Channelized OC3 IQ and IQE Interfaces

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Supported Platforms

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

- M Series
- MX Series
- T Series
- J Series

Using the Examples in This Manual

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.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
   ```

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.xsl; }
   ```

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

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

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

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

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

Documentation Conventions

Table 1 on page xi 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 xi defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

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

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

Convention	Description	Examples
Italic text like this	• Introduces or emphasizes important new terms. • Identifies book names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS System Basics Configuration Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	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** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Enclose optional keywords or variables.	**stub <default-metric** *metric***>;**
| (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.	**broadcast | multicast** **(***string1* **|** *string2* **|** *string3***)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	**community name members [** *community-ids* **]**
Indention and braces ({ })	Identify a level in the configuration hierarchy.	**[edit]** **routing-options {** **static {** **route default {** **nexthop** *address*; **retain;** **}** **}** **}**
; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

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

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- 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

CHAPTER 1

Channelized OC3 IQ and IQE Interfaces

Channelized OC3 IQ and IQE Overview

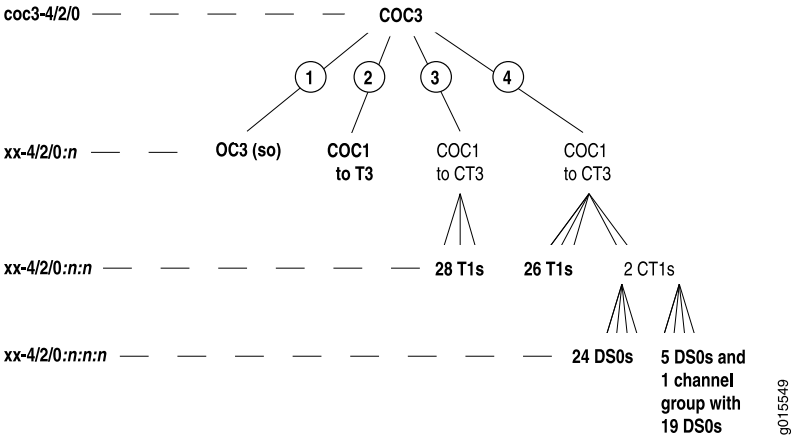
Channelized intelligent queuing (IQ) and channelized enhanced intelligent queuing (IQE) interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than regular channelized interfaces.

On each port of a Channelized OC3 IQ or a Channelized OC3 IQE interface, you can configure the following interface types:

- One OC3 SONET interface
- Up to three T3 interfaces
- Up to 84 T1 interfaces
- Up to three E3 interfaces (COC3 IQE PICs in SDH mode)
- Up to 63 E1 interfaces (COC3 IQE PICs in SDH mode)
- Up to 336 *N*xDS0 interfaces on an M Series router
- Up to 768 *N*xDS0 interfaces on a T Series router

Figure 1 on page 4 shows an example of how a Channelized OC3 PIC might be partitioned. In the figure, the OC3 SONET interface would be a standalone interface because it would use the entire bandwidth of the PIC. The same applies to each port of the 2–port Channelized OC3 Enhanced IQ (IQE) PIC.

Figure 1: Channelized OC3 IQ Interface Example for Show Interfaces Controller



You can configure the following encapsulation types:

- PPP
- Frame Relay
- Cisco HDLC
- CCC
- TCC
- MPLS—On IQE interfaces.

For more information about interface encapsulation, see Configuring Interface Encapsulation on Physical Interfaces and Configuring Interface Encapsulation on Logical Interfaces.

To configure channelized interfaces, include the following statements at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
no-partition interface-type type;
partition partition-number oc-slice oc-slice-range interface-type type;
partition partition-number timeslots time-slot-range interface-type type;
```

PART 2

Configuration

CHAPTER 2

Channelized OC3 IQ and IQE Interfaces

Partitions, OC Slices, Interface Types, and Time Slots

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC3 interfaces, you can configure up to three OC1 interfaces, so the partition number can be **1**, **2**, or **3**. For channelized T3 interfaces (**ct3**), you can configure multiple interfaces at once by including a partition range, such as **1-3**. This creates three T1 interfaces with channel numbers 1 through 3.

NOTE: **For channelized IQ and IQE interfaces, channel numbering begins with 1 (:1). For regular channelized interfaces, channel numbering begins with 0 (:0).**

You configure the OC-slice range for SONET/SDH interfaces only. The OC-slice range is correlated with the bandwidth size required for the interface type you are configuring. For example, a channelized OC3 interface (**coc3**) can be divided into three OC1 interfaces, each containing one OC slice. Therefore the OC-slice value must be **1**, **2**, or **3**.

The configurable interface types are dependent on the hierarchy level at which you include the **interface-type** and **partition** or **no-partition** statements. For example, when you include the **no-partition** statement at the **[edit interfaces coc3-*fpc/pic/port*]** hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface. When you include the **partition** statement at the **[edit interfaces coc1-*fpc/pic/port*]** hierarchy level, the configurable interface types are **ct1** or **t1**. If you want to create a T1 interface, include the **t1** option. If you want to further channelize down to the *N*xDS0 level, include the **ct1** option as an intermediate step before dividing the channelized T1 interface (**ct1**) into *N*xDS0 interfaces.

You configure time slots for fractional T1 interfaces and *N*xDS0 interfaces. You can configure ranges by using hyphens. You can configure discontinuous time slots by using commas. Do not include spaces.

Configuring a Clear Channel on Channelized OC3 IQ and IQE PICs

A *clear channel* is an interface that uses the entire bandwidth of the PIC. To configure a clear channel, include the **no-partition** and **interface-type** statements in the configuration.

On Channelized OC3 IQ and IQE PICs, you can configure one OC3 clear-channel interface per port. To configure an OC3 interface, include the **no-partition** and **interface-type** statements at the **[edit interfaces coc3-*fpc/pic/port*]** hierarchy level:

```
[edit interfaces coc3-fpc/pic/port]
no-partition interface-type so;
```

This configuration creates interface **so-*fpc/pic/port***. When you include the **no-partition** statement at the [edit interfaces **coc3-*fpc/pic/port*]** hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface.

On a 2-port or 4–port Channelized OC3 IQE PIC, you can configure two to four separate OC3 clear-channel interfaces by additionally specifying the port numbers. Configuration is otherwise the same as previously described on a (1-port) Channelized OC3 IQ PIC.

Configuring T3 Interfaces on IQ and IQE Interfaces

To configure a T3 interface on an OC3 PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc3-*fpc/pic/port*]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc3-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

When you include the **partition** statement at the **[edit interfaces coc3-*fpc/pic/port*]** hierarchy level, the only configurable interface type is **coc1**. This configuration creates interface **coc1-*fpc/pic/port*:*channel***.

NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Then, include the **no-partition interface-type** statement at the **[edit interfaces coc1-*fpc/pic/port*:*channel*]** hierarchy level, specifying the **t3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition interface-type t3;
```

This configuration creates interface **t3-*fpc/pic/port*:*channel***.

Example: Configuring T3 Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface **t3-1/1/0:3**.

```
[edit interfaces coc3-1/1/0]
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

For a full configuration example, see the Junos OS Feature Guides.

Configuring T1 and NxDS0 Interfaces

To configure T1 interfaces on a Channelized OC3 IQ or IQE PIC, perform the following tasks:

1. Partition the channelized OC3 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc3-*fpc/pic/port*]** hierarchy level, specifying the **coc1** interface type:

   ```
   [edit interfaces coc3-fpc/pic/port]
   partition partition-number oc-slice oc-slice-range interface-type coc1;
   ```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-*fpc/pic/port:channel*]** hierarchy level, specifying the **t1** interface type:

   ```
   [edit interfaces coc1-fpc/pic/port:channel]
   partition partition-number interface-type t1;
   ```

3. If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the **[edit interfaces coc1-*fpc/pic/port:channel*]** hierarchy level, specifying the **ct3** interface type:

   ```
   [edit interfaces coc1-fpc/pic/port:channel]
   no-partition partition-number interface-type ct3;
   ```

   NOTE: **Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.**

   Note that because the **no-partition** statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

4. To configure T1 interfaces, partition the channelized T3 interface into T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces ct3-*fpc/pic/port:channel*]** hierarchy level, specifying the **t1** interface type:

   ```
   [edit interfaces ct3-fpc/pic/port:channel]
   partition partition-number interface-type t1;
   ```

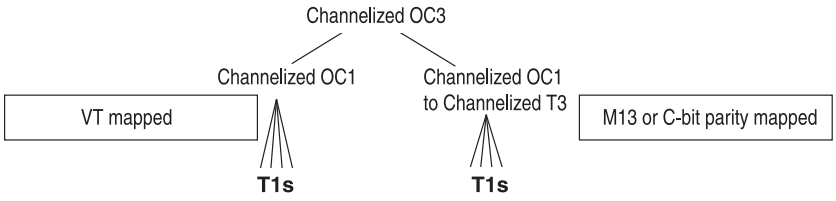
5. To configure *N*xDS0 interfaces, partition the channelized T3 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces ct3-*fpc/pic/port*:*channel*]** hierarchy level and specifying the **ct1** interface type:

   [edit interfaces ct3-*fpc/pic/port*:*channel*]
   partition *partition-number* interface-type ct1;

   NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

   Figure 2 on page 10 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 IQ interfaces.

Figure 2: T1 Interfaces on a Channelized OC3 PIC



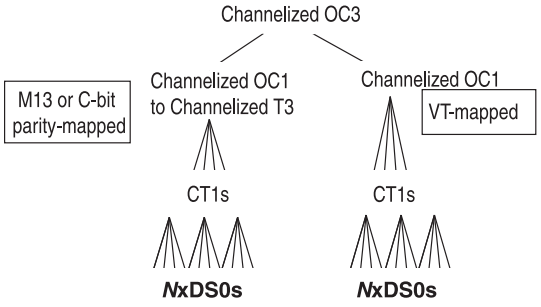
Bold entries correspond to actual packet channels.

6. Configure channelized *N*xDS0 IQ interfaces on the channelized T1 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces ct1-*fpc/pic/port*:*channel*]** hierarchy level, specifying the **ds** interface type:

   [edit interfaces ct1-*fpc/pic/port*:*channel*]
   partition *partition-number* timeslots *time-slot-range* interface-type ds;

Figure 3 on page 10 shows VT-mapped and M13 or C-bit parity-mapped configurations of *N*xDS0 IQ interfaces.

Figure 3: Sample Channelization of OC3 IQ or IQE PIC



Bold entries correspond to actual packet channels.

Example: Configuring T1 and NxDS0 Interfaces

Configure the following T1 interfaces:

```
t1-0/0/0:1:1
t1-0/0/0:1:2
t1-0/0/0:1:3
t1-0/0/0:1:4
t1-0/0/0:1:5
```

VT-Mapped Configuration

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1-5 interface-type t1;
```

M13 or C-bit Parity-Mapped Configuration

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
[edit interfaces ct3-0/0/0:1]
partition 1-5 interface-type t1;
```

Configure the following two *N*xDS0 interfaces with 10 time slots and 4 time slots, respectively:

```
ds-0/0/0:1:2:1
ds-0/0/0:1:2:2
```

VT-Mapped Configuration

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 2 interface-type ct1;
[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;
```

M13 or C-bit Parity-Mapped Configuration

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
[edit interfaces ct3-0/0/0:1]
partition 2 interface-type ct1;
[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;
```

For a full configuration example, see the Junos OS Feature Guides.

Example: Setting Remote Loopback and Running BERT Tests on NxDS0 Interfaces

For Channelized OC3 IQ and IQE PICs, if you need remote loopback on a far-end *N*xDS0 interface, and you are running a BERT test from the local *N*xDS0 interface, you must set remote loopback on the far-end router's associated channelized T1 interface (**ct1**). To do this, include the **loopback remote** statement at the **[edit interfaces ct1-*fpc/picport* t1-options]** hierarchy level. For example:

Local router:

```
[edit interfaces]
ct1-0/0/0:2:2 {
    partition 1 timeslots 1-10 interface-type ds;
    ds-0/0/0:2:2:1 {
        ds0-options {
            bert-period 30;
        }
    }
}
```

Remote router:

```
[edit interfaces]
ct1-0/0/0:2:2 {
    partition 1 timeslots 1-10 interface-type ds;
    t1-options {
        loopback remote;
    }
}
```

Configuring Fractional T1 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC3 IQ or IQE PIC, you must perform the following tasks:

1. Configure a T1 interface on the Channelized OC3 IQ or IQE PIC. For more information, see "Configuring T1 and NxDS0 Interfaces" on page 9.
2. Configure the number of time slots allocated to the T1 IQ interface by including the **timeslots** statement at the **[edit interfaces t1-*fpc/pic/port*<:*channel*> t1-options]** hierarchy level:

   ```
   [edit interfaces t1-fpc/pic/port<:channel> t1-options]
   timeslots time-slot-range;
   ```

For channelized T1 IQ interfaces, the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information, see Configuring Fractional T1 Time Slots.

Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-5,10;
```

For a full configuration example, see the Junos OS Feature Guides.

Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces

For Channelized OC3 IQ or IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the **[edit interfaces *interface-name* ppp-options]** hierarchy level:

```
no-termination-request;
```

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the Junos Services Interfaces Configuration Release 12.3.

CHAPTER 3

Network Interfaces Configuration Statements and Hierarchy

[edit chassis] Hierarchy Level

```
chassis {
  aggregated-devices {
    ethernet {
      device-count number;
    }
    sonet {
      device-count number;
    }
  }
  channel-group number {
    ethernet {
      device-count number;
    }
    fpc slot-number{
      pic pic-number {
        adaptive-services{
          service-package (layer-2 | layer-3);
        }
        aggregate-ports;
        atm-cell-relay-accumulation;
        atm-l2circuit-mode (aal5 | cell | trunk trunk);
        ce1 {
          e1 link-number {
            channel-group group-number;
            timeslots time-slot-range;
          }
        }
        channelization;
        ct1 {
          t1 link-number {
            channel-group group-number;
            timeslots time-slot-range;
```

```
            }
          }
          ct3 {
            port port-number {
              t1 link-number {
                channel-group group-number;
                timeslots time-slot-range;
              }
            }
            framing sdh;
          }
          max-queues-per-interface number;
          mlfr-uni-nni-bundles num-intf;
          no-concatenate;
          shdsl {
            pic-mode (1-port-atm | 2-port-atm);
          }
          vtmapping (klm | itu-t);
        }
      }
      fpc slot-number{
      pic pic-number{
        egress-policer-overhead bytes;
          ingress-policer-overhead bytes;
        }
      }
    }
```

[edit interfaces] Hierarchy Level

The statements at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level can also be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

NOTE: The accounting-profile statement is an exception to this rule. The **accounting-profile** statement can be configured at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level, but it cannot be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

```
interfaces {
  traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable |
      no-world-readable> ;
    flag flag <disable>;
  }
  interface-name {
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
      lacp {
        (active | passive);
```

```
      link-protection {
        disable;
      (revertive | non-revertive);
      periodic interval;
      system-priority priority;
    }
    link-protection;
    link-speed speed;
    (loopback | no-loopback);
    mc-ae{
      chassis-id chassis-id;
      mc-ae-id mc-ae-id;
      mode (active-active | active-standby);
      redundancy-group group-id;
      status-control (active | standby);
    }
    minimum-links number;
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
  }
  aggregated-sonet-options {
    link-speed speed | mixed;
    minimum-links number;
  }
  atm-options {
    cell-bundle-size cells;
    ilmi;
    linear-red-profiles profile-name {
      high-plp-max-threshold percent;
      low-plp-max-threshold percent;
      queue-depth cells high-plp-threshold percent low-plp-threshold percent;
    }
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    pic-type (atm1 | atm2);
    plp-to-clp;
    promiscuous-mode {
      vpi vpi-identifier;
    }
    scheduler-maps map-name {
      forwarding-class class-name {
        epd-threshold cells plp1 cells;
        linear-red-profile profile-name;
        priority (high | low);
        transmit-weight (cells number | percent number);
      }
      vc-cos-mode (alternate | strict);
    }
    use-null-cw;
      vpi vpi-identifier {
      maximum-vcs maximum-vcs;
```

```
      oam-liveness {
        down-count cells;
        up-count cells;
      }
      oam-period (seconds | disable);
      shaping {
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
          burst length);
        queue-length number;
      }
    }
  }
  clocking clock-source;
  data-input (system | interface interface-name);
  dce;
  serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
      control-signal (assert | de-assert | normal);
      cts (ignore | normal | require);
      dcd (ignore | normal | require);
      dsr (ignore | normal | require);
      dtr signal-handling-option;
      ignore-all;
      indication (ignore | normal | require);
      rts (assert | de-assert | normal);
      tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
      control-signal (assert | de-assert | normal);
      cts (ignore | normal | require);
      dcd (ignore | normal | require);
      dsr (ignore | normal | require);
      dtr signal-handling-option;
      ignore-all;
      indication (ignore | normal | require);
      rts (assert | de-assert | normal);
      tm (ignore | normal | require);
    }
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    indication-polarity (negative | positive);
    line-protocol protocol;
    loopback mode;
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);
    transmit-clock invert;
  }
  description text;
  dialer-options {
```

```
    pool pool-name <priority priority>;
  }
  disable;
  ds0-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
  }
  e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
  }
  e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    framing feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (16 | 32);
    framing (g.751 | g.832);
    idle-cycle-flag (filler | shared);
    invert-data;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
    (unframed | no-unframed);
  }
  encapsulation type;
  es-options {
    backup-interface es-fpc/pic/port;
  }
  fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
```

```
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
  }
  flexible-vlan-tagging;
  gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
      local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    no-auto-mdix;
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
    ethernet-switch-profile {
      (mac-learn-enable | no-mac-learn-enable);
      tag-protocol-id [ tpids ];
      ethernet-policer-profile {
        input-priority-map {
          ieee802.1p premium [ values ];
        }
        output-priority-map {
          classifier {
            premium {
              forwarding-class class-name {
                loss-priority (high | low);
              }
            }
          }
        }
        policer cos-policer-name {
          aggregate {
            bandwidth-limit bps;
            burst-size-limit bytes;
          }
          premium {
            bandwidth-limit bps;
            burst-size-limit bytes;
          }
        }
      }
    }
  }
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
```

```
ima-group-options {
  differential-delay number;
  frame-length (32 | 64 | 128 | 256);
  frame-synchronization {
    alpha number;
    beta number;
    gamma number;
  }
  minimum-links number;
  symmetry (symmetrical-config-and-operation |
    symmetrical-config-asymmetrical-operation);
  test-procedure {
    ima-test-start;
    ima-test-stop;
    interface name;
    pattern number;
    period number;
  }
  transmit-clock (common | independent);
  version (1.0 |1.1);
}
ima-link-options group-id group-id;
interface-set interface-set-name {
  interface ethernet-interface-name {
    (unit unit-number | vlan-tags-outer vlan-tag);
  }
  interface interface-name {
    (unit unit-number);
  }
}
isdn-options {
  bchannel-allocation (ascending | descending);
  calling-number number;
  pool pool-name <priority priority>;
  spid1 spid-string;
  spid2 spid-string;
  static-tei-val value;
  switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
  t310 seconds;
  tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
  lmi-type (ansi | itu | c-lmi);
  n391dte number;
  n392dce number;
  n392dte number;
  n393dce number;
  n393dte number;
  t391dte seconds;
  t392dce seconds;
}
lsq-failure-options {
  no-termination-request;
  [ trigger-link-failure interface-name ];
```

```
}
mac mac-address;
mlfr-uni-nni-bundle-options {
  acknowledge-retries number;
  acknowledge-timer milliseconds;
  action-red-differential-delay (disable-tx | remove-link);
  drop-timeout milliseconds;
  fragment-threshold bytes;
  cisco-interoperability send-lip-remove-link-for-link-reject;
  hello-timer milliseconds;
  link-layer-overhead percent;
  lmi-type (ansi | itu | c-lmi);
  minimum-links number;
  mrru bytes;
  n391 number;
  n392 number;
  n393 number;
  red-differential-delay milliseconds;
  t391 seconds;
  t392 seconds;
  yellow-differential-delay milliseconds;
}
modem-options {
  dialin (console | routable);
  init-command-string initialization-command-string;
}
mtu bytes;
multi-chassis-protection {
  peer a.b.c.d {
    interfaceinterface-name;
    }
  }
multiservice-options {
  (core-dump | no-core-dump);
  (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
  interface-type type;
}
no-vpivci-swapping;
otn-options {
  fec (efec | gfec | none);
  (laser-enable | no-laser-enable);
  (line-loopback | no-line-loopback);
  pass-thru;
  rate (fixed-stuff-bytes | no-fixed-stuff-bytes | pass-thru);
  transmit-payload-type number;
  trigger (oc-lof | oc-lom | oc-los | oc-wavelength-lock | odu-ais | odu-bbe-th | odu-bdi
    | odu-es-th | odu-lck | odu-oci | odu-sd | odu-ses-th | odu-ttim | odu-uas-th |
    opu-ptm | otu-ais | otu-bbe-th | otu-bdi | otu-es-th | otu-fec-deg | otu-fec-exe |
    otu-iae | otu-sd | otu-ses-th | otu-ttim | otu-uas-th);
  tti;
}
```

```
optics-options {
   wavelength nm;
   alarm alarm-name {
      (syslog | link-down);
   }
   warning warning-name {
      (syslog | link-down);
   }
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
   chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
   }
   compression {
      acfc;
      pfc;
   }
   dynamic-profile profile-name;
   no-termination-request;
   pap {
      access-profile name;
      local-name name;
      local-password password;
      compression;
   }
}
psn-vcipsn-vci-identifier;
psn-vpipsn-vpi-identifier;
receive-bucket {
   overflow (discard | tag);
   rate percentage;
   threshold bytes;
}
redundancy-options {
   priority sp-fpc/pic/port;
   secondary sp-fpc/pic/port;
   hot-standby;
}
satop-options {
   payload-size n;
}
schedulers number;
serial-options {
   clock-rate rate;
   clocking-mode (dce | internal | loop);
   control-polarity (negative | positive);
   cts-polarity (negative | positive);
   dcd-polarity (negative | positive);
   dce-options {
```

```
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
      }
      dsr-polarity (negative | positive);
      dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
      }
      dtr-circuit (balanced | unbalanced);
      dtr-polarity (negative | positive);
      encoding (nrz | nrzi);
      indication-polarity (negative | positive);
      line-protocol protocol;
      loopback mode;
      rts-polarity (negative | positive);
      tm-polarity (negative | positive);
      transmit-clock invert;
    }
    services-options {
      inactivity-timeout seconds;
      open-timeout seconds;
      session-limit {
        maximum number;
        rate new-sessions-per-second;
        }
        syslog {
        host hostname {
          facility-override facility-name;
          log-prefix prefix-number;
          services priority-level;
        }
      }
    }
    shdsl-options {
      annex (annex-a | annex-b);
      line-rate line-rate;
      loopback (local | remote);
      snr-margin {
        current margin;
        snext margin;
      }
    }
```

```
sonet-options {
   aggregate asx;
   aps {
      advertise-interval milliseconds;
      annex-b;
      authentication-key key;
      fast-aps-switch;
      force;
      hold-time milliseconds;
      lockout;
      neighbor address;
      paired-group group-name;
      preserve-interface;
      protect-circuit group-name;
      request;
      revert-time seconds;
      switching-mode (bidirectional | unidirectional);
      working-circuit group-name;
   }
   bytes {
      c2 value;
      e1-quiet value;
      f1 value;
      f2 value;
      s1 value;
      z3 value;
      z4 value;
   }
   fcs (16 | 32);
   loopback (local | remote);
   mpls {
      pop-all-labels {
         required-depth number;
      }
   }
   path-trace trace-string;
   (payload-scrambler | no-payload-scrambler);
   rfc-2615;
   trigger {
      defect ignore;
      hold-time up milliseconds down milliseconds;
   }
   vtmapping (itu-t | klm);
   (z0-increment | no-z0-increment);
}
speed (10m | 100m | 1g | oc3 | oc12 | oc48);
stacked-vlan-tagging;
switch-options {
   switch-port port-number {
      (auto-negotiation | no-auto-negotiation);
      speed (10m | 100m | 1g);
      link-mode (full-duplex | half-duplex);
   }
}
t1-options {
   bert-algorithm algorithm;
```

```
    bert-error-rate rate;
    bert-period seconds;
    buildout value;
    byte-encoding (nx56 | nx64);
    crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
    crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
    fcs (16 | 32);
    framing (esf | sf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (filler | shared);
    timeslots time-slot-range;
  }
  t3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate
      value>;
    fcs (16 | 32);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    (loop-timing | no-loop-timing);
    loopback (local | payload | remote);
    (mac | no-mac);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
  }
  traceoptions {
    flag flag <flag-modifier> <disable>;
  }
  transmit-bucket {
    overflow discard;
    rate percentage;
    threshold bytes;
  }
  (traps | no-traps);
  unidirectional;
  vlan-tagging;
  vlan-vci-tagging;
  unit logical-unit-number {
    accept-source-mac {
      mac-address mac-address {
        policer {
          input cos-policer-name;
          output cos-policer-name;
        }
      }
    }
```

```
accounting-profile name;
advisory-options {
  downstream-rate rate;
  upstream-rate rate;
}
allow-any-vci;
atm-scheduler-map (map-name | default);
backup-options {
  interface interface-name;
}
bandwidth rate;
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
  rtp {
    f-max-period number;
    maximum-contexts number <force>;
    queues [ queue-numbers ];
    port {
      minimum port-number;
      maximum port-number;
    }
  }
}
compression-device interface-name;
copy-tos-to-outer-ip-header;
demux-destination family;
demux-source family;
demux-options {
  underlying-interface interface-name;
}
description text;
interface {
  l2tp-interface-id name;
  (dedicated | shared);
}
dialer-options {
  activation-delay seconds;
  callback;
  callback-wait-period time;
  deactivation-delay seconds;
  dial-string [ dial-string-numbers ];
  idle-timeout seconds;
  incoming-map {
    caller (caller-id | accept-all);
    initial-route-check seconds;
    load-interval seconds;
    load-threshold percent;
    pool pool-name;
    redial-delay time;
    watch-list {
      [ routes ];
    }
  }
}
disable;
```

```
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
  activation-priority priority;
  bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
  (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
  inner-tag-protocol-id tpid;
  inner-vlan-id number;
  tag-protocol-id tpid;
  vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
  input-policer policer-name;
  input-three-color policer-name;
  output-policer policer-name;
  output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
  down-count cells;
  up-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
  (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
  inner-tag-protocol-id tpid;
  inner-vlan-id number;
  tag-protocol-id tpid;
  vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
  chap {
    access-profile name;
    default-chap-secret name;
    local-name name;
    passive;
  }
```



```
    compression {
      acfc;
      pfc;
      pap;
      default-pap-password password;
      local-name name;
      local-password password;
      passive;
    }
    dynamic-profile profile-name;
    lcp-max-conf-req number;
    lcp-restart-timer milliseconds;
    loopback-clear-timer seconds;
    ncp-max-conf-req number;
    ncp-restart-timer milliseconds;
  }
  pppoe-options {
    access-concentrator name;
    auto-reconnect seconds;
    (client | server);
    service-name name;
    underlying-interface interface-name;
  }
  proxy-arp;
  service-domain (inside | outside);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
      burst length);
    queue-length number;
  }
  short-sequence;
  transmit-weight number;
  (traps | no-traps);
  trunk-bandwidth rate;
  trunk-id number;
  tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
      destination routing-instance-name;
    }
    source source-address;
    ttl number;
  }
  vci vpi-identifier.vci-identifier;
  vci-range start start-vci end end-vci;
  vpi vpi-identifier;
  vlan-id number;
  vlan-id-list [vlan-id vlan-id–vlan-id];
  vlan-id-range number-number;
  vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
  vlan-tags-outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id];
  family family {
    accounting {
      destination-class-usage;
```

```
    source-class-usage {
      direction;
    }
  }
  access-concentrator name;
  address address {
    destination address;
  }
  bundle ml-fpc/pic/port | ls-fpc/pic/port);
  duplicate-protection;
  dynamic-profile profile-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list {
      [ filter-names ];
      output filter-name;
    }
    output-list {
      [ filter-names ];
    }
  }
  ipsec-sa sa-name;
  keep-address-and-control;
  max-sessions number;
  max-sessions-vsa-ignore;
  mtu bytes;
  multicast-only;
  negotiate-address;
  no-redirects;
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  proxy inet-address address;
  receive-options-packets;
  receive-ttl-exceeded;
  remote (inet-address address | mac-address address);
  rpf-check {
    fail-filter filter-name;
    mode loose;
  }
  sampling {
    direction;
  }
  service {
    input {
      service-set service-set-name <service-filter filter-name>;
      post-service-filter filter-name;
    }
    output {
      service-set service-set-names <service-filter filter-name>;
    }
  }
```

```
service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
  maximum-seconds>;
targeted-broadcast {
  forward-and-send-to-re;
  forward-only;
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
translate-plp-control-word-de;
unnumbered-address interface-name <destination address destination-profile
  profile-name | preferred-source-address address>;
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
  multipoint-destination address {
    epd-threshold cells plp1 cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (seconds | disable);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
        rate burst length);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  preferred;
  primary;
  (vrrp-group | vrrp-inet6-group) group-number {
    (accept-data | no-accept-data);
    advertise–interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
      hold-time seconds;
    }
    priority-number number;
    track {
      priority-cost seconds;
      priority-hold-time interface-name {
        bandwidth-threshold bits-per-second {
          priority;
        }
        interface priority;
      }
      route ip-address/mask routing-instance instance-name priority-cost cost;
    }
```

```
                virtual-address [ addresses ];
              }
            }
          }
        }
      }
    }
```

Related Documentation

- *Junos OS Hierarchy and RFC Reference*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

[edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the **[edit logical-systems]** hierarchy level that are also documented in this manual. For more information about logical systems, see the Logical Systems Configuration Guide.

```
logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
      allow-any-vci;
      atm-scheduler-map (map-name | default);
      bandwidth rate;
      backup-options {
        interface interface-name;
      }
      cell-bundle-size cells;
      clear-dont-fragment-bit;
      compression {
        rtp {
          f-max-period number;
          port {
            minimum port-number;
            maximum port-number;
          }
          queues [ queue-numbers ];
        }
      }
      compression-device interface-name;
      description text;
      interface {
        l2tp-interface-id name;
        (dedicated | shared);
      }
```

```
dialer-options {
   activation-delay seconds;
   deactivation-delay seconds;
   dial-string [ dial-string-numbers ];
   idle-timeout seconds;
   initial-route-check seconds;
   load-threshold number;
   pool pool;
   remote-name remote-callers;
   watch-list {
      [ routes ];
   }
}
disable;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
   activation-priority priority;
   bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
input-vlan-map {
   inner-tag-protocol-id;
   inner-vlan-id;
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
   tag-protocol-id tpid;
   vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
   input-policer policer-name;
   input-three-color policer-name;
   output-policer policer-name;
   output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
   up-count cells;
   down-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
   inner-tag-protocol-id;
   inner-vlan-id;
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
   tag-protocol-id tpid;
   vlan-id number;
```

```
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
  chap {
    access-profile name;
    default-chap-secret name;
    local-name name;
    passive;
  }
  compression {
    acfc;
    pfc;
    }
  }
  dynamic-profile profile-name;
  pap {
    default-pap-password password;
    local-name name;
    local-password password;
    passive;
  }
}
proxy-arp;
service-domain (inside | outside);
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
    burst length);
  queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
  backup-destination address;
  destination address;
  key number;
  routing-instance {
    destination routing-instance-name;
  }
  source source-address;
  ttl number;
}
vci vpi-identifier.vci-identifier;
vlan-id number;
vlan-id-list [vlan-id vlan-id–vlan-id]
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id]
vpi vpi-identifier;
family family {
  accounting {
    destination-class-usage;
```

```
    source-class-usage {
      direction;
    }
  }
  bundle interface-name;
  filter {
    group filter-group-number;
    input filter-name;
    input-list {
      [ filter-names ];
    }
    output filter-name;
    output-list {
      [ filter-names ];
    }
  }
  ipsec-sa sa-name;
  keep-address-and-control;
  mtu bytes;
  multicast-only;
  no-redirects;
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  proxy inet-address address;
  receive-options-packets;
  receive-ttl-exceeded;
  remote (inet-address address | mac-address address);
  rpf-check <fail-filter filter-name> {
    <mode loose>;
  }
  sampling {
    direction;
  }
  service {
    input {
      service-set service-set-name <service-filter filter-name>;
      post-service-filter filter-name;
    }
    output {
      service-set service-set-name <service-filter filter-name>;
    }
  }
  (translate-discard-eligible | no-translate-discard-eligible);
  (translate-fecn-and-becn | no-translate-fecn-and-becn);
  unnumbered-address interface-name destination address destination-profile
    profile-name;
  address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
```

```
                multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
                multipoint-destination address {
                  epd-threshold cells plp1 cells;
                  inverse-arp;
                  oam-liveness {
                    up-count cells;
                    down-count cells;
                  }
                  oam-period (seconds | disable);
                  shaping {
                    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
                      rate burst length);
                    queue-length number;
                  }
                  vci vpi-identifier.vci-identifier;
                }
                preferred;
                primary;
                (vrrp-group | vrrp-inet6-group) group-number {
                  (accept-data | no-accept-data);
                  advertise–interval seconds;
                  authentication-type authentication;
                  authentication-key key;
                  fast-interval milliseconds;
                  (preempt | no-preempt) {
                    hold-time seconds;
                  }
                  priority-number number;
                  track {
                    priority-cost seconds;
                    priority-hold-time interface-name {
                      interface priority;
                      bandwidth-threshold bits-per-second {
                        priority;
                      }
                    }
                    route ip-address/mask routing-instance instance-name priority-cost cost;
                  }
                }
                virtual-address [ addresses ];
              }
            }
          }
        }
      }
```

Related Documentation

- *Junos OS Hierarchy and RFC Reference*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

CHAPTER 4

Statement Summary

fast-aps-switch

Syntax fast-aps-switch;

Hierarchy Level [edit interfaces *interface-name* sonet-options aps]

Release Information Statement introduced in Junos OS Release 12.1.

Description (M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

NOTE:

- Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.
- When the **fast-aps-switch** statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.
- To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.
- The **fast-aps-switch** statement cannot be configured when the APS **annex-b** option is configured.
- The interfaces that have the **fast-aps-switch** statement configured cannot be used in virtual private LAN service (VPLS) environments.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Reducing APS Switchover Time in Layer 2 Circuits

interface-type (Interfaces)

Syntax interface-type (bc | coc1 | ct1 | ct3 | dc | ds |so | t1 | t3);

Hierarchy Level [edit interfaces *interface-range name* no-partition],
[edit interfaces *interface-range name* partition *partition-number*],
[edit interfaces *interface-range name* partition *partition-number* oc-slice *oc-slice-range*],
[edit interfaces *interface-range name* partition *partition-number* timeslot *timeslot-range*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For IQ and IQE interfaces only, configure the sublevel interface type.

Options

bc—Dual—Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* timeslot *timeslot-range*]** hierarchy level to create a bearer (B) channel **bc-*pim*/0/*port*:*channel*** interface for each time you want to function as an ISDN PRI B-channel.

coc1—Channelized OC1 interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* oc-slice *oc-slice-range* interface-type coc12-*fpc/pic/port*]** hierarchy level.

ct1—Channelized T1 interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* interface-type ct3-*fpc/pic/port*<:*channel*>]** hierarchy level.

ct3—Channelized T3 interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* oc-slice *oc-slice-range* interface-type coc1-*fpc/pic/port*:*channel* no-partition]** hierarchy level.

dc—Dual-Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* timeslot *timeslot-range*]** hierarchy level to create a (D) channel **dc-*pim*/0/*port*** to control the B-channels.

ds—DS0 interface type. You can specify this interface type at the **[edit interfaces *interface-name*partition *partition-number* interface-type (ce1-*fpc/pic/port* | ct1-*fpc/pic/port*<:*channel*>)]** hierarchy level.

so—SONET/SDH interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* oc-slice *oc-slice-range* interface-type coc12-*fpc/pic/port*]** hierarchy level.

t1—T1 interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* oc-slice *oc-slice-range* interface-type (coc12-*fpc/pic/port* | coc1-*fpc/pic/port*)]** hierarchy level.

t3—T3 interface type. You can specify this interface type at the **[edit interfaces *interface-name* partition *partition-number* oc-slice*oc-slice-range* interface-type (coc12-*fpc/pic/port* | coc1-*fpc/pic/port*:*channel* no-partition)]** hierarchy level.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Channelized E1 IQ and IQE Interfaces Overview
- Channelized OC12/STM4 IQ and IQE Interfaces Overview
- Configuring Channelized T3 IQ Interfaces

no-termination-request

Syntax
no-termination-request;

Hierarchy Level
[edit interfaces *interface-name* ppp-options],
[edit interfaces lsq-*fpc/pic/port* lsq-failure-options]

Release Information
Statement introduced in Junos OS Release 7.4.
Support at the **[edit interfaces *interface-name* ppp-options]** hierarchy level added in Junos OS Release 8.3.

Description
For LSQ PICs or link PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the PIC fails.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Link PIC Failover on Channelized OC3 IQ and IQE Interfaces on page 13
- Configuring Link PIC Failover on Channelized OC12/STM4 IQ and IQE Interfaces
- Configuring Link PIC Failover on Channelized STM1 Interfaces
- Junos Services Interfaces Configuration Release 12.3

oc-slice

Syntax oc-slice *oc-slice-range*;

Hierarchy Level [edit interfaces *interface-name* partition *partition-number*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For channelized OC12 IQ interfaces only, configure the range of SONET/SDH slices.

Default If you do not include either this statement or the **no-partition** statement, the Channelized OC12 IQ PICs not partitioned, and no data channels are configured.

Options ***oc-slice-range***—Range of SONET/SDH slices. OC3 interfaces must occupy three consecutive OC slices per interface, in the form 1–3, 4–6, 7–9, or 10–12. The T3, T1, and DS0 interface types each occupy one OC slice per interface.

Range: For OC3 interfaces,1–3, 4–6, 7–9, or 10–12; for SONET/SDH and T3 interfaces, 1–12

The remaining statement is explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelized OC12/STM4 IQ and IQE Interfaces Overview

partition

Syntax partition *partition-number* oc-slice *oc-slice-range* interface-type *type* timeslots *time-slot-range*;

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For IQ interfaces and J Series interfaces on the Dual-Port Channelized E1 and T1PIM, configure the channelized interface partition. The partition number is correlated with the channel number. Partition and channel numbering on IQ interfaces begins with **:1**, not **:0**.

Default If you omit this statement, the channelized PIC or PIM is not partitioned, and no data channels are configured.

Options ***partition-number***—Sublevel interface partition index.

Range:

- 1 through 4 for an OC3 interface on a channelized OC12 IQ interface.
- 1 through 12 for a T3 interface on a channelized OC12 IQ interface.
- 1 through 4 for a T3 interface on a channelized T3 IQ interface.
- 1 through 28 for a T1 IQ interface on a channelized OC12 IQ or channelized T3 IQ interface.
- 1 through 10 for an E1 interface on a channelized E1 IQ interface.
- 1 through 30 on a channelized E1 interface.
- 1 through 23 on a channelized T1 interface.
- 1 through 24 for *N*xDS0 interfaces on either channelized OC12 IQ or channelized DS3 IQ interfaces.
- 0 through 31(with 0 reserved for framing) for *N*xDS0 interfaces on channelized E1 IQ interfaces.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelized E1 IQ and IQE Interfaces Overview
- Channelized OC12/STM4 IQ and IQE Interfaces Overview
- Configuring Channelized T3 IQ Interfaces
- no-partition on page 44

timeslots

Syntax timeslots *time-slot-range*;

Hierarchy Level [edit interfaces e1-*fpc/pic/port*],
[edit interfaces t1-*fpc/pic/port*],
[edit interfaces *interface-name* e1-options],
[edit interfaces *interface-name* partition *partition-number*],
[edit interfaces *interface-name* t1-options]

Release Information Statement introduced before Junos OS Release 7.4.

Description For E1 and T1interfaces, allocate the specific time slots by number.

NOTE: When configuring E1 or T1 interfaces on the 10-port Channelized E1/T1 IQE PIC, the **timeslots** statement must be included at the **[edit interfaces e1-*fpc/pic/port*]** or **[edit interfaces t1-*fpc/pic/port*]** hierarchy level as appropriate.

Options ***time-slot-range***—Actual time slot numbers allocated:

Range: Ranges vary by interface type and configuration option as follows:

- 1 through 24 for T1 interfaces (0 is reserved)
- 1 through 31 for 4-port E1 PICs (0 is reserved)
- 1 through 31 for *Nx*DS0 interfaces (0 is reserved)
- 2 through 32 for 10-port Channelized E1 and 10-port Channelized E1 IQ PICs (1 is reserved)
- 2 through 32 for the setting under **e1-options** with IQE PICs (1 is reserved) (when creating fractional E1)
- 1 through 31 for the setting under **partition** with IQE PICs (0 is reserved) (when creating *Nx*DS0)

NOTE: When creating fractional E1 interfaces only, if you connect a 4-port E1 PIC interface to a device that uses time slot numbering from 2 through 32, you must subtract 1 from the configured number of time slots.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Fractional E1 IQ and IQE Interfaces
- Configuring Fractional T1 IQ and IQE Interfaces

- Configuring Fractional E1 Time Slots
- Configuring Fractional T1 Time Slots
- Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots

no-partition

Syntax no-partition interface-type (e1 | (cau4 | so) | (ct3 | t3) | so | t3);

Hierarchy Level [edit interfaces ce1-*fpc/pic/port*],
[edit interfaces coc1-*fpc/pic/port*:*channel*],
[edit interfaces coc12-*fpc/pic/port*],
[edit interfaces cstm1-*fpc/pic/port*],
[edit interfaces ct3-*fpc/pic/port*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For Channelized E1 IQ PICs only, configure the channelized E1 interface as an unpartitioned, clear channel.

For Channelized OC12 PIC only, convert the channelized OC1 IQ interface into a channelized T3 interface or a T3 interface. You perform this configuration task for C-bit parity and M13-mapped configurations.

For Channelized OC12 IQ PICs only, configure the channelized OC12 interface as an unpartitioned, clear channel.

For Channelized STM1 PIC only, convert the channelized STM1 IQ interface into a channelized Administrative Unit 4 (AU-4) interface or a SONET/SDH STM1 interface.

For Channelized DS3 PIC only, configure the channelized T3 interface as an unpartitioned, clear channel.

Default If you do not include either this statement or the **partition** statement, the Channelized IQ PIC is not partitioned, and no data channels are configured.

Options The option used must correspond to the physical interface type:

e1—E1 interface type.

coc12 so—Channelized OC12 interface type, in SONET mode.

cau4—Channelized AU-4 interface type.

cstm1—SONET/SDH STM1 interface type, in SDH mode.

ct3—Channelized T3 interface type.

t3—T3 interface type.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelized E1 IQ and IQE Interfaces Overview
- Channelized OC12/STM4 IQ and IQE Interfaces Overview
- Configuring an OC12/STM4 Interface

- Configuring Channelized STM1 IQ and IQE Interfaces
- Configuring T3 IQ Interfaces
- partition on page 41
- no-partition

PART 3

Administration

CHAPTER 5

Monitoring Commands

show interfaces (Channelized OC3 IQ and IQE)

Syntax

show interfaces (*type-fpc/pic/port* <:*channel*><:*channel*><:*channel*>)
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced before Junos OS Release 7.4.

Description

(M Series and T Series routers only) Display status information about the specified channelized OC3 IQ or IQE interface.

Options

type-fpc/pic/port*:*channel*:*channel*:*channel—Interface type with optional corresponding channel levels. The interface type can be one of the following:

- ***type-fpc/pic/port***—For the physical interface, ***type*** is **coc3**. For the clear channel, ***type*** is **so** (for OC3).
- ***type-fpc/pic/port*:*channel***—At the first level of channelization, ***type*** can be **coc1** (channelized OC1), **ct3** (from **coc1**), or **t3** (from **coc1**).
- ***type-fpc/pic/port*:*channel*:*channel***—At the second level of channelization, ***type*** can be **ct1** (from **coc1** or **ct3**) or **t1** (from **coc1** or **ct3**).
- ***type-fpc/pic/port*:*channel*:*channel*:*channel***—At the third level of channelization, ***type*** can be **ds** (from **ct1**).

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level

view

List of Sample Output

show interfaces extensive (Channelized OC3 IQ) (Physical) on page 65
show interfaces extensive (Channelized OC1 on Channelized OC3 IQ) on page 65
show interfaces extensive (Channelized T1 on Channelized OC3 IQ) on page 66
show interfaces extensive (DS0 on Channelized OC3 IQ) on page 67

Output Fields

Table 3 on page 51 lists the output fields for the **show interfaces** (all Channelized OC interfaces) command. Output fields are listed in the approximate order in which they appear.

Table 3: Channelized OC show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the "Enabled Field" section under Common Output Fields Description.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Description	Interface description.	All levels
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	SONET/SDH reference clock source. It can be **Internal** or **External**. Clocking is configured and displayed only for channel 0.	All levels
***Framing* mode**	Framing mode: **SONET** or **SDH**.	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Whether loopback is enabled and the type of loopback (**local** or **remote**).	All levels
SONET loopback	Whether loopback is enabled on a SONET/SDH interface, and the type of loopback (**local** or **remote**).	All levels
FCS	Frame check sequence on the interface (either **16** or **32**). The default is **16-bit**.	All levels
Payload scrambler	Whether payload scrambling is enabled.	All levels
Parent	Name and interface index of the interface to which a particular child interface belongs. **None** indicates that this interface is the top level.	All levels
Device flags	Information about the physical device. Possible values are described in the "Device Flags" section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the "Interface Flags" section under Common Output Fields Description.	All levels
Link flags	Information about the link. Possible values are described in the "Link Flags" section under Common Output Fields Description.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
ANSI or ITU LMI settings	(Frame Relay) Settings for Local Management Interface (LMI). The format is **(ANSI or ITU) LMI settings: *value*, *value*... *nn*** seconds, where ***value*** can be: • **n391dte**—DTE full status polling interval (1–255) • **n392dce**—DCE error threshold (1–10) • **n392dte**—DTE error threshold (1–10) • **n393dce**—DCE monitored event count (1–10) • **n393dte**—DTE monitored event count (1–10) • **t391dte**—DTE polling timer (5–30 seconds) • **t392dce**—DCE polling verification timer (5–30 seconds)	All levels
LMI statistics	(Frame Relay) Statistics about the link management. • **Input**—Number of packets coming in on the interface (*nn*) and how much time has passed since the last packet arrived. The format is **Input: *nn* (last sent *hh*:*mm*:*ss* ago)**. • **Output**—Number of packets sent out on the interface (*nn*) and how much time has passed since the last packet was sent. The format is **Output: *nn* (last sent *hh*:*mm*:*ss* ago)**.	**detail extensive**
DTE statistics	(Frame Relay) Statistics about messages transmitted from the data terminal equipment (DTE) to the data circuit-terminating equipment (DCE): • **Enquiries sent**—Number of link status enquiries sent from the DTE to the DCE. • **Full enquiries sent**—Number of full enquiries sent from the DTE to the DCE. • **Enquiry responses received**—Number of enquiry responses received by the DTE from the DCE. • **Full enquiry responses received**—Number of full enquiry responses sent from the DTE to the DCE.	**detail extensive** none
DCE statistics	(Frame Relay) Statistics about messages transmitted from the DCE to the DTE: • **Enquiries received**—Number of enquiries received by the DCE from the DTE. • **Full enquiries received**—Number of full enquiries received by the DCE from the DTE. • **Enquiry responses sent**—Number of enquiry responses sent from the DCE to the DTE. • **Full enquiry responses sent**—Number of full enquiry responses sent from the DCE to the DTE.	**detail extensive** none
Common statistics	(Frame Relay) Statistics about messages sent between the DTE and the DCE: • **Unknown messages received**—Number of received packets that do not fall into any category. • **Asynchronous updates received**—Number of link status peer changes received. • **Out-of-sequence packets received**—Number of packets for which the sequence of the packets received is different from the expected sequence. • **Keepalive responses timedout**—Number of keepalive responses that timed out when no LMI packet was reported for **n392dte** or **n393dce** intervals. (See **LMI settings**.)	**detail extensive** none

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Nonmatching DCE-end DLCIs	(Frame Relay) Number of DLCIs configured from the DCE, displayed only from the DTE.	**detail extensive** none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped:** ***year-month-day hh:mm:ss timezone year-month-day (hh:mm:ss*** **ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)**.	**detail extensive** none
CoS Queues	Number of CoS queues configured.	**detail extensive** none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
DS1 alarms **DS1 defects**	E1or T1 media-specific defects that can 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 turn on the red or yellow alarm LED on the craft interface. See the following list for all possible alarms and defects. For complete explanations of most of these alarms and defects, see *Bellcore Telcordia GR-499-CORE*. • **LOS**—Loss of signal. • **LOF**—Loss of frame. • **AIS**—Alarm indication signal. • **YLW**—Yellow alarm. Indicates errors at the remote site receiver.	**detail extensive** none

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
T1 media	Counts of T1 or E1 media-specific errors. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. The T1 or E1 media-specific error types are: • **SEF**—Severely errored framing • **BEE**—Bit error • **AIS**—Alarm indication signal • **LOF**—Loss of frame • **LOS**—Loss of signal • **YELLOW**—Errors at the remote site receiver • **BPV**—Bipolar violation • **EXZ**—Excessive zeros • **LCV**—Line code violation • **PCV**—Pulse code violation • **CS**—Carrier state • **FEBE**—Far-end block error (E1 only) • **LES**—Line error seconds • **ES**—Errored seconds • **BES**—Bit error seconds • **SES**—Severely errored seconds • **SEFS**—Severely errored framing seconds • **UAS**—Unavailable seconds	**extensive**
Traffic statistics	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Input errors	Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Giants**—Number of frames received that are larger than the giant threshold. • **Bucket Drops**—Drops caused by traffic load exceeding the interface transmit/receive leaky bucket configuration. The default is off. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **HS link CRC errors**—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • **SRAM errors**—Number of hardware errors that occurred in the static RAM (SRAM) on the PIC. If the value of this field increments, the PIC is malfunctioning. • **HS link FIFO overflows**—Number of FIFO overflows on the high-speed links between the ASICs responsible for handling the router interfaces. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions** —Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Aged packets**—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • **HS link FIFO underflows**—Number of FIFO underflows on the high-speed links between the ASICs responsible for handling the router interfaces. • **MTU errors**—Number of packets whose size exceeds the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues	Total number of egress queues supported on the specified interface.	**detail extensive**
Queue counters	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**detail extensive**
Active alarms **Active defects**	Defects that can prevent the interface from passing packets: • **None**—There are no active defects or alarms. • **LOF**—Loss of frame.	**detail extensive**
SONET alarms **SONET defects**	Media-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router or light the red or yellow alarm LED on the craft interface. See these fields for possible alarms and defects: **SONET PHY**, **SONET section**, **SONET line**, and **SONET path**.	All levels

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SONET vt	SONET virtual-tributary (VT) alarms and defects: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-V**—Remote error indication (near-end VT) • **LOP-V**—Loss of pointer (near-end VT) • **AIS-V**—Alarm indication signal (near-end VT) • **RDI-V**—Remote defect indication (near-end VT) • **UNEQ-V**—Unequipped (near-end VT) • **PLM-V**—Payload label mismatch (near-end VT) • **ES-V**—Errored seconds (near-end VT) • **SES-V**—Severely errored seconds (near-end VT) • **UAS-V**—Unavailable seconds (near-end VT) • **ES-VFE**—Errored seconds (far-end VT) • **SES-VFE**—Severely errored seconds (far-end VT) • **UAS-VFE**—Unavailable seconds (far-end VT)	**extensive**
SONET PHY	Counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **PLL Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**
SONET section	Counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOS**—Loss of signal • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

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

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Received SONET overhead **Transmitted SONET overhead**	Values of the received and transmitted SONET/SDH overhead: **F1**—Section user channel byte. This byte is set aside for the purposes of users. **S1**—Synchronization Status (S1). The S1 byte is located in the first STS-1 of an STS-*N*. Bits 5 through 8 convey the synchronization status of the network element. **Z3** and **Z4**—Path overhead. **V5**—Virtual Tributary (VT) path overhead byte.	**extensive**
SDH alarms **SDH defects**	SDH media-specific defects that can 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: SDH PHY, SDH regenerator section, SDH multiplex section, and SDH path. NOTE: For controller based SONET PICs, the SDH alarms and SDH defects output in the **show interface coc3 extensive** command output only shows the section and line level defects. The path level defects can be found under the SONET (so) interface output.	All levels
SDH PHY	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **PLL Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**
SDH regenerator section	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **RS-BIP8**—24-bit BIP for multiplex section overhead (B2 bytes) • **OOF**—Out of frame • **LOS**—Loss of signal • **LOF**—Loss of frame • **RS-ES**—Errored seconds (near-end regenerator section) • **RS-SES**—Severely errored seconds (near-end regenerator section) • **RS-SEFS**—Severely errored framing seconds (regenerator section)	**extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SDH multiplex section	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **MS-BIP24**—8-bit BIP for high-order path overhead (B3 byte) • **MS-FEBE**—Far-end block error (multiplex section) • **MS-FERF**—Far-end remote fail (multiplex section) • **MS-AIS**—alarm indication signal (multiplex section) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **MS-ES**—Errored seconds (near-end multiplex section) • **MS-SES**—Severely errored seconds (near-end multiplex section) • **MS-UAS**—Unavailable seconds (near-end multiplex section) • **MS-ES-FE**—Errored seconds (far-end multiplex section) • **MS-SES-FE**—Severely errored seconds (far-end multiplex section) • **MS-UAS-FE**—Unavailable seconds (far-end multiplex section	**extensive**
SDH path	Active alarms and defects, plus counts of specific SDH errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **HP-BIP8**—8-bit BIP for regenerator section overhead (B1 byte) • **HP-FEBE**—Far-end block error (high-order path) • **HP-LOP**—Loss of pointer (high-order path) • **HP-AIS**—High-order-path alarm indication signal • **HP-FERF**—Far-end remote fail (high-order path) • **HP-UNEQ**—Unequipped (high-order path) • **HP-PLM**—Payload label mismatch (high-order path) • **HP-ES**—Errored seconds (near-end high-order path) • **HP-SES**—Severely errored seconds (near-end high-order path) • **HP-UAS**—Unavailable seconds (near-end high-order path) • **HP-ES-FE**—Errored seconds (far-end high-order path) • **HP-SES-FE**—Severely errored seconds (far-end high-order path) • **HP-UAS-FE**—Unavailable seconds (far-end high-order path)	**extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Received SDH overhead **Transmitted SDH overhead**	Values of the received and transmitted SONET overhead: • **C2**—Signal label. Allocated to identify the construction and content of the STS-level SPE and for PDI-P. • **F1**—Section user channel byte. This byte is set aside for the purposes of users. • **K1** and **K2**—These bytes are allocated for APS signaling for the protection of the multiplex section. • **J0**—Section trace. This byte is defined for STS-1 number 1of an STS-*N* signal. Used to transmit a 1-byte fixed-length string or a 16-byte message so that a receiving terminal in a section can verify its continued connection to the intended transmitter. • **S1**—Synchronization status. The S1 byte is located in the first STS-1 of an STS-*N*. • **Z3** and **Z4**—Allocated for future use.	**extensive**
Received path trace **Transmitted path trace**	Channelized OC12 interfaces allow path trace bytes to be sent inband across the SONET/SDH link. 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. This information is specific to each of the 12 channelized OC12 interfaces.	**extensive**
DS3 media	Counts of T3 media-specific errors. For detailed definitions of the T3 (DS-3) error events (BPV, EXZ, LCV, PCV, and CCV) and performance parameters (LES, PES, PSES, CES, CSES, SEFS, and UAS), see RFC 2496. The DS3 or E3 media-specific error types can be: • **PLL Lock**—Phase-locked loop out of lock • **Reframing**—Frame alignment recovery time • **AIS**—Alarm indication signal • **LOF**—Loss of frame • **LOS**—Loss of signal • **IDLE**—Idle code detected • **YELLOW**—Errors at the remote site receiver • **BPV**—Bipolar violation • **EXZ**—Excessive zeros • **LCV**—Line code violation • **PCV**—(DS3 only) Pulse code violation • **CCV**—(DS3 only) C-bit coding violation • **FEBE**—(DS3 only) Far-end block error • **LES**—Line error seconds • **PES**—(DS3 only) P-bit errored seconds • **PSES**—(DS3 only) P-bit errored seconds (section) • **CES**—(DS3 only) C-bit errored seconds • **CSES**—(DS3 only) C-bit severely errored seconds • **SEFS**—Severely errored framing seconds • **UAS**—Unavailable seconds	**extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
HDLC configuration	Information about the HDLC configuration. • **Policing bucket**—Configured state of the receiving policer. • **Shaping bucket**—Configured state of the transmitting shaper. • **Giant threshold**—Giant threshold programmed into the hardware. • **Runt threshold**—Runt threshold programmed into the hardware. • **Timeslots**—Configured time slots for the interface. • **Line encoding**—Line encoding used. It is always **HDB3**. • **Byte encoding**—(T1 only) Byte encoding used: **Nx64K** or **Nx56K**. • **Line encoding**—Line encoding used. For T1, the value can be **B8ZS** or **AMI**. For E1, the value is **HDB3**. • **Data inversion**—HDLC data inversion setting: **Enabled** or **Disabled**. • **Idle cycle flag**—Idle cycle flags. • **Start end flag**—Start and end flag.	**extensive**
Interface transmit queues	Name of the transmit queues and their associated statistics for each DS3 channel on the Channelized OC12 PIC. • **B/W**—Queue bandwidth as a percentage of the total interface bandwidth. • **WRR**—Weighted round-robin (in percent). • **Packets**—Number of packets transmitted. • **Bytes**—Number of bytes transmitted. • **Drops**—Number of packets dropped. • **Errors**—Number of packet errors.	**extensive**
DSU configuration	Information about the DSU configuration. The last three lines (**Bit count**, **Error bit count**, and **LOS information**) are displayed only if a BERT has ever been run on the interface. • **Compatibility mode**—CSU/DSU compatibility mode: **None**, **Larscom**, **Kentrox**, or **Digital-Link**. • **Scrambling**—Payload scrambling. It can be **Enabled** or **Disabled**. • **Subrate**—Configured subrate setting. Applies only when**Digital-Link** compatibility mode is used. It can be **Disabled** or display units in kbps. • **FEAC loopback**—(T3) Whether a far-end alarm and control (FEAC) loopback is **Active** or **Inactive**. This feature is used to send alarm or status information from the far-end terminal back to the near-end terminal and to initiate T3 loopbacks at the far-end terminal from the near-end terminal. • **Response**—Whether the FEAC signal is **Enabled** or **Disabled**. • **Count**—Number of FEAC loopbacks.	**extensive**
BERT configuration	(DS interfaces) BERT (bit error rate test) checks the quality of the line. This output appears only when a BERT is run on the interface. • **BERT time period**—Configured total time period that the BERT is to run. • **Elapsed**—Actual time elapsed since the start of the BERT (in seconds). • **Induced error rate**—Configured rate at which the bit errors are induced in the BERT pattern. • **Algorithm**—Type of algorithm selected for the BERT.	**detail extensive** none

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number. • **PLP byte**—Packet Level Protocol byte.	**extensive**
CoS information	Information about the CoS queue for the physical interface. • **CoS transmit queue**—Queue number and its associated user-configured forwarding class name. • **Bandwidth %**—Percentage of bandwidth allocated to the queue. • **Bandwidth bps**—Bandwidth allocated to the queue (in bps). • **Buffer %**—Percentage of buffer space allocated to the queue. • **Buffer usec**—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • **Priority**—Queue priority: **low** or **high**. • **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.	**extensive**
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	Logical interface SNMP interface index number.	**detail extensive** none
Flags	Information about the logical interface. Possible values are described in the "Logical Interface Flags" section under Common Output Fields Description.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Traffic statistics	Total number of bytes and packets received and transmitted on the logical interface. These statistics are the sum of the local and transit statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize. • **Input rate**—Rate of bits and packets received on the interface. • **Output rate**—Rate of bits and packets transmitted on the interface.	**detail extensive**
Local statistics	Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	**detail extensive**

Table 3: Channelized OC show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Transit statistics	Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	**detail extensive**
Protocol	Protocol family configured on the logical interface, such as **iso**, **inet6**, or **mpls**.	**detail extensive** none
Multilink bundle	(If the logical interface is configured as part of a multilink bundle.) Interface name for the multilink bundle.	**detail extensive** none
MTU	MTU size on the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route table	Routing table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive**
Addresses, Flags	Information about the address flags. Possible values are described in the "Addresses Flags" section under Common Output Fields Description.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none
Broadcast	Broadcast address.	**detail extensive** none
DLCI	(Frame Relay) DLCI number of the logical interface. The following DLCI information is displayed: **Flags**, **Total down time**, **Last down**, and **Traffic statistics**. **Flags** is one or more of the following: • **Active**—Set when the link is active and the DTE and DCE are exchanging information. • **Down**—Set when the link is active, but no information is received from the DCE. • **Unconfigured**—Set when the corresponding DLCI in the DCE is not configured. • **Configured**—Set when the corresponding DLCI in the DCE is configured. • **Dce-configured**—Displayed when the command is issued from the DTE.	**detail extensive** none
DLCI statistics	(Frame Relay) Data-link connection identifier (DLCI) statistics. • **Active DLCI**—Number of active DLCIs. • **Inactive DLCI**—Number of inactive DLCIs.	**detail extensive** none

Sample Output

show interfaces extensive (Channelized OC3 IQ) (Physical)

```
user@host> show interfaces extensive coc3-0/0/0
Physical interface: coc3-0/0/0, Enabled, Physical link is Down
  Interface index: 128, SNMP ifIndex: 22, Generation: 11
  Description: pink coc3-0/0/0
  Link-level type: Controller, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, Parent: None
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2005-01-27 16:39:21 PST (1w0d 22:09 ago)
  Statistics last cleared: Never
  SONET alarms   : PLL, LOS
  SONET defects  : PLL, LOF, LOS, SEF, AIS-L
  SONET PHY:            Seconds        Count  State
    PLL Lock             681767            1  PLL Lock Error
    PHY Light                 0            0  OK
  SONET section:
    BIP-B1                    0            0
    SEF                  681767            1  Defect Active
    LOS                  681767            1  Defect Active
    LOF                  681767            1  Defect Active
    ES-S                 681767
    SES-S                681767
    SEFS-S               681767
  SONET line:
    BIP-B2                    0            0
    REI-L                     0            0
    RDI-L                     0            0  OK
    AIS-L                681767            1  Defect Active
    BERR-SF                   0            0  OK
    BERR-SD                   0            0  OK
    ES-L                 681767
    SES-L                681767
    UAS-L                681757
    ES-LFE                    0
    SES-LFE                   0
    UAS-LFE                   0
  Received SONET overhead:
    F1      : 0x00, J0      : 0x00, K1      : 0xff, K2      : 0xff
    S1      : 0xff
  Transmitted SONET overhead:
    F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
    S1      : 0x00
```

show interfaces extensive (Channelized

```
user@host> show interfaces extensive coc1-0/0/0:1
Physical interface: coc1-0/0/0:1, Enabled, Physical link is Down
  Interface index: 133, SNMP ifIndex: 27, Generation: 16
```

OC1 on Channelized OC3 IQ)

```
  Link-level type: Controller, Clocking: Internal, SONET mode, Speed: 51840kbps,

   Loopback: None, Parent: coc3-0/0/0
Interface index 128
 Device flags   : Present Running Down 16384
 Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
 Link flags     : None
 Hold-times     : Up 0 ms, Down 0 ms
 CoS queues     : 4 supported
 Last flapped   : 2005-02-04 14:51:07 PST (00:00:35 ago)
 Statistics last cleared: Never
 SONET alarms   : None
 SONET defects  : AIS-P
 SONET path:
   BIP-B3                    0           0
   REI-P                     0           0
   LOP-P                     0           0  OK
   AIS-P                    36           1  Defect Active
   RDI-P                     0           0  OK
   UNEQ-P                    0           0  OK
   PLM-P                     0           0  OK
   ES-P                     36
   SES-P                    36
   UAS-P                    26
   ES-PFE                    0
   SES-PFE                   0
   UAS-PFE                   0
 Received SONET overhead:
   C2      : 0xff, C2(cmp) : 0x01, F2      : 0x00, Z3      : 0x00
   Z4      : 0x00, S1(cmp) : 0x00
 Transmitted SONET overhead:
   C2      : 0x01, F2      : 0x00, Z3      : 0x00, Z4      : 0x00
 Received path trace:
   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 00 00 00 ................
   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
 Transmitted path trace: router-1 coc1-0/0/0:1
   6b 61 76 65 72 69 20 63 6f 63 31 2d 30 2f 30 2f   router-1 coc1-0/0/0:1
   30 3a 31 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 ................
 Packet Forwarding Engine configuration:
   Destination slot: 0 (0x00)
```

show interfaces extensive (Channelized

```
user@host> show interfaces extensive ct1-0/0/0:1:1
Physical interface: ct1-0/0/0:1:1, Enabled, Physical link is Down
  Interface index: 134, SNMP ifIndex: 62, Generation: 17
```

T1 on Channelized OC3 IQ)

```
  Link-level type: Controller, Clocking: Internal, Speed: T1, Loopback: None,
  Framing: ESF, Parent: coc1-0/0/0:1 Interface index 133
  Device flags   : Present Running Down 16384
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  CoS queues     : 4 supported
  Last flapped   : 2005-02-04 14:54:35 PST (00:00:18 ago)
  Statistics last cleared: Never
  DS1   alarms   : None
  DS1   defects  : AIS, LOF
  T1  media:            Seconds        Count  State
    SEF                       1            1  OK
    BEE                       1            1  OK
    AIS                      18            1  Defect Active
    LOF                      18            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                      18
    ES                       18
    SES                      18
    SEFS                     18
    BES                       0
    UAS                      14
  DS1 BERT configuration:
    BERT time period: 10 seconds, Elapsed: 0 seconds
    Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
  SONET alarms   : None
  SONET defects  : None
  SONET vt:
    BIP-BIP2                  0            0
    REI-V                     0            0
    LOP-V                     0            0  OK
    AIS-V                    19            1  Defect Active
    RDI-V                    19            1  Defect Active
    UNEQ-V                    0            0  OK
    PLM-V                    19            1  Defect Active
    ES-V                     19
    SES-V                    19
    UAS-V                     9
    ES-VFE                    0
    SES-VFE                   0
    UAS-VFE                   0
  Received SONET overhead:
    V5      : 0x07, V5(cmp) : 0x02
  Transmitted SONET overhead:
    V5      : 0x02
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
```

show interfaces extensive (DS0 on Channelized OC3 IQ)

```
user@host> show interfaces extensive ds-0/0/0:1:1:1
Physical interface: ds-0/0/0:1:1:1, Enabled, Physical link is Down
  Interface index: 135, SNMP ifIndex: 63, Generation: 18
  Link-level type: PPP, MTU: 1504, Clocking: Internal, Speed: 320kbps,
  Loopback: None, FCS: 16, Parent: ct1-0/0/0:1:1  Interface index 134
  Device flags   : Present Running
```

```
Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
CoS queues     : 4 supported
Last flapped   : Never
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,
  Policed discards: 0, L3 incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, HS link CRC errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
   Resource errors: 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

HDLC configuration:
  Giant threshold: 1514, Runt threshold: 2
  Timeslots      : 1-5
  Byte encoding: Nx64K, Data inversion: Disabled, Idle cycle flag: flags,
  Start end flag: shared
DS0 BERT configuration:
  BERT time period: 10 seconds, Elapsed: 0 seconds
  Induced Error rate: 10e-0, Algorithm: 2^15 - 1, O.151, Pseudorandom (9)
Packet Forwarding Engine configuration:
  Destination slot: 0, PLP byte: 4 (0x00)
```

show interfaces controller (Channelized OC3 IQ and IQE)

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

Release Information Command introduced before Junos OS Release 7.4.

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

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

Required Privilege Level view

List of Sample Output show interfaces controller (Channelized OC3 IQ) on page 69

Output Fields Table 4 on page 69 lists the output fields for the **show interfaces controller** (Channelized OC3 IQ) command. Output fields are listed in the approximate order in which they appear.

Table 4: 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
```

CHAPTER 6

Command Summaries

Channelized E1 Interface Operational Mode Commands

Table 5 on page 71 summarizes the command-line interface (CLI) commands that you can use to monitor and troubleshoot channelized E1 interfaces. Commands are listed in alphabetical order.

Table 5: Channelized E1 Interface Operational Mode Commands

Task	Command
Display status information about channelized E1 interfaces.	show interfaces (Channelized E1)
Display channelized E1 IQ interface information.	show interfaces (Channelized E1 IQ)
Display the interface names of the physical channelized E1 IQ interface and the channels configured on each interface.	show interfaces controller (Channelized E1 IQ)

NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on the channelized E1 interface, see the Junos® OS Network Interfaces.

For channelization illustrations and configuration examples for channelized IQ interfaces, see the *Junos Feature Guide*.

Channelized OC Interface Operational Commands

Table 6 on page 72 summarizes the command-line interface (CLI) commands to monitor and troubleshoot channelized OC interfaces. Commands are listed in alphabetical order.

Table 6: Channelized OC Interface Operational Mode Commands

Task or Information to Monitor	CLI Command
Display channelized OC3 IQ and IQE interface information.	show interfaces (Channelized OC3 IQ and IQE)
Display status information about channelized OC12 interfaces.	show interfaces (Channelized OC12)
Display channelized OC12 IQ and IQE interface information.	show interfaces (Channelized OC12 IQ and IQE)
Display the interface names of the physical channelized OC3 IQ and IQE interface and the channels configured on each interface.	show interfaces controller (Channelized OC3 IQ and IQE)
Display the interface names of the physical channelized OC12 IQ and IQE interface and the channels configured on each interface.	show interfaces controller (Channelized OC12 IQ and IQE)
Display channelized OC48 IQ and IQE interface information.	show interfaces (Channelized OC48 IQ and IQE)

NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on channelized OC interfaces, see the *Junos Network Interfaces Configuration Guide*.

For channelization illustrations and configuration examples for channelized IQ and IQE interfaces, see the *Junos Feature Guide*.

Channelized STM1 Interface Operational Mode Commands

Table 7 on page 72 summarizes the command-line interface (CLI) commands that you can use to monitor and troubleshoot channelized STM1 interfaces. Commands are listed in alphabetical order.

Table 7: Channelized STM1 Interface Operational Mode Commands

Task	Command
Display status information about channelized STM1 interfaces.	show interfaces (Channelized STM1)

Table 7: Channelized STM1 Interface Operational Mode Commands *(continued)*

Task	Command
Display channelized STM1 IQ interface information.	show interfaces (Channelized STM1 IQ)
Display the interface names of the physical channelized STM1 IQ interface and the channels configured on each interface.	show interfaces controller (Channelized STM1 IQ)

NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on the channelized STM1 interface, see the *Junos Network Interfaces Configuration Guide*.

For channelization illustrations and configuration examples for channelized IQ interfaces, see the *Junos Feature Guide*.

Channelized T1 and T3 Interface Operational Mode Commands

Table 8 on page 73 summarizes the command-line interface (CLI) commands that you can use to monitor and troubleshoot channelized T1 and T3 interfaces. Commands are listed in alphabetical order.

Table 8: Channelized T1 and T3 Interface Operational Mode Commands

Task	Command
Display status information about channelized DS3-to-DS0 interfaces.	show interfaces (Channelized DS3-to-DS0)
Display status information about channelized DS3-to-DS1 interfaces.	show interfaces (Channelized DS3-to-DS1)
Display channelized T1 IQ interface information.	show interfaces (Channelized T1 IQ)
Display channelized T3 IQ interface information.	show interfaces (Channelized T3 IQ)
Display the interface names of the physical channelized T1 IQ interface and the channels configured on each interface.	show interfaces controller (Channelized T1 IQ)
Display the interface names of the physical channelized T3 IQ interface and the channels configured on each interface.	show interfaces controller (Channelized T3 IQ)

NOTE: For more information about the channel type and level of channelization, and for information about the number of channels that are supported on the different types of channelized T1 and T3 interfaces, see the *Junos Network Interfaces Configuration Guide.*

For more information on monitoring and troubleshooting channelized DS3-to-DS0 and DS3-to-DS1 interfaces, see the *Junos Interfaces Network Operations Guide*.

For channelization illustrations and configuration examples for channelized IQ interfaces, see the *Junos Feature Guide*.

PART 4

Troubleshooting

CHAPTER 7

Interface Diagnostics

Interface Diagnostics

You can use two diagnostic tools to test the physical layer connections of interfaces: loopback testing and bit error rate test (BERT) testing. Loopback testing enables you to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, *N*xDS0, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own data link layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own data link layer packets, you can assume the problem is on one of the segments between the local router and the remote router's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

There are several types of loopback testing supported by the Junos OS, as follows:

- DCE local—Loops packets back on the local DCE.
- DCE remote—Loops packets back on the remote DCE.

- Local—Useful for troubleshooting physical PIC errors. Configuring local loopback on an interface allows transmission of packets to the channel service unit (CSU) and then to the circuit toward the far-end device. The interface receives its own transmission, which includes data and timing information, on the local router's PIC. The data received from the CSU is ignored. To test a local loopback, issue the **show interfaces *interface-name*** command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- Payload—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated.
- Remote—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's interface card. A router at one end of the circuit initiates a remote loopback toward its remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 9 on page 78 shows the loopback modes supported on the various interface types.

Table 9: Loopback Modes by Interface Type

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	Configuring Ethernet Loopback Capability
Circuit Emulation E1	Local and remote	Configuring E1 Loopback Capability
Circuit Emulation T1	Local and remote	Configuring T1 Loopback Capability
E1 and E3	Local and remote	Configuring E1 Loopback Capability and Configuring E3 Loopback Capability
*N*xDS0	Payload	Configuring Channelized E1 IQ and IQE Interfaces, "Configuring T1 and NxDS0 Interfaces" on page 9, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Channelized STM1 IQ and IQE Interfaces, and Configuring Channelized T3 IQ Interfaces
Serial (V.35 and X.21)	Local and remote	Configuring Serial Loopback Capability
Serial (EIA-530)	DCE local, DCE remote, local, and remote	Configuring Serial Loopback Capability
SONET/SDH	Local and remote	Configuring SONET/SDH Loopback Capability

Table 9: Loopback Modes by Interface Type *(continued)*

Interface	Loopback Modes	Usage Guidelines
T1 and T3	Local, payload, and remote	Configuring T1 Loopback Capability and Configuring T3 Loopback Capability See also Configuring the T1 Remote Loopback Response

To configure loopback testing, include the **loopback** statement:

loopback *mode*;

You can include this statement at the following hierarchy levels:

- **[edit interfaces** *interface-name* **aggregated-ether-options]**
- **[edit interfaces** *interface-name* **ds0-options]**
- **[edit interfaces** *interface-name* **e1-options]**
- **[edit interfaces** *interface-name* **e3-options]**
- **[edit interfaces** *interface-name* **fastether-options]**
- **[edit interfaces** *interface-name* **gigether-options]**
- **[edit interfaces** *interface-name* **serial-options]**
- **[edit interfaces** *interface-name* **sonet-options]**
- **[edit interfaces** *interface-name* **t1-options]**
- **[edit interfaces** *interface-name* **t3-options]**

Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the **[edit interfaces** *interface-name interface-type*-**options]** hierarchy level:

[edit interfaces *interface-name interface-type*-options]
bert-algorithm *algorithm*;
bert-error-rate *rate*;
bert-period *seconds*;

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

rate is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from 10^{-0} (1 error per bit) to 10^{-7} (1 error per 10 million bits).

algorithm is the pattern to send in the bit stream. For a list of supported algorithms, enter a **?** after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]

user@host# set bert-algorithm ?
Possible completions:
  pseudo-2e11-o152     Pattern is 2^11 -1 (per O.152 standard)
  pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.152 standard)
  pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
  pseudo-2e20-o153     Pattern is 2^20 - 1 (per O.153 standard)
        ...
```

For specific hierarchy information, see the individual interface types.

NOTE: The 4-port E1 PIC supports only the following algorithms:

```
pseudo-2e11-o152     Pattern is 2^11 -1 (per O.152 standard)
pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e23-o151     Pattern is 2^23 (per O.151 standard)
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

NOTE: The 12-port T1/E1 Circuit Emulation (CE) PIC supports only the following algorithms:

```
  all-ones-repeating   Repeating one bits
  all-zeros-repeating  Repeating zero bits
  alternating-double-ones-zeros  Alternating pairs of ones and zeros
  alternating-ones-zeros  Alternating ones and zeros
  pseudo-2e11-o152     Pattern is 2^11 -1 (per O.152 standard)
  pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.151 standard)
  pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
  pseudo-2e7           Pattern is 2^7 - 1
  pseudo-2e9-o153      Pattern is 2^9 - 1 (per O.153 standard)
  repeating-1-in-4     1 bit in 4 is set
  repeating-1-in-8     1 bit in 8 is set
  repeating-3-in-24    3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

NOTE: The IQE PICs support only the following algorithms:

```
all-ones-repeating   Repeating one bits
all-zeros-repeating  Repeating zero bits
alternating-double-ones-zeros  Alternating pairs of ones and zeros
alternating-ones-zeros  Alternating ones and zeros
pseudo-2e9-o153      Pattern is 2^9  -1 (per O.153 (511 type) standard)
pseudo-2e11-o152     Pattern is 2^11 -1 (per O.152 and O.153 (2047 type)
 standards)
pseudo-2e15-o151     Pattern is 2^15 -1 (per O.151 standard)
pseudo-2e20-o151     Pattern is 2^20 -1 (per O.151 standard)
pseudo-2e20-o153     Pattern is 2^20 -1 (per O.153 standard)
pseudo-2e23-o151     Pattern is 2^23 -1 (per O.151 standard)
repeating-1-in-4     1 bit in 4 is set
repeating-1-in-8     1 bit in 8 is set
repeating-3-in-24    3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

NOTE: BERT is supported on the PDH interfaces of the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP and the DS3/E3 MIC. The following BERT algorithms are supported:

```
all-ones-repeating            Repeating one bits
all-zeros-repeating           Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros        Alternating ones and zeros
repeating-1-in-4              1 bit in 4 is set
repeating-1-in-8              1 bit in 8 is set
repeating-3-in-24             3 bits in 24 are set
pseudo-2e9-o153               Pattern is 2^9 - 1 (per 0.153 standard)
pseudo-2e11-o152              Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151              Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151              Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153              Pattern is 2^20 - 1 (per 0.153 standard)
pseudo-2e23-o151              Pattern is 2^23 (per 0.151 standard)
```

Table 10 on page 82 shows the BERT capabilities for various interface types.

Table 10: BERT Capabilities by Interface Type

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)		• Limited algorithms
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		• Limited algorithms
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	• Single port at a time • Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	• Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	• Single channel at a time • Limited algorithms • No bit count
Channelized STM1	Yes (channel 0–62)	N/A	• Multiple channels • Only one algorithm • No error insert • No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	• Multiple ports and channels • Limited algorithms for T1 • No error insert for T1 • No bit count for T1

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see Channelized IQ and IQE Interfaces Properties.

Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the **disable** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the **test interface *interface-name interface-type*-bert-start** operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the **bert-period** statement. If you wish to terminate the test sooner, issue the **test interface *interface-name interface-type*-bert-stop** command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the **show interfaces extensive | find BERT** command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the Junos OS Operational Mode Commands.

NOTE: To exchange BERT patterns between a local router and a remote router, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local router, issue the **test interface** command.

Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of 10^{-0} (1 error per bit). The configured bit pattern of **all-ones-repeating** means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]
t3-1/2/0 {
    t3-options {
        bert algorithm all-ones-repeating;
        bert-error-rate 0;
        bert-period 120;
```

```
    }
}
```

PART 5

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