b>RDI-P</b>—Path remote defect indication</li> <li>• <b>UNEQ-P</b>—Path unequipped</li> <li>• <b>PLM-P</b>—Path payload (signal) label mismatch</li> <li>• <b>ES-P</b>—Errored seconds (near-end STS path)</li> <li>• <b>SES-P</b>—Severely errored seconds (near-end STS path)</li> <li>• <b>UAS-P</b>—Unavailable seconds (near-end STS path)</li> <li>• <b>ES-PFE</b>—Errored seconds (far-end STS path)</li> <li>• <b>SES-PFE</b>—Severely errored seconds (far-end STS path)</li> <li>• <b>UAS-PFE</b>—Unavailable seconds (far-end STS path)</li> </ul>
<b>Received SONET overhead</b>  <b>Transmitted SONET overhead</b>	<p>Values of the received and transmitted SONET overhead:</p> <ul style="list-style-type: none"> <li>• <b>C2</b>—Signal label. Allocated to identify the construction and content of the STS-level SPE and for PDI-P.</li> <li>• <b>F1</b>—Section user channel byte. This byte is set aside for the purposes of users.</li> <li>• <b>K1</b> and <b>K2</b>—These bytes are allocated for APS signaling for the protection of the multiplex section.</li> <li>• <b>J0</b>—Section trace. This byte is defined for STS-1 number 1 of an STS-<i>N</i> 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.</li> <li>• <b>S1</b>—Synchronization status. The S1 byte is located in the first STS-1 number of an STS-<i>N</i> signal.</li> <li>• <b>Z3</b> and <b>Z4</b>—Allocated for future use.</li> </ul>
<b>Received path trace</b>  <b>Transmitted path trace</b>	<p>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.</p>
<b>HDLC configuration</b>	<p>Information about the HDLC configuration.</p> <ul style="list-style-type: none"> <li>• <b>Policing bucket</b>—Configured state of the receiving policer.</li> <li>• <b>Shaping bucket</b>—Configured state of the transmitting shaper.</li> <li>• <b>Giant threshold</b>—Giant threshold programmed into the hardware.</li> <li>• <b>Runt threshold</b>—Runt threshold programmed into the hardware.</li> </ul>

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

Field Name	Field Description
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: <ul style="list-style-type: none"> <li>• <b>Destination slot</b>—FPC slot number.</li> <li>• <b>PLP byte</b>—Packet Level Protocol byte.</li> </ul>
CoS information	Information about the CoS queue for the physical interface. <ul style="list-style-type: none"> <li>• <b>CoS transmit queue</b>—Queue number and its associated user-configured forwarding class name.</li> <li>• <b>Bandwidth %</b>—Percentage of bandwidth allocated to the queue.</li> <li>• <b>Bandwidth bps</b>—Bandwidth allocated to the queue (in bps).</li> <li>• <b>Buffer %</b>—Percentage of buffer space allocated to the queue.</li> <li>• <b>Buffer usec</b>—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.</li> <li>• <b>Priority</b>—Queue priority: <b>low</b> or <b>high</b>.</li> <li>• <b>Limit</b>—Displayed if rate limiting is configured for the queue. Possible values are <b>none</b> and <b>exact</b>. If <b>exact</b> is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If <b>none</b> is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.</li> </ul>
Forwarding classes	Total number of forwarding classes supported on the specified interface.
Egress queues	Total number of egress queues supported on the specified interface.
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 <b>Packet Forwarding Engine Chassis Queues</b> 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.

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

Field Name	Field Description
RED-dropped packets	<p>Number of packets dropped because of random early detection (RED).</p> <ul style="list-style-type: none"> <li>(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: <ul style="list-style-type: none"> <li><b>Low, non-TCP</b>—Number of low-loss priority non-TCP packets dropped because of RED.</li> <li><b>Low, TCP</b>—Number of low-loss priority TCP packets dropped because of RED.</li> <li><b>High, non-TCP</b>—Number of high-loss priority non-TCP packets dropped because of RED.</li> <li><b>High, TCP</b>—Number of high-loss priority TCP packets dropped because of RED.</li> </ul> </li> <li>(MX Series routers with enhanced DPCs, and T Series routers with enhanced FPCs only) The output classifies dropped packets into the following categories: <ul style="list-style-type: none"> <li><b>Low</b>—Number of low-loss priority packets dropped because of RED.</li> <li><b>Medium-low</b>—Number of medium-low loss priority packets dropped because of RED.</li> <li><b>Medium-high</b>—Number of medium-high loss priority packets dropped because of RED.</li> <li><b>High</b>—Number of high-loss priority packets dropped because of RED.</li> </ul> </li> </ul> <p><b>NOTE:</b> Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.</p>
RED-dropped bytes	<p>Number of bytes dropped because of RED. The byte counts vary by PIC type.</p> <ul style="list-style-type: none"> <li>(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: <ul style="list-style-type: none"> <li><b>Low, non-TCP</b>—Number of low-loss priority non-TCP bytes dropped because of RED.</li> <li><b>Low, TCP</b>—Number of low-loss priority TCP bytes dropped because of RED.</li> <li><b>High, non-TCP</b>—Number of high-loss priority non-TCP bytes dropped because of RED.</li> <li><b>High, TCP</b>—Number of high-loss priority TCP bytes dropped because of RED.</li> </ul> </li> </ul> <p><b>NOTE:</b> Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.</p>
Transmit rate	Configured transmit rate of the scheduler. The rate is a percentage of the total interface bandwidth.
Rate Limit	<p>Rate limiting configuration of the queue. Possible values are :</p> <ul style="list-style-type: none"> <li><b>None</b>—No rate limit.</li> <li><b>exact</b>—Queue transmits at the configured rate.</li> </ul>
Buffer size	Delay buffer size in the queue.
Priority	Scheduling priority configured as <b>low</b> or <b>high</b> .
Excess Priority	Priority of the excess bandwidth traffic on a scheduler: <b>low</b> , <b>medium-low</b> , <b>medium-high</b> , <b>high</b> , or <b>none</b> .

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

Field Name	Field Description
Drop profiles	<p>Display the assignment of drop profiles.</p> <ul style="list-style-type: none"> <li>• <b>Loss priority</b>—Packet loss priority for drop profile assignment.</li> <li>• <b>Protocol</b>—Transport protocol for drop profile assignment.</li> <li>• <b>Index</b>—Index of the indicated object. Objects that have indexes in this output include schedulers and drop profiles.</li> <li>• <b>Name</b>—Name of the drop profile.</li> <li>• <b>Type</b>—Type of the drop profile: <b>discrete</b> or <b>interpolated</b>.</li> <li>• <b>Fill Level</b>—Percentage fullness of a queue.</li> <li>• <b>Drop probability</b>—Drop probability at this fill level.</li> </ul>
Excess Priority	Priority of the excess bandwidth traffic on a scheduler.
Drop profiles	<p>Display the assignment of drop profiles.</p> <ul style="list-style-type: none"> <li>• <b>Loss priority</b>—Packet loss priority for drop profile assignment.</li> <li>• <b>Protocol</b>—Transport protocol for drop profile assignment.</li> <li>• <b>Index</b>—Index of the indicated object. Objects that have indexes in this output include schedulers and drop profiles.</li> <li>• <b>Name</b>—Name of the drop profile.</li> <li>• <b>Type</b>—Type of the drop profile: <b>discrete</b> or <b>interpolated</b>.</li> <li>• <b>Fill Level</b>—Percentage fullness of a queue.</li> <li>• <b>Drop probability</b>—Drop probability at this fill level.</li> </ul>
Adjustment information	<p>Display the assignment of shaping-rate adjustments on a scheduler node or queue.</p> <ul style="list-style-type: none"> <li>• <b>Adjusting application</b>—Application that is performing the shaping-rate adjustment. <ul style="list-style-type: none"> <li>• The adjusting application can appear as <b>anclp LS-0</b>, which is the Junos OS Access Node Control Profile process (<b>anclpd</b>) that performs shaping-rate adjustments on schedule nodes.</li> <li>• The adjusting application can also appear as <b>pppoe</b>, 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).</li> </ul> </li> <li>• <b>Adjustment type</b>—Type of adjustment: <b>absolute</b> or <b>delta</b>.</li> <li>• <b>Configured shaping rate</b>—Shaping rate configured for the scheduler node or queue.</li> <li>• <b>Adjustment value</b>—Value of adjusted shaping rate.</li> <li>• <b>Adjustment target</b>—Level of shaping-rate adjustment performed: <b>node</b> or <b>queue</b>.</li> <li>• <b>Adjustment overhead-accounting mode</b>—Configured shaping mode: <b>frame</b> or <b>cell</b>.</li> </ul>

## 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 (T4000 Routers with Type 5 FPCs)

user@host> show class-of-service interface xe-4/0/0

Physical interface: xe-4/0/0, Index: 153  
 Queues supported: 8, Queues in use: 4  
 Shaping rate: 5000000000 bps  
 Scheduler map: <default>, Index: 2  
 Congestion-notification: Disabled

Logical interface: xe-4/0/0.0, Index: 77

Index	Object	Name	Type
13	Classifier	ipprec-compatibility	ip

## 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-scheduler-map, Index: 58414
Input shaping rate: 10000 bps
878674 Input scheduler map: scheduler-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 ge-0/3/0 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:
Total octets      Receive      Transmit
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          high
  2 ef2                         39          19500    0          120
none
  Direction : Input
  CoS transmit queue            Bandwidth          Buffer Priority
Limit                           %          bps      %          usec          low
  0 af3                         30          3000     45          0
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 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-scheduler-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: scheduler-map

Scheduler map: scheduler-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
priority Policing priority
af3      normal
af2      normal
ef2      normal
ef1      normal
af1      normal

ID      Queue  Restricted queue  Fabric
0       0       0               low
1       1       1               low
2       2       2               high
3       3       3               high
4       4       0               low

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
    Output bytes : 0
    Input packets: 0
    Output packets: 0
  Protocol inet, MTU: 1500, Generation: 172, Route table: 0
    Flags: Sendbcst-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: Sendbcst-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              normal      0      0      0      low
af2              normal      1      1      1      low
ef2              normal      2      2      2      high
ef1              normal      3      3      3      high
af1              normal      4      4      0      low

```

### show class-of-service interface (ACX Series Routers)

```

user@host-g11# show class-of-service interface
Physical interface: at-0/0/0, Index: 130
Queues supported: 4, Queues in use: 4
Scheduler map: <default>, Index: 2
Congestion-notification: Disabled

Logical interface: at-0/0/0.0, Index: 69

Logical interface: at-0/0/0.32767, Index: 70

Physical interface: at-0/0/1, Index: 133
Queues supported: 4, Queues in use: 4
Scheduler map: <default>, Index: 2
Congestion-notification: Disabled

Logical interface: at-0/0/1.0, Index: 71

Logical interface: at-0/0/1.32767, Index: 72

Physical interface: ge-0/1/0, Index: 146
Queues supported: 8, Queues in use: 5
Scheduler map: <default>, Index: 2
Congestion-notification: Disabled
Object      Name      Type      Index
Rewrite     dscp-default  dscp      31
Classifier   d1          dscp      11331
Classifier   ci          ieee8021p  583

Logical interface: ge-0/1/0.0, Index: 73
Object      Name      Type      Index
Rewrite     custom-exp  exp (mpls-any)  46413

```

Logical interface: ge-0/1/0.1, Index: 74

Logical interface: ge-0/1/0.32767, Index: 75

Physical interface: ge-0/1/1, Index: 147

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Logical interface: ge-0/1/1.0, Index: 76

Physical interface: ge-0/1/2, Index: 148

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Rewrite	ri	ieee8021p (outer)	35392
Classifier	ci	ieee8021p	583

Physical interface: ge-0/1/3, Index: 149

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Logical interface: ge-0/1/3.0, Index: 77

Object	Name	Type	Index
Rewrite	custom-exp2	exp (mpls-any)	53581

Physical interface: ge-0/1/4, Index: 150

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Physical interface: ge-0/1/5, Index: 151

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Physical interface: ge-0/1/6, Index: 152

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Physical interface: ge-0/1/7, Index: 153

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	d1	dscp	11331

Physical interface: ge-0/2/0, Index: 154

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Physical interface: ge-0/2/1, Index: 155

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Logical interface: ge-0/2/1.0, Index: 78

Logical interface: ge-0/2/1.32767, Index: 79

Physical interface: xe-0/3/0, Index: 156

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Logical interface: xe-0/3/0.0, Index: 80

Physical interface: xe-0/3/1, Index: 157

Queues supported: 8, Queues in use: 5

Scheduler map: <default>, Index: 2

Congestion-notification: Disabled

Object	Name	Type	Index
Classifier	ipprec-compatibility	ip	13

Logical interface: xe-0/3/1.0, Index: 81

[edit]

user@host-g11#

## show class-of-service forwarding-table

---

<b>Syntax</b>	show class-of-service forwarding-table
<b>Syntax (TX Matrix and TX Matrix Plus Router)</b>	show class-of-service forwarding-table <lcc number>   <sfc number>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 11.1 for the QFX Series.
<b>Description</b>	Display the entire class-of-service (CoS) configuration as it exists in the forwarding table. Executing this command is equivalent to executing all <b>show class-of-service forwarding-table</b> commands in succession.
<b>Options</b>	<p><b>lcc number</b>—(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 router (or line-card chassis) configured in the routing matrix.</p> <p>Replace <i>number</i> with the following values depending on the LCC configuration:</p> <ul style="list-style-type: none"><li>• 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.</li><li>• 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.</li><li>• 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.</li><li>• 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.</li></ul> <p><b>sfc number</b>—(TX Matrix Plus routers only) (Optional) Display the forwarding table configuration for the TX Matrix Plus router. Replace <i>number</i> with 0.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show class-of-service forwarding-table on page 123</a> <a href="#">show class-of-service forwarding-table lcc (TX Matrix Plus Router) on page 124</a>
<b>Output Fields</b>	See the output field descriptions for <b>show class-of-service forwarding-table</b> commands: <ul style="list-style-type: none"><li>• <i>show class-of-service forwarding-table classifier</i></li><li>• <i>show class-of-service forwarding-table classifier mapping</i></li><li>• <i>show class-of-service forwarding-table drop-profile</i></li><li>• <i>show class-of-service forwarding-table fabric scheduler-map</i></li><li>• <i>show class-of-service forwarding-table loss-priority-map</i></li></ul>

- *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

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

Entry	Fullness(%)	Drop 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)

<b>Syntax</b>	<code>show interfaces controller ce1-fpc/pic/port</code>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4.
<b>Description</b>	Display the interface names of the physical channelized E1 IQ interface and the channels configured on each interface.
<b>Options</b>	<code>ce1-fpc/pic/port</code> —Basic Rate Interface (BRI) interface name.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show interfaces controller (Channelized E1 IQ with Logical E1) on page 126</a> <a href="#">show interfaces controller (Channelized E1 IQ with Logical DSO) on page 126</a>
<b>Output Fields</b>	Table 7 on page 126 lists the output fields for the <b>show interfaces controller</b> (Channelized E1 IQ) command. Output fields are listed in the approximate order in which they appear.

**Table 7: Channelized E1 IQ show interfaces controller Output Fields**

Field Name	Field Description
<b>Controller</b>	Physical channelized interface name and the names of any channels configured on it.
<b>Admin</b>	Administrative status of the interface.
<b>Link</b>	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 DSO)

```

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- <i>fpc/pic/port</i>
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- <i>fpc/pic/slot</i> —Channelized OC12 IQ or IQE interface name.
Required Privilege Level	view
List of Sample Output	<a href="#">show interfaces controller (Channelized OC12 IQ) on page 127</a>
Output Fields	<a href="#">Table 8 on page 127</a> lists the output fields for the <b>show interfaces controller</b> (Channelized OC12 IQ and IQE) command. Output fields are listed in the approximate order in which they appear.

Table 8: 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	<a href="#">show interfaces controller (Channelized OC3 IQ) on page 129</a>
Output Fields	<a href="#">Table 9 on page 129</a> lists the output fields for the <b>show interfaces controller</b> (Channelized OC3 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 9: 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)

<b>Syntax</b>	<code>show interfaces controller cstm1-<i>fpc/pic/port</i></code>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4.
<b>Description</b>	(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.
<b>Options</b>	<code>cstm1-<i>fpc/pic/slot</i></code> —Channelized STM1 IQ interface name.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show interfaces controller (Physical Channelized STM1 IQ with Logical E1) on page 130</a>
<b>Output Fields</b>	<a href="#">Table 10 on page 130</a> lists the output fields for the <b>show interfaces controller</b> (Channelized STM1 IQ) command. Output fields are listed in the approximate order in which they appear.

**Table 10: Channelized STM1 IQ show interfaces controller Output Fields**

Field Name	Field Description
<b>Controller</b>	Physical channelized interface name and the names of any channels configured on it.
<b>Admin</b>	Administrative status of the interface.
<b>Link</b>	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
cstm1-0/0/0
cau4-0/0/0
  e1-0/0/0:1
  e1-0/0/0:2
  e1-0/0/0:3
  e1-0/0/0:4
  e1-0/0/0:5
  e1-0/0/0:6
  e1-0/0/0:7
  e1-0/0/0:8
  e1-0/0/0:9
  e1-0/0/0:10
  ce1-0/0/0:11
    ds-0/0/0:11:1
    ds-0/0/0:11:2

```

	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)

<b>Syntax</b>	<code>show interfaces controller ct1-fpc/pic/slot</code>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4.
<b>Description</b>	(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.
<b>Options</b>	<code>ct1-fpc/pic/slot</code> —Channelized T1 IQ interface name.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show interfaces controller (T1 IQ) (Clear-Channel T1) on page 132</a> <a href="#">show interfaces controller (T1 IQ) (Channelized DS) on page 132</a>
<b>Output Fields</b>	Table 11 on page 132 lists the output fields for the <b>show interfaces controller</b> (Channelized T1 IQ) command. Output fields are listed in the approximate order in which they appear.

**Table 11: Channelized T1 IQ show interfaces controller Output Fields**

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

<b>Syntax</b>	<code>show interfaces controller ct3-<i>fpc/pic/slot</i></code>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4.
<b>Description</b>	(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.
<b>Options</b>	<code>ct3-<i>fpc/pic /slot</i></code> —Channelized T3 IQ interface name.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show interfaces controller (T3 IQ) on page 134</a>
<b>Output Fields</b>	Table 12 on page 134 lists the output fields for the <b>show interfaces controller</b> (Channelized T3 IQ) command. Output fields are listed in the approximate order in which they appear.

**Table 12: Channelized T3 IQ show interfaces controller Output Fields**

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

## Sample Output

### show interfaces controller (T3 IQ)

```

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

```

	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

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