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Network Configuration Example

Configuring a Routing Matrix with a TX
Matrix Plus Router in Mixed Mode

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CHAPTER

Configuring a Routing Matrix with a TX Matrix Plus Router in Mixed Mode

About This Network Configuration Example

This document provides information about a TXP-Mixed-LCC-3D (also referred as mixed mode) configuration in a routing matrix with TX Matrix Plus router, and how to configure mixed mode in a routing matrix with TX Matrix Plus router.

Overview of a Routing Matrix with a TX Matrix Plus Router

The TX Matrix Plus router is the centralized switch fabric of the routing matrix, which is a multiterabit routing system for interconnecting routers.

The routing matrix multichassis architecture provides scalable growth for aggregation and core services for voice, video, and data networks. It provides a flexible and cost-effective means to simplify large point-of-presence (POP) and central office environments. The routing matrix delivers high availability services from tunnel services, ATM, DS3, OC3/STM1, OC12/STM4, Gigabit Ethernet, 10-Gigabit Ethernet, 100-Gigabit Ethernet, OC48/STM16, OC192/STM64, and other high-speed interfaces.

The routing matrix leverages the intelligent virtual services capabilities of the Junos® operating system (Junos OS), which enables you to create multiple application-specific logical networks over a single physical topology. This gives you the ability to virtually separate traffic types that require unique network attributes—such as ATM or high-priority voice over IP (VoIP) and third-generation (3G) mobile traffic—from bulk transit IP traffic.

The router architecture cleanly separates control operations from packet forwarding operations. This design eliminates processing and traffic congestions, permitting the routing matrix to achieve terabit performance levels. Control operations in the routing matrix are performed by the host subsystem, which runs Junos OS to handle traffic engineering and configuration management. High availability, interchassis communications are provided by an Ethernet LAN that interconnects the host subsystems in the TX Matrix Plus router (also referred to as the switch-fabric chassis or the SFC) and the line-card chassis (LCC) routers.

A routing matrix based on a Juniper Networks® TX Matrix Plus router is a multichassis architecture composed of one TX Matrix Plus router and one of the following LCC configurations:

- TXP-T1600 configuration—Supports up to four interconnected Juniper Networks T1600 Core Routers.

- TXP-T1600-3D configuration—Supports up to eight interconnected Juniper Networks T1600 Core Routers.

- TXP-T4000-3D configuration—Supports up to four interconnected Juniper Networks T4000 Core Routers.

- TXP-Mixed-LCC-3D configuration—Supports the following combinations of T1600 and T4000 routers:

  - Six T1600 routers and one T4000 router

  - Four T1600 routers and two T4000 routers

  - Two T1600 routers and three T4000 routers

The TXP-T1600-3D, TXP-T4000-3D, and TXP-Mixed-LCC-3D configurations use 3D SIBs (TXP-F13-3D and TXP-F2S-3D SIBs on the SFC and TXP-LCC-3D SIB on the LCC). For more details on the hardware components used in the routing matrix with a TX Matrix Plus router, see the *TX Matrix Plus Router Hardware Guide*.

Overview of a Routing Matrix with a TXP-Mixed-LCC-3D Configuration

A routing matrix with the TXP-Mixed-LCC-3D configuration consists of three types of chassis: a Juniper Networks TX Matrix Plus router and a combination of Juniper Networks T1600 Core Routers and Juniper Networks T4000 Core Routers.

- TX Matrix Plus router—A routing matrix contains only one Juniper Networks TX Matrix Plus router. A TX Matrix Plus router in a routing matrix is also referred to as the *switch-fabric chassis* (SFC). In the Junos OS CLI, **sfc 0** is used to refer to the TX Matrix Plus router. For information about installing and connecting to a TX Matrix Plus router, see the *TX Matrix Plus Router Hardware Guide*.

- T1600 and T4000 routers—In the mixed LCC configuration, a routing matrix can comprise:

  - Six T1600 routers and one T4000 router

  - Four T1600 routers and two T4000 routers

  - Two T1600 routers and three T4000 routers

To enable the TXP-Mixed-LCC-3D configuration in the Junos OS CLI, you must configure the LCC mode on the SFC. To configure the LCC mode, include the **set lcc-mode lcc** *lcc-number* **mode (empty | t1600 | t4000)** statement at the **[edit chassis]** hierarchy level. By default, the LCC mode is set to **t1600**.

To view the configured LCC mode information, use the **show chassis lcc-mode** operational mode command.

> **NOTE:**
> - The LCC mode **t4000** is supported only on the even-numbered LCCs—LCC 0, LCC 2, LCC 4, and LCC 6.
>
> - When you set the LCC mode as **t4000**, you must set the next LCC (odd-numbered) mode as **empty**. For example, if you set LCC mode **t4000** on LCC 2, then you must set the LCC 3 mode as **empty**. Otherwise, the commit operation fails. Setting the LCC mode for an LCC as **empty** disables the control plane and data plane connections between that LCC and the SFC, so the LCC does not come online.
>
> - LCC numbers in a mixed-mode configuration can be changed as long as the T4000 LCC is assigned an even number. For other valid combinations of LCCs in the mixed-mode configuration, see *Line-Card Chassis ID* in the *TX Matrix Plus Router Hardware Guide*.

In a routing matrix, the TX Matrix Plus router controls all the connected T1600 and T4000 routers, as shown in Figure 1 on page 8, Figure 2 on page 9, and Figure 3 on page 10.

Figure 1: TXP-Mixed-LCC-3D Configuration with One T4000 Router and Six T1600 Routers

T4000 Router
LCC-0

T1600 Router
LCC-2

T1600 Router
LCC-3

TX Matrix Plus
Router
SFC

T1600 Router
LCC-4

T1600 Router
LCC-5

T1600 Router
LCC-6

T1600 Router
LCC-7

——— Data path
– · – · – Control path

g041550
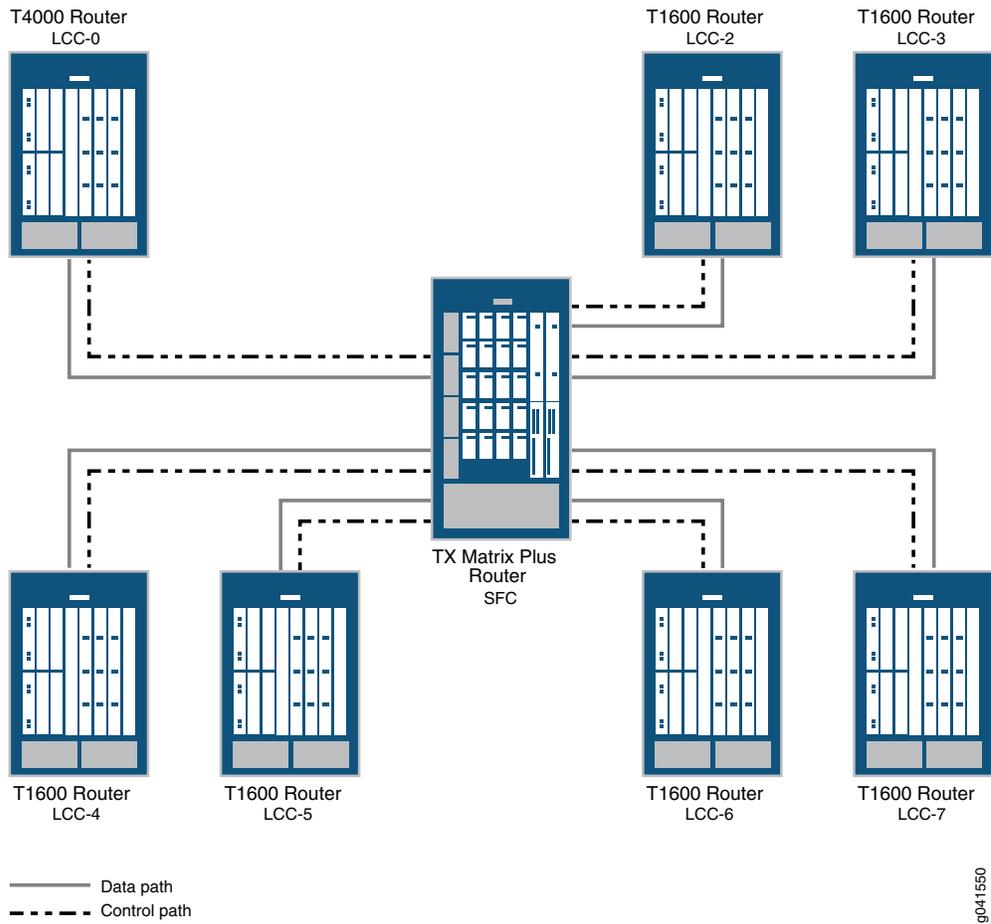
Figure 2: TXP-Mixed-LCC-3D Configuration with Two T4000 Routers and Four T1600 Routers
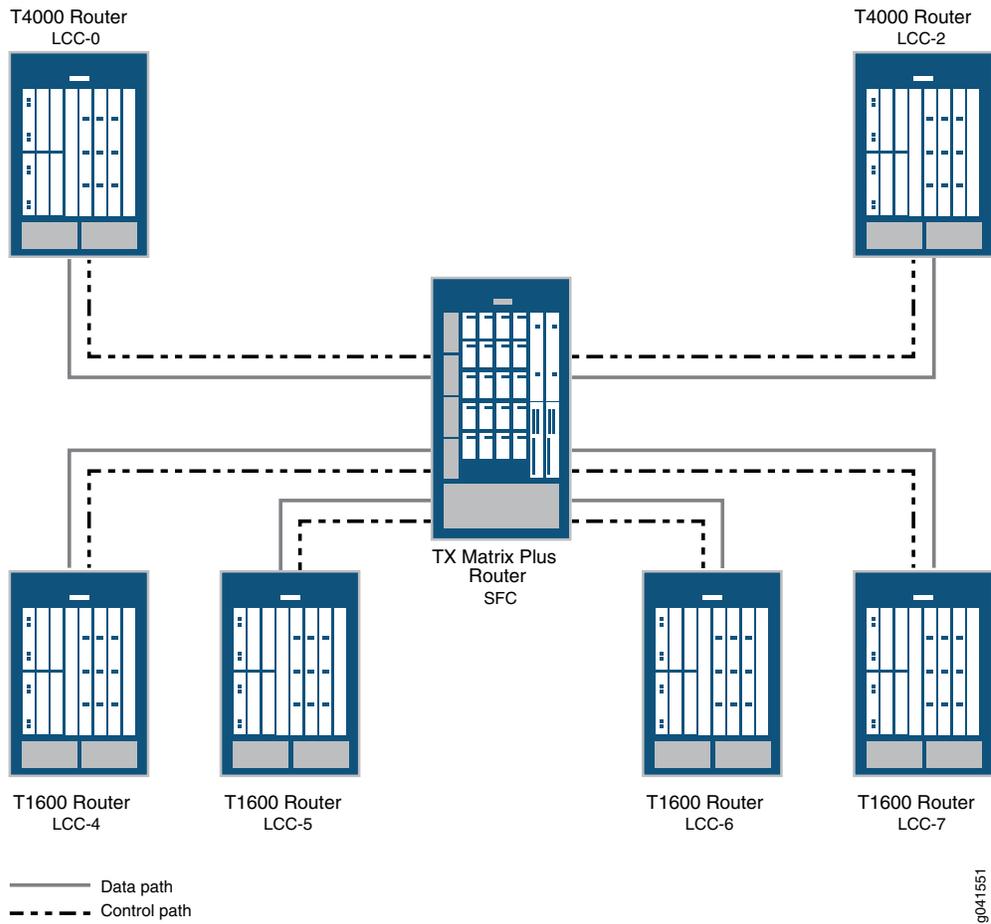
Figure 3: TXP-Mixed-LCC-3D Configuration with Three T4000 Routers and Two T1600 Routers
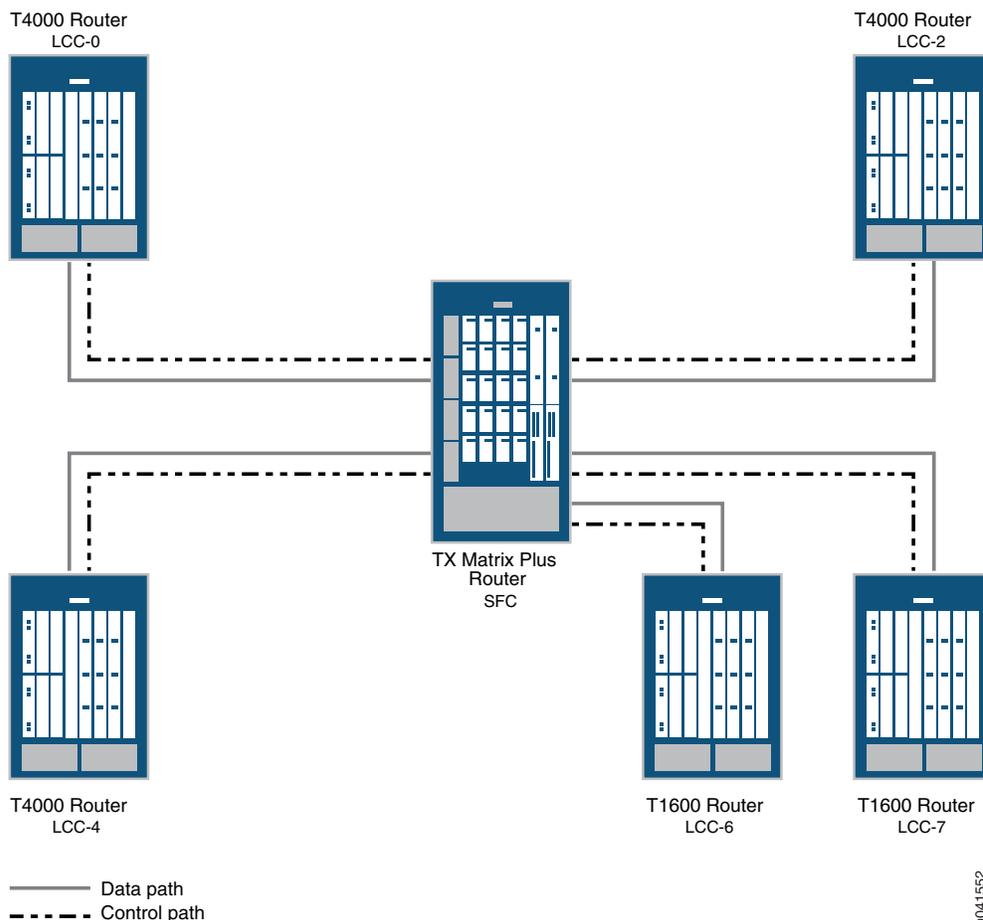
Use Case for a Routing Matrix with a TX Matrix Plus Router in a TXP-Mixed-LCC-3D Configuration

The TX Matrix Plus router is the centralized switch fabric of the routing matrix that interconnects multiple line-card chassis (LCCs) to build a multichassis routing matrix. In releases earlier than Junos OS Release 13.1, only the T1600 LCCs were supported on the routing matrix with the TX Matrix Plus router. In Junos OS Release 13.1 and later releases with enhanced Switch Interface Boards (SIBs), you have the flexibility to connect the TX Matrix Plus router to a hybrid configuration of T1600 and T4000 LCCs by means of additional interfaces and FPC types. This hybrid configuration is known as a TXP-Mixed-LCC-3D or a mixed-mode configuration in the routing matrix with a TX Matrix Plus router.

One of the use case scenarios for using the mixed-mode configuration is to support large-scale subscribers. For example, suppose you are using an existing routing matrix with a TX Matrix Plus router, you have retail subscribers on T1600 LCCs, and you need to provide services to both retail and enterprise subscribers on a single routing matrix that can work as a provider edge (PE) router. In such a situation, you can add T4000 LCCs to the existing routing matrix (by using the mixed-mode configuration) and use the routing matrix as a PE router. For more details on T1600 and T4000 router capabilities, see the *T1600 Product Portfolio* and *T4000 Product Portfolio*.

In a fully scaled routing matrix with a TX Matrix Plus router, the following combinations of T1600 and T4000 LCCs are supported:

- Six T1600 LCCs and one T4000 LCC

- Four T1600 LCCs and two T4000 LCCs

- Two T1600 LCCs and three T4000 LCCs

For other valid combinations of LCCs in the mixed-mode configuration, see the *TX Matrix Plus Router Hardware Guide*.

Example: Configuring a Routing Matrix with a TX Matrix Plus Router in Mixed Mode

IN THIS SECTION

The mixed-mode (TXP-Mixed-LCC-3D) configuration supports the following combinations of T1600 and T4000 routers:

- Six T1600 routers and one T4000 router

- Four T1600 routers and two T4000 routers

- Two T1600 routers and three T4000 routers

This example provides a step-by-step procedure and commands for configuring and verifying a routing matrix with a TX Matrix Plus router and 3D SIBs in a mixed-mode configuration of two T1600 routers and three T4000 routers.

Requirements

This example uses the following software and hardware components:

- Junos OS Release 13.1 or later.
- One TX Matrix Plus router SFC (also referred to as the switch-fabric chassis (SFC) in a routing matrix).
- Three T4000 routers (also referred to as line-card chassis (LCC) in a routing matrix).
- Two T1600 routers (also referred to as line-card chassis (LCC) in a routing matrix).
- Interchassis UTP Category 5 Ethernet cables that connect the SFC and LCC control planes.
- Equipment racks for the SFC and the LCCs.

  NOTE: This configuration example has been tested using the software release listed and is assumed to work on all later releases.

Before you configure a routing matrix with a TX Matrix Plus router and 3D SIBs, make sure that you understand how to connect the hardware components, and upgrade to a TX Matrix Plus router with 3D SIBs including setting the SFC configuration size. For more information, see the *TX Matrix Plus Hardware Guide*.

Overview

TX Matrix Plus routers with 3D SIBs double the T Series multichassis bandwidth when compared with TX Matrix Plus routers without 3D SIBs. Each T1600 LCC adds up to 1.6 terabits per second (Tbps) full-duplex (3.2 Tbps of any-to-any, nonblocking, half-duplex) switching. Each T4000 LCC adds up to 2.0 Tbps, full-duplex (4.0 Tbps of any-to-any, nonblocking, half-duplex) switching.

In this example, you configure a routing matrix in mixed mode that includes a TX Matrix Plus router with 3D SIBs, and two T1600 and three T4000 LCCs with 3D SIBs.

Note the following key considerations for this routing matrix configuration:

- The TX Matrix Plus router with 3D SIBs, or the SFC, manages the routing matrix as a single router. All the operational commands and configurations required for the connected LCCs are executed on the TX Matrix Plus router with 3D SIBs which is designated as **sfc0**.

- Create configuration groups for each Routing Engine in the routing matrix by using the special configuration groups for a routing matrix consisting of routers with dual Routing Engines: **re0**, **re1**, **lcc0-re0**, **lcc2-re0**, **lcc4-re0**, **lcc6-re0**, **lcc7-re0**, **lcc0-re1**, **lcc2-re1**, **lcc4-re1**, **lcc6-re1**, and **lcc7-re1**. Configure hostnames, default routes, and management Ethernet interfaces in these Routing Engine configuration groups.

- To configure interfaces, use the routing matrix FPC numbering convention of slots 0 through 63. For details, see the *FPC Numbering for Interfaces in TXP-Mixed-LCC-3D Configuration*.

Topology

In this example, Routing Matrix A comprises a TX Matrix Plus router (**sfc0**) with 3D SIBs, three T4000 routers with 3D SIBs, and two T1600 routers with 3D SIBs.

In this example, the following hostnames are used for the TX Matrix Plus router and the LCCs:

- **sfc0**—Primary Routing Engine on the TX Matrix Plus router
- **sfc0_alt_re**—Backup Routing Engine on the TX Matrix Plus router
- **lcc0**—Primary Routing Engine on T4000 LCC 0
- **lcc0_alt_re**—Backup Routing Engine on T4000 LCC 0
- **lcc2**—Primary Routing Engine on T4000 LCC 2
- **lcc2_alt_re**—Backup Routing Engine on T4000 LCC 2
- **lcc4**—Primary Routing Engine on T4000 LCC 4
- **lcc4_alt_re**—Backup Routing Engine on T4000 LCC 4
- **lcc6**—Primary Routing Engine on T1600 LCC 6
- **lcc6_alt_re**—Backup Routing Engine on T1600 LCC 6
- **lcc7**—Primary Routing Engine on T1600 LCC 7
- **lcc7_alt_re**—Backup Routing Engine on T1600 LCC 7

shows that Routing Matrix A is a provider edge (PE) router in a Layer 2 circuit network. Ethernet interfaces xe-1/0/0 on LCC 0, xe-16/0/0 on LCC 2, xe-32/0/0 on LCC 4, xe-48/0/0 on LCC 6, and xe-56/0/0 on LCC 7 connect to an IP/MPLS core network.

Figure 4: Topology of a Routing Matrix with a TX Matrix Plus Router in a Mixed Mode
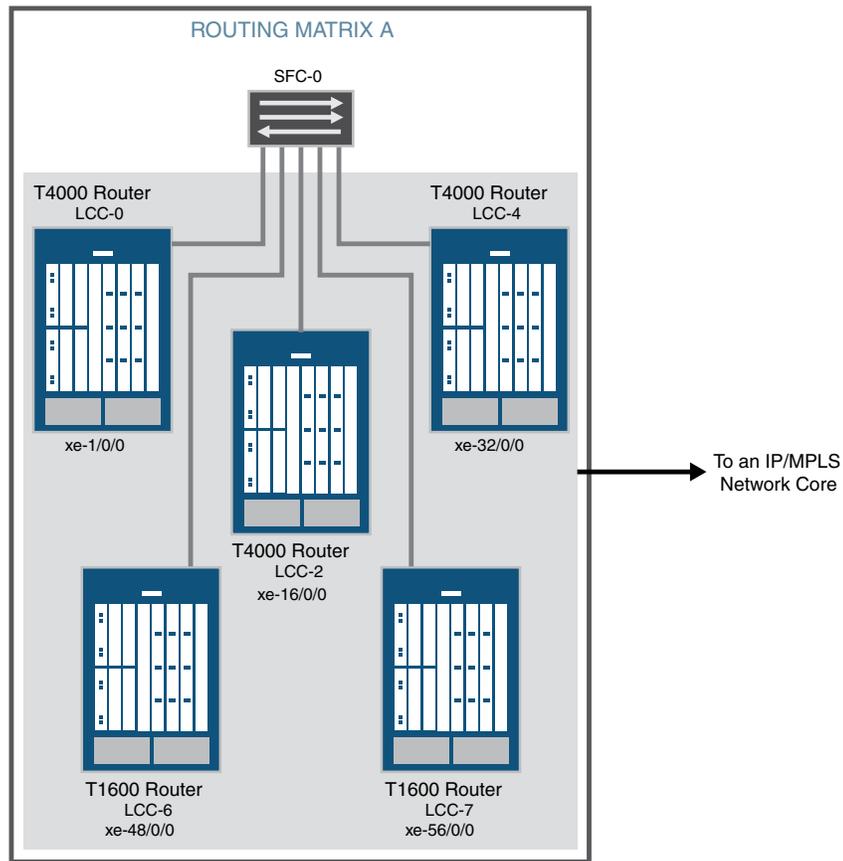
Configuration

IN THIS SECTION

To configure a routing matrix with a TX Matrix Plus router in mixed mode, perform the following tasks:

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set chassis lcc-mode lcc 0 t4000
set chassis lcc-mode lcc 1 empty
set chassis lcc-mode lcc 2 t4000
set chassis lcc-mode lcc 3 empty
set chassis lcc-mode lcc 4 t4000
set chassis lcc-mode lcc 5 empty
set chassis lcc-mode lcc 6 t1600
set chassis lcc-mode lcc 7 t1600
set groups re0 system host-name sfc0
set groups lcc0-re0 system host-name lcc0
set groups lcc2-re0 system host-name lcc2
set groups lcc4-re0 system host-name lcc4
set groups lcc6-re0 system host-name lcc6
set groups lcc7-re0 system host-name lcc7
set groups re1 system host-name sfc0_alt_re
set groups lcc0-re1 system host-name lcc0_alt_re
set groups lcc2-re1 system host-name lcc2_alt_re
set groups lcc4-re1 system host-name lcc4_alt_re
set groups lcc6-re1 system host-name lcc6_alt_re
set groups lcc7-re1 system host-name lcc7_alt_re
set groups re0 system backup-router 10.216.63.254
set groups lcc0-re0 system backup-router 10.216.63.254
set groups lcc2-re0 system backup-router 10.216.63.254
set groups lcc4-re0 system backup-router 10.216.63.254
set groups lcc6-re0 system backup-router 10.216.63.254
set groups lcc7-re0 system backup-router 10.216.63.254
set groups re1 system backup-router 10.216.63.254
set groups lcc0-re1 system backup-router 10.216.63.254
set groups lcc2-re1 system backup-router 10.216.63.254
set groups lcc4-re1 system backup-router 10.216.63.254
set groups lcc6-re1 system backup-router 10.216.63.254
set groups lcc7-re1 system backup-router 10.216.63.254
set groups lcc0-re1 system backup-router 10.216.63.254
set groups re0 interfaces em0 unit 0 family inet address 10.216.49.204/20
set groups lcc0-re0 interfaces em0 unit 0 family inet address 10.216.49.205/20
set groups lcc2-re0 interfaces em0 unit 0 family inet address 10.216.49.206/20
set groups lcc4-re0 interfaces em0 unit 0 family inet address 10.216.49.207/20
set groups lcc6-re0 interfaces em0 unit 0 family inet address 10.216.49.208/20
set groups lcc7-re0 interfaces em0 unit 0 family inet address 10.216.49.209/20
```

```
set groups re1 interfaces em0 unit 0 family inet address 10.216.49.210/20
set groups lcc0-re1 interfaces em0 unit 0 family inet address 10.216.49.211/20
set groups lcc2-re1 interfaces em0 unit 0 family inet address 10.216.49.212/20
set groups lcc4-re1 interfaces em0 unit 0 family inet address 10.216.49.213/20
set groups lcc6-re1 interfaces em0 unit 0 family inet address 10.216.49.214/20
set groups lcc7-re1 interfaces em0 unit 0 family inet address 10.216.49.215/20
set apply-groups [ re0 re1 lcc0-re0 lcc0-re1 lcc2-re0 lcc2-re1 lcc4-re0 lcc4-re1 lcc6-re0 lcc6-re1 lcc7-re0 lcc7-re1
    ]
set interfaces xe-1/0/0 mtu 9192
set interfaces xe-1/0/0 unit 0 family inet address 10.15.1.2/30
set interfaces xe-1/0/0 unit 0 family iso
set interfaces xe-1/0/0 unit 0 family mpls filter input filter_1
set interfaces xe-8/0/0 mtu 9192
set interfaces xe-8/0/0 unit 0 family inet address 11.15.1.2/30
set interfaces xe-8/0/0 unit 0 family iso
set interfaces xe-8/0/0 unit 0 family mpls filter input filter_2
set interfaces xe-32/0/0 mtu 9192
set interfaces xe-32/0/0 unit 0 family inet address 12.15.1.2/30
set interfaces xe-32/0/0 unit 0 family iso
set interfaces xe-32/0/0 unit 0 family mpls filter input filter_3
set interfaces xe-48/0/0 mtu 9192
set interfaces xe-48/0/0 unit 0 family inet address 13.15.1.2/30
set interfaces xe-48/0/0 unit 0 family iso
set interfaces xe-48/0/0 unit 0 family mpls filter input filter_4
set interfaces xe-56/0/0 mtu 9192
set interfaces xe-56/0/0 unit 0 family inet address 14.15.1.2/30
set interfaces xe-56/0/0 unit 0 family iso
set interfaces xe-56/0/0 unit 0 family mpls filter input filter_5
set interfaces lo0 unit 0 family inet address 127.0.0.1/32
set interfaces lo0 unit 0 family inet address 10.255.77.158/32 primary
set interfaces lo0 unit 0 family inet6 address 47.0005.80ff.f800.0000.0108.0001.0102.5507.0158.00
set interfaces lo0 unit 0 family inet6 address 2001:db8::10:255:77:158/32 primary
set protocols mpls interface xe-8/0/0
set protocols isis interface xe-8/0/0
set protocols ldp interface xe-8/0/0
set protocols mpls interface xe-16/0/0
set protocols isis interface xe-16/0/0
set protocols ldp interface xe-16/0/0
set protocols mpls interface xe-32/0/0
set protocols isis interface xe-32/0/0
set protocols ldp interface xe-32/0/0
set protocols mpls interface xe-48/0/0
set protocols isis interface xe-48/0/0
set protocols ldp interface xe-48/0/0
```

```
set protocols mpls interface xe-56/0/0
set protocols isis interface xe-56/0/0
set protocols ldp interface xe-56/0/0
set firewall family mpls filter filter_1 term plp0 from exp [ 0 2 4 6 ]
set firewall family mpls filter filter_1 term plp0 then count LOW loss-priority low
set firewall family mpls filter filter_1 term plp1 from exp [ 1 3 5 7 ]
set firewall family mpls filter filter_1 term plp1 then count HIGH loss-priority high
set firewall family mpls filter filter_2 term plp2 from exp [ 0 2 4 6 ]
set firewall family mpls filter filter_2 term plp2 then count LOW loss-priority medium-low
set firewall family mpls filter filter_2 term plp3 from exp [ 1 3 5 7 ]
set firewall family mpls filter filter_2 term plp3 hen count HIGH loss-priority medium-high
set firewall family mpls filter filter_3 term plp4 from exp [ 1 3 5 7]
set firewall family mpls filter filter_3 term plp4 then count LOW loss-priority low
set firewall family mpls filter filter_3 term plp5 from exp [ 0 2 4 6 ]
set firewall family mpls filter filter_3 term plp5 then count HIGH loss-priority high
set firewall family mpls filter filter_4 term plp6 from exp [ 0 1 2 3 ]
set firewall family mpls filter filter_4 term plp6 then count LOW loss-priority low
set firewall family mpls filter filter_4 term plp7 from exp [ 4 5 6 7 ]
set firewall family mpls filter filter_4 term plp7 then count HIGH loss-priority high
set firewall family mpls filter filter_5 term plp8 from exp [ 0 2 4 6 ]
set firewall family mpls filter filter_5 term plp8 then count LOW loss-priority medium-low
set firewall family mpls filter filter_5 term plp9 from exp [ 1 3 5 7 ]
set firewall family mpls filter filter_5 term plp9 then count HIGH loss-priority medium-high
```

Configuring LCC Mode

Step-by-Step Procedure

A routing matrix with a TX Matrix Plus router and 3D SIBs supports a combination of T1600 and T4000 LCCs, which is also known as the TXP-Mixed-LCC-3D configuration. To enable the TXP-Mixed-LCC-3D configuration, you must configure the LCC mode on the TX Matrix Plus router. In this example, LCC 0, LCC 2, and LCC 4 are configured as T4000 LCCs and LCC 6 and LCC 7 are configured as T1600 LCCs.

> **NOTE:**
> - By default, the LCC mode is configured to **t1600**.
>
> - The LCC mode **t4000** is supported only on the even-numbered LCCs LCC 0, LCC 2, LCC 4, and LCC 6.
>
> - When you set the LCC mode as **t4000**, you must set the LCC mode for the next (odd-numbered) LCC as **empty**. For example, if you set the LCC mode **t4000** on LCC 2, then you must set the mode for LCC 3 as **empty**. Otherwise, the commit operation fails. Setting the LCC mode for an LCC as **empty** disables the control plane and data plane connections between that LCC and the SFC, so the LCC does not come online.

To configure LCC mode:

1. Configure the LCC mode **t4000** for LCC 0, LCC 2, and LCC 4 and the LCC mode **empty** for the odd-numbered LCCs (LCC 1, LCC 3, and LCC 5) next to the T4000 LCCs.

```
[edit chassis]
user@sfc0# set lcc-mode lcc 0 t4000
user@sfc0# set lcc-mode lcc 1 empty
user@sfc0# set lcc-mode lcc 2 t4000
user@sfc0# set lcc-mode lcc 3 empty
user@sfc0# set lcc-mode lcc 4 t4000
user@sfc0# set lcc-mode lcc 5 empty
```

2. (Optional) Configure the LCC mode as **t1600** on LCC 6 and LCC 7.

```
[edit chassis]
user@sfc0# set lcc-mode lcc 6 t1600
user@sfc0# set lcc-mode lcc 7 t1600
```

> **NOTE:** By default, the LCC mode is set to **t1600**. However, if the LCC mode is set to **t4000** or **empty** due to a previous configuration, then you need to configure the LCC mode as **t1600**. You can verify the LCC mode by using the **show chassis lcc-mode** operational mode command.

Creating Special Configuration Groups

Step-by-Step Procedure

The configuration groups featured in Junos OS enable you to create a group containing configuration statements and to direct the inheritance of that group's statements in the rest of the configuration.

Using special configuration group names for all Routing Engines in the routing matrix allows you to configure the individual Routing Engines in each router differently. Because the configuration statements in the special configuration groups for Routing Engines apply to specific Routing Engines in the routing matrix, you can create a single configuration for all of the routers, with each Routing Engine using only the configuration statements that apply to it. For example, the configuration specified in group **re0** is applied only if the current Routing Engine is in slot 0; likewise, the configuration specified in group **re1** is applied only if the current Routing Engine is in slot 1. Therefore, both Routing Engines can use the same configuration file, each using only the configuration statements that apply to it.

To create and apply special configuration groups:

1. Create special groups for the primary and the backup Routing Engines on the SFC.

   In this example, **re0** and **re1** are the special group names for the primary and backup Routing Engines of the SFC.

   ```
   [edit groups]
   user@sfc0# set re0 system host-name sfc0
   user@sfc0# set re1 system host-name sfc0_alt_re
   ```

2. Create special groups for the primary and the backup Routing Engines on the LCCs.

   In this example, **lcc0-re0**, **lcc2-re0**, **lcc4-re0**, **lcc6-re0**, and **lcc7-re0** are the special group names for the primary Routing Engines in the LCCs and **lcc0-re1**, **lcc2-re1**, **lcc4-re1**, **lcc6-re1**, and **lcc7-re1** are the special group names for the backup Routing Engines in the LCCs.

   ```
   [edit groups]
   user@sfc0# set lcc0-re0 system host-name lcc0
   user@sfc0# set lcc0-re1 system host-name lcc0_alt_re
   user@sfc0# set lcc2-re0 system host-name lcc2
   user@sfc0# set lcc2-re1 system host-name lcc2_alt_re
   user@sfc0# set lcc4-re0 system host-name lcc4
   user@sfc0# set lcc4-re1 system host-name lcc4_alt_re
   user@sfc0# set lcc6-re0 system host-name lcc6
   user@sfc0# set lcc6-re1 system host-name lcc6_alt_re
   user@sfc0# set lcc7-re0 system host-name lcc7
   user@sfc0# set lcc7-re1 system host-name lcc7_alt_re
   ```

3. Set a default router for the primary and backup Routing Engines in the SFC and the LCCs.

```
[edit groups]
user@sfc0# set re0 system backup-router 10.216.63.254
user@sfc0# set re1 system backup-router 10.216.63.254
user@sfc0# set lcc0-re0 system backup-router 10.216.63.254
user@sfc0# set lcc0-re1 system backup-router 10.216.63.254
user@sfc0# set lcc2-re0 system backup-router 10.216.63.254
user@sfc0# set lcc2-re1 system backup-router 10.216.63.254
user@sfc0# set lcc4-re0 system backup-router 10.216.63.254
user@sfc0# set lcc4-re1 system backup-router 10.216.63.254
user@sfc0# set lcc6-re0 system backup-router 10.216.63.254
user@sfc0# set lcc6-re1 system backup-router 10.216.63.254
user@sfc0# set lcc7-re0 system backup-router 10.216.63.254
user@sfc0# set lcc7-re1 system backup-router 10.216.63.254
```

4. Configure an IP address for the management interface logical port for the SFC and for each LCC.

```
[edit groups]
user@sfc0#set re0 interfaces em0 unit 0 family inet address 10.216.49.204/20
user@sfc0#set lcc0-re0 interfaces em0 unit 0 family inet address 10.216.49.205/20
user@sfc0#set lcc2-re0 interfaces em0 unit 0 family inet address 10.216.49.206/20
user@sfc0#set lcc4-re0 interfaces em0 unit 0 family inet address 10.216.49.207/20
user@sfc0#set lcc6-re0 interfaces em0 unit 0 family inet address 10.216.49.208/20
user@sfc0#set lcc7-re0 interfaces em0 unit 0 family inet address 10.216.49.209/20
user@sfc0#set re1 interfaces em0 unit 0 family inet address 10.216.49.210/20
user@sfc0#set lcc0-re1 interfaces em0 unit 0 family inet address 10.216.49.211/20
user@sfc0#set lcc2-re1 interfaces em0 unit 0 family inet address 10.216.49.212/20
user@sfc0#set lcc4-re1 interfaces em0 unit 0 family inet address 10.216.49.213/20
user@sfc0#set lcc6-re1 interfaces em0 unit 0 family inet address 10.216.49.214/20
user@sfc0#set lcc7-re1 interfaces em0 unit 0 family inet address 10.216.49.215/20
```

5. Enable inheritance to ensure that the group's statements are inherited in the rest of the configuration.

```
[edit]
user@sfc0# set apply-groups [ re0 re1 lcc0-re0 lcc0-re1 lcc2-re0 lcc2-re1 lcc4-re0 lcc4-re1 lcc6-re0 lcc6-re1
    lcc7-re0 lcc7-re1 ]
```

Configuring Interfaces

Step-by-Step Procedure

Ethernet interfaces xe-1/0/0 on LCC 0, xe-16/0/0 on LCC 2, xe-32/0/0 on LCC 4, xe-48/0/0 on LCC 6, and xe-56/0/0 on LCC 7 connect to an IP/MPLS core network.

To configure the interfaces:

1. Configure the Ethernet interfaces and interface properties.

```
[edit]
user@sfc0# set interfaces xe-1/0/0 mtu 9192
user@sfc0# set interfaces xe-1/0/0 unit 0 family inet address 10.15.1.2/30
user@sfc0# set interfaces xe-1/0/0 unit 0 family iso
user@sfc0# set interfaces xe-8/0/0 mtu 9192
user@sfc0# set interfaces xe-8/0/0 unit 0 family inet address 11.15.1.2/30
user@sfc0# set interfaces xe-8/0/0 unit 0 family iso
user@sfc0# set interfaces xe-32/0/0 mtu 9192
user@sfc0# set interfaces xe-32/0/0 unit 0 family inet address 12.15.1.2/30
user@sfc0# set interfaces xe-32/0/0 unit 0 family iso
user@sfc0# set interfaces xe-48/0/0 mtu 9192
user@sfc0# set interfaces xe-48/0/0 unit 0 family inet address 13.15.1.2/30
user@sfc0# set interfaces xe-48/0/0 unit 0 family iso
user@sfc0# set interfaces xe-56/0/0 mtu 9192
user@sfc0# set interfaces xe-56/0/0 unit 0 family inet address 14.15.1.2/30
user@sfc0# set interfaces xe-56/0/0 unit 0 family iso
```

2. Configure the loopback interface properties.

   You can configure the loopback interface on the routing matrix as usual. In this example, IP and IPv6 addresses are configured on the loopback interface with subnetwork routes.

```
[edit]
user@sfc0# set interfaces lo0 unit 0 family inet address 127.0.0.1/32
user@sfc0# set interfaces lo0 unit 0 family inet address 10.255.77.158/32 primary
user@sfc0# set interfaces lo0 unit 0 family inet6 address
    47.0005.80ff.f800.0000.0108.0001.0102.5507.0158.00
user@sfc0# set interfaces lo0 unit 0 family inet6 address 2001:db8::10:255:77:158/32 primary
```

Configuring Protocols

Step-by-Step Procedure

You can configure the protocols as usual. In this example, MPLS, IS-IS, and LDP protocols are configured on the SFC.

To configure the protocols:

- Configure protocols on the configured interfaces in the routing matrix.

```
[edit]
user@sfc0# set protocols mpls interface xe-8/0/0
user@sfc0# set protocols isis interface xe-8/0/0
user@sfc0# set protocols ldp interface xe-8/0/0
user@sfc0# set protocols mpls interface xe-16/0/0
user@sfc0# set protocols isis interface xe-16/0/0
user@sfc0# set protocols ldp interface xe-16/0/0
user@sfc0# set protocols mpls interface xe-32/0/0
user@sfc0# set protocols isis interface xe-32/0/0
user@sfc0# set protocols ldp interface xe-32/0/0
user@sfc0# set protocols mpls interface xe-48/0/0
user@sfc0# set protocols isis interface xe-48/0/0
user@sfc0# set protocols ldp interface xe-48/0/0
user@sfc0# set protocols mpls interface xe-56/0/0
user@sfc0# set protocols isis interface xe-56/0/0
user@sfc0# set protocols ldp interface xe-56/0/0
```

Configuring Firewall Filters

Step-by-Step Procedure

Firewall filters are configured to protect your router and network from excessive incoming traffic or hostile attacks that can disrupt network service, and to control which packets are forwarded from which router interfaces.

In this example, MPLS firewall filters **filter_1**, **filter_2**, **filter_3**, **filter_4**, and **filter_5** are configured to count packets based on the EXP bits for the MPLS label in a packet.

To configure firewall filters:

1. Configure firewall filters in the routing matrix.

```
[edit]
user@sfc0# set firewall family mpls filter filter_1 term plp0 from exp [ 0 2 4 6 ]
user@sfc0# set firewall family mpls filter filter_1 term plp0 then count LOW loss-priority low
user@sfc0# set firewall family mpls filter filter_1 term plp1 from exp [ 1 3 5 7 ]
user@sfc0# set firewall family mpls filter filter_1 term plp1 then count HIGH loss-priority high
user@sfc0# set firewall family mpls filter filter_2 term plp2 from exp [ 0 2 4 6 ]
```

```
user@sfc0# set firewall family mpls filter filter_2 term plp2 then count LOW loss-priority medium-low
user@sfc0# set firewall family mpls filter filter_2 term plp3 from exp [ 1 3 5 7 ]
user@sfc0# set firewall family mpls filter filter_2 term plp3 then count HIGH loss-priority medium-high
user@sfc0# set firewall family mpls filter filter_3 term plp4 from exp [ 1 3 5 7]
user@sfc0# set firewall family mpls filter filter_3 term plp4 then count LOW loss-priority low
user@sfc0# set firewall family mpls filter filter_3 term plp5 from exp [ 0 2 4 6 ]
user@sfc0# set firewall family mpls filter filter_3 term plp5 then count HIGH loss-priority high
user@sfc0# set firewall family mpls filter filter_4 term plp6 from exp [ 0 1 2 3 ]
user@sfc0# set firewall family mpls filter filter_4 term plp6 then count LOW loss-priority low
user@sfc0# set firewall family mpls filter filter_4 term plp7 from exp [ 4 5 6 7 ]
user@sfc0# set firewall family mpls filter filter_4 term plp7 then count HIGH loss-priority high
user@sfc0# set firewall family mpls filter filter_5 term plp8 from exp [ 0 2 4 6 ]
user@sfc0# set firewall family mpls filter filter_5 term plp8 then count LOW loss-priority medium-low
user@sfc0# set firewall family mpls filter filter_5 term plp9 from exp [ 1 3 5 7 ]
user@sfc0# set firewall family mpls filter filter_5 term plp9 then count HIGH loss-priority medium-high
```

2. Apply the MPLS firewall filters to interfaces.

```
[edit]
user@sfc0# set interfaces xe-1/0/0 unit 0 family mpls filter input filter_1
user@sfc0# set interfaces xe-8/0/0 unit 0 family mpls filter input filter_2
user@sfc0# set interfaces xe-32/0/0 unit 0 family mpls filter input filter_3
user@sfc0# set interfaces xe-48/0/0 unit 0 family mpls filter input filter_4
user@sfc0# set interfaces xe-56/0/0 unit 0 family mpls filter input filter_5
```

Verification

IN THIS SECTION

Confirm that the configuration is working properly.

Verifying LCC Mode

Purpose

Confirm that the LCC mode is working properly.

Action

In operational mode, enter the **show chassis lcc-mode** command.

```
[edit]
user@sfc0# show chassis lcc-mode
```

```
  Slot          LCC-mode
   0            T4000
   1            EMPTY
   2            T4000
   3            EMPTY
   4            T4000
   5            EMPTY
   6            T1600
   7            T1600
```

Meaning

The LCC mode is displayed as **T4000** for LCC 0, LCC 2, and LCC 4. The LCC mode is shown as **T1600** for LCC 6 and LCC 7. The LCC mode for the odd-numbered LCCs (LCC 1, LCC 3, and LCC 5) is shown as **empty**.

This means the LCC mode is configured correctly for the TXP-Mixed-LCC-3D configuration.

Verifying LCC Information

Purpose

Verify that the TX Matrix Plus router and the connected LCCs are communicating properly within the routing matrix.

Action

In operational mode, enter the **show chassis lccs** command.

```
[edit]
user@sfc0# show chassis lccs
```

```
Slot   State                Uptime
 0     Online               59 minutes, 41 seconds
 1     Empty
 2     Online               59 minutes, 41 seconds
 3     Empty
 4     Online               59 minutes, 41 seconds
 5     Empty
 6     Online               59 minutes, 41 seconds
 7     Online               59 minutes, 41 seconds
```

Meaning

The display output includes the following information about the LCCs:

- The **Slot** field displays the LCC slot number in the SFC.

- The **State** field displays the LCC state information.

  - **Online**—The LCC connected to a TX Matrix Plus router with 3D SIBs is online and communicating properly.

  - **Offline**—The LCC is powered down.

  - **Uptime**—The duration since the LCC is online.

RELATED DOCUMENTATION

Troubleshooting: Offline LCCs in a Routing Matrix with a TX Matrix Plus Router

Verifying Junos OS Versions for All Routers

Purpose

Verify that the correct version of Junos OS is running for all routing matrix components.

Action

In operational mode, enter the **show version** command.

```
user@sfc0> show version
sfc0-re0:
--------------------------------------------------------------------------
Hostname: sfc0
Model: txp
```

```
JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]

lcc0-re0:
--------------------------------------------------------------------------
Hostname: lcc0
Model: t4000
JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
```

```
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]


lcc2-re0:
--------------------------------------------------------------------------
Hostname: lcc2
Model: t4000
JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
```

```
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]


lcc4-re0:
--------------------------------------------------------------------------
Hostname: lcc4
Model: t4000
JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
```

```
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]
```

lcc6-re0:

```
--------------------------------------------------------------------------
Hostname: lcc6
Model: t1600

JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]
```

lcc7-re0:

```
--------------------------------------------------------------------------
Hostname: lcc7
Model: t1600
```

```
JUNOS Base OS boot [13.1R1.0]
JUNOS Base OS Software Suite [13.1R1.0]
JUNOS 64-bit Kernel Software Suite [13.1R1.0]
JUNOS Crypto Software Suite [13.1R1.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [13.1R1.0]
JUNOS Packet Forwarding Engine Support (T-Series) [13.1R1.0]
JUNOS Online Documentation [13.1R1.0]
JUNOS Services AACL Container package [13.1R1.0]
JUNOS Services Application Level Gateways [13.1R1.0]
JUNOS AppId Services [13.1R1.0]
JUNOS Border Gateway Function package [13.1R1.0]
JUNOS Services Captive Portal and Content Delivery Container package [13.1R1.0]
JUNOS Services HTTP Content Management package [13.1R1.0]
JUNOS IDP Services [13.1R1.0]
JUNOS Services Jflow Container package [13.1R1.0]
JUNOS Services LL-PDF Container package [13.1R1.0]
JUNOS Services MobileNext Software package [13.1R1.0]
JUNOS Services Mobile Subscriber Service Container package [13.1R1.0]
JUNOS Services NAT [13.1R1.0]
JUNOS Services PTSP Container package [13.1R1.0]
JUNOS Services RPM [13.1R1.0]
JUNOS Services Stateful Firewall [13.1R1.0]
JUNOS Voice Services Container package [13.1R1.0]
JUNOS Services Example Container package [13.1R1.0]
JUNOS Services Crypto [13.1R1.0]
JUNOS Services SSL [13.1R1.0]
JUNOS Services IPSec [13.1R1.0]
JUNOS Runtime Software Suite [13.1R1.0]
JUNOS Routing Software Suite [13.1R1.0]
JUNOS 64-bit Runtime Software Suite [13.1R1.0]
```

Meaning

In this example, all the routers have the same software revision [13.1R1.0]. It indicates that all the routers are running the same 64-bit Junos OS.

Verifying the Configured Interfaces

Purpose

Verify that all available interfaces in the routing matrix are up.

Action

In operational mode, enter the **show interfaces terse** command.

```
user@sfc0> show interfaces terse
Interface               Admin Link Proto    Local                  Remote
xe-1/0/0                up    up
xe-1/0/0.0              up    up   inet     10.15.1.2/30
                                   iso
                                   mpls

xe-8/0/0.0              up    up   inet     11.15.1.2/30
                                   iso
                                   mpls
xe-32/0/0
xe-32/0/0.0             up    up   inet     12.15.1.2/30
                                   iso
                                   mpls
xe-48/0/0
xe-48/0/0.0             up    up   inet     13.15.1.2/30
                                   iso
                                   mpls
xe-56/0/0
xe-56/0/0.0             up    up   inet     14.15.1.2/30
                                   iso
                                   mpls
em0.0                   up    up   inet     10.216.49.205/20
```

Meaning

The **Admin** and the **Link** status are shown as **up**, which means that the interfaces are configured and working properly.

Verifying the Route Information

Purpose

Verify the route information for the routing matrix.

Action

In operational mode, enter the **show route summary** command.

```
user@sfc0> show route summary
Router ID: 10.255.77.158
```

```
inet.0: 13 destinations, 14 routes (12 active, 0 holddown, 1 hidden)
              Direct:      4 routes,      3 active
               Local:      2 routes,      2 active
              Static:      6 routes,      6 active
               IS-IS:      2 routes,      1 active
iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
              Direct:      1 routes,      1 active
mpls.0: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
                MPLS:      3 routes,      3 active
inet6.0: 2 destinations, 2 routes (2 active, 0 holddown, 0 hidden)
              Direct:      2 routes,      2 active
__juniper_private1__.inet6.0: 1 destinations, 1 routes (1 active, 0 holddown, 0
hidden)
              Direct:      1 routes,      1 active
```

Meaning

The summary statistics about the entries in the routing table are shown based on the configuration.

Verifying System Uptime

Purpose

Verify the amount of time the routing matrix components have been in operation.

Action

In operational mode, enter the **show system uptime** command.

```
user@sfc0> show system uptime
sfc0-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:03:18 PST (01:12:49 ago)
Protocols started: 2012-12-02 20:53:12 PST (00:22:55 ago)
Last configured: 2012-12-02 20:41:01 PST (00:35:06 ago) by user
 9:16PM  up 1:13, 2 users, load averages: 0.06, 0.01, 0.00

lcc0-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:25:06 PST (00:51:01 ago)
Last configured: 2012-12-02 20:40:51 PST (00:35:16 ago) by user
 9:16PM  up 51 mins, 1 user, load averages: 0.02, 0.06, 0.03
```

```
lcc2-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:04:48 PST (01:11:19 ago)
Last configured: 2012-12-02 20:40:53 PST (00:35:14 ago) by user
 9:16PM  up 1:11, 0 users, load averages: 0.00, 0.02, 0.01

lcc4-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:03:35 PST (01:12:32 ago)
Last configured: 2012-12-02 20:40:53 PST (00:35:14 ago) by user
 9:16PM  up 1:13, 0 users, load averages: 0.01, 0.06, 0.07

lcc6-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:03:30 PST (01:12:37 ago)
Last configured: 2012-12-02 20:40:53 PST (00:35:14 ago) by user
 9:16PM  up 1:13, 0 users, load averages: 0.06, 0.03, 0.00


lcc7-re0:
--------------------------------------------------------------------------
Current time: 2012-12-02 21:16:07 PST
System booted: 2012-12-02 20:05:11 PST (01:10:56 ago)
Last configured: 2012-12-02 20:40:53 PST (00:35:14 ago) by user
9:16PM  up 1:11, 0 users, load averages: 0.00, 0.00, 0.00
```

Meaning

The output shows the following information:

- **Current time**—Current system time in UTC.

- **System booted**—Date and time when the Routing Engine on the router was last booted and how long it has been running.

- **Protocols started**—Date and time when the routing protocols were last started and how long they have been running.

- **Last configured**—Date and time when a configuration was last committed. Also shows the name of the user who issued the last commit command.

- **time and up**—Current time, in the local time zone, and how long the router has been operational.

- **users**—Number of users logged in to the router.

- **load averages**—Load averages for the last 1 minute, 5 minutes, and 15 minutes.

Verifying the Craft Interface Messages

Purpose

Verify the information on the craft interface. The craft interface allows you to view status and troubleshooting information at a glance and to perform many system control functions.

Action

In operational mode, enter the **show chassis craft-interface** command.

```
user@sfc0> show chassis craft-interface
sfc0-re0:
--------------------------------------------------------------------------------
FPM Display Contents:
    +--------------------+
    |sfc0                |
    |Up 0 + 01:12        |
    |                    |
    |Power OK            |
    +--------------------+

SFC Front Panel Switch Settings:
SFC Chassis Number : 00
Config Size        : 3

Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                 *    .
Fail               .    .
Master             *    .

Front Panel Alarm Indicators:
-----------------------------
Red LED      .
Yellow LED   .
Major relay  .
Minor relay  .

Front Panel F13 SIB LEDs:
SIB   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
```

```
--------------------------------------------------------------------------
Fail    .    .    .    .    .    .    .    .    .    .    .    .    .    .    .
OK      *    *    .    *    *    .    *    *    *    *    .    .    .    .    .    .
Active  *    *    .    *    *    .    *    *    *    *    .    .    .    .    .    .


PS LEDs:
   PS   0    1
------------
Red     .    .
Green   *    .


Fan Tray LEDs:
   FT   0    1    2    3    4    5
----------------------------
Red     .    .    .    .    .    .
Green   *    *    *    *    *    *


CB LEDs:
   CB   0    1
--------------
Amber   .    .
Green   *    .
Blue    *    .


lcc0-re0:
---------------------------------------------------------------------------
FPM Display contents:
    +--------------------+
    |lcc0                |
    |Up 0 + 51:01        |
    |                    |
    |Power OK            |
    +--------------------+


Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .


Front Panel Alarm Indicators:
-----------------------------
Red LED      .
```

```
Yellow LED   .
Major relay  .
Minor relay  .


Front Panel FPC LEDs:
FPC    0   1   2   3   4   5   6   7
------------------------------------
Red    .   .   .   .   .   .   .   .
Green  .   *   .   .   .   .   .   .


CB LEDs:
  CB   0   1
--------------
Amber  .   .
Green  *   .
Blue   *   .


SCG LEDs:
  SCG  0   1
--------------
Amber  .   .
Green  *   *
Blue   *   .


SIB LEDs:
  SIB  0   1   2   3   4
-------------------------
Red    .   .   .   .   .
Green  *   *   *   *   .


lcc2-re0:
--------------------------------------------------------------------------------
FPM Display contents:
    +--------------------+
    |lcc2               |
    |Up 0 + 01:11       |
    |                   |
    |Power OK           |
    +--------------------+


Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
```

```
Fail             .    .
Master           *    .


Front Panel Alarm Indicators:
-----------------------------
Red LED      .
Yellow LED   .
Major relay  .
Minor relay  .


Front Panel FPC LEDs:
FPC    0   1   2   3   4   5   6   7
------------------------------------
Red    .   .   .   .   .   .   .   .
Green  .   *   *   .   .   .   .   .


CB LEDs:
  CB   0   1
--------------
Amber  .   .
Green  *   .
Blue   *   .


SCG LEDs:
  SCG  0   1
--------------
Amber  .   .
Green  *   *
Blue   *   .


SIB LEDs:
  SIB  0   1   2   3   4
-------------------------
Red    .   .   .   .   .
Green  *   *   *   *   .


lcc4-re0:
--------------------------------------------------------------------------------
FPM Display contents:
    +-------------------+
    |lcc4               |
    |Up 0 + 01:12       |
    |                   |
    |Power OK           |
```

```
    +--------------------+

Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .

Front Panel Alarm Indicators:
-----------------------------
Red LED     .
Yellow LED  .
Major relay .
Minor relay .

Front Panel FPC LEDs:
FPC    0   1   2   3   4   5   6   7
-----------------------------------
Red    .   .   .   .   .   .   .   .
Green  .   *   *   .   .   .   .   .

CB LEDs:
   CB   0   1
--------------
Amber   .   .
Green   *   .
Blue    *   .

SCG LEDs:
   SCG  0   1
--------------
Amber   .   .
Green   *   *
Blue    *   .

SIB LEDs:
   SIB  0   1   2   3   4
-------------------------
Red    .   .   .   .   .
Green  *   *   *   *   .

lcc6-re0:
--------------------------------------------------------------------------------
```

```
FPM Display contents:

    +--------------------+
    |lcc6                |
    |Up 0 + 01:12        |
    |                    |
    |Power OK            |
    +--------------------+


Front Panel System LEDs:
Routing Engine    0     1
--------------------------
OK                *    .
Fail             .    .
Master           *    .


Front Panel Alarm Indicators:
-----------------------------
Red LED      .
Yellow LED   .
Major relay  .
Minor relay  .


Front Panel FPC LEDs:
FPC    0   1   2   3   4   5   6   7
------------------------------------
Red    .   .   .   .   .   .   .   .
Green  *   *   .   .   .   .   .   *


CB LEDs:
  CB   0   1
--------------
Amber  .   .
Green  *   .
Blue   *   .


SCG LEDs:
  SCG  0   1
--------------
Amber  .   .
Green  *   *
Blue   *   .


SIB LEDs:
  SIB  0   1   2   3   4
```

```
--------------------------
Red     .   .   .   .   .
Green   *   *   *   *   .



lcc7-re0:
--------------------------------------------------------------------------------
FPM Display contents:
    +--------------------+
    |lcc7                |
    |Up 0 + 01:10        |
    |                    |
    |Power OK            |
    +--------------------+


Front Panel System LEDs:
Routing Engine    0    1
--------------------------
OK                *    .
Fail              .    .
Master            *    .


Front Panel Alarm Indicators:
-----------------------------
Red LED     .
Yellow LED  .
Major relay .
Minor relay .


Front Panel FPC LEDs:
FPC    0   1   2   3   4   5   6   7
------------------------------------
Red    .   .   .   .   .   .   .   .
Green  *   *   .   .   .   .   .   *


CB LEDs:
  CB    0    1
--------------
Amber   .    .
Green   *    .
Blue    *    .


SCG LEDs:
  SCG   0    1
```

```
--------------
Amber    .    .
Green    *    *
Blue     *    .

SIB LEDs:
   SIB   0    1    2    3    4
   --------------------------
Red      .    .    .    .    .
Green    *    *    *    *    .
```

Meaning

The output shows the information of the craft interface.

- The **FPM Display Contents** field displays the following contents of the Front Panel Module:

  - First line—TX Matrix Plus router name.

  - Second line—Length of time the TX Matrix Plus router has been running, reported in the following form:

    Up *days + hours:minutes*

    > NOTE: During an alarm condition, the second line displays the number of active alarms in the following form:
    >
    > *alarm-count* Alarms active

  - Third and fourth lines—Information about the router traffic load, the power supply status, the fan status, and the temperature status.

    > NOTE: During an alarm condition, the third and fourth lines display individual alarm messages, with the most severe condition shown first. The prefix on each line indicates whether the alarm is a red or yellow alarm. R indicates a major alarm and Y indicates a minor alarm. You can view more information about the error messages associated with the alarm LEDs and the craft interface LCD by issuing the **show chassis alarms** operational mode command.

- The **SFC Chassis Number** field displays **00** and the **Config Size** field displays **3**.

- Status of the **Front Panel System LEDs**, **Front Panel F13 SIB LEDs**, **PS LEDs**, **Fan Tray LEDs**, **CB LEDs**, **SIB LEDs**, and **SCG LEDs**. A dot (.) indicates that the LED is not lit. An asterisk (*) indicates that the LED is lit. For more details on the LEDs and troubleshooting information, see *TX Matrix Plus LED Overview*.

- Status of the **Front Panel Alarm Indicators**. A dot (.) indicates that the relay is off. An asterisk (*) indicates that the relay is active.

Verifying the Chassis Alarms

Purpose

Verify the information about chassis alarms.

Action

In operational mode, enter the **show chassis alarms** command.

```
user@sfc0> show chassis alarms
sfc0-re0:
--------------------------------------------------------------------------------
Alarm time               Class  Description
2012-07-19 10:07:32 UTC  Minor  SIB F13 0 Temperature Warm
2012-07-19 10:07:07 UTC  Minor  SIB F2S 0/6 Temperature Warm
2012-07-19 10:07:07 UTC  Minor  SIB F2S 0/4 Temperature Warm
2012-07-19 10:07:07 UTC  Minor  SIB F2S 0/2 Temperature Warm
2012-07-19 10:07:07 UTC  Minor  SIB F2S 0/0 Temperature Warm
2012-07-19 10:07:07 UTC  Minor  SIB F13 6 Temperature Warm
2012-07-19 10:06:42 UTC  Minor  SIB F2S 2/6 Temperature Warm
2012-07-19 10:06:42 UTC  Minor  SIB F2S 2/4 Temperature Warm
2012-07-19 10:06:42 UTC  Minor  SIB F2S 2/2 Temperature Warm
2012-07-19 10:06:42 UTC  Minor  SIB F2S 2/0 Temperature Warm
2012-07-19 10:06:42 UTC  Minor  SIB F13 3 Temperature Warm
2012-07-19 10:06:17 UTC  Minor  SIB F2S 1/6 Temperature Warm
2012-07-19 10:06:17 UTC  Minor  SIB F2S 1/4 Temperature Warm
2012-07-19 10:06:17 UTC  Minor  SIB F2S 1/2 Temperature Warm
2012-07-19 10:06:17 UTC  Minor  SIB F2S 1/0 Temperature Warm

lcc0-re0:
-------------------------------------------------------------------------
Alarm time               Class  Description
2012-07-19 10:04:13 UTC  Minor  SIB 2 Temperature Warm
2012-07-19 10:04:13 UTC  Minor  SIB 1 Temperature Warm
2012-07-19 10:04:13 UTC  Minor  SIB 0 Temperature Warm

lcc2-re0:
-------------------------------------------------------------------------
```

```
Alarm time                 Class  Description
2012-07-19 10:04:18 UTC    Minor  SIB 2 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 1 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 0 Temperature Warm


lcc4-re0:
--------------------------------------------------------------------------
Alarm time                 Class  Description
2012-07-19 10:04:18 UTC    Minor  SIB 2 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 1 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 0 Temperature Warm


lcc6-re0:
--------------------------------------------------------------------------
Alarm time                 Class  Description
2012-07-19 10:04:18 UTC    Minor  SIB 2 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 1 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 0 Temperature Warm


lcc7-re0:
--------------------------------------------------------------------------
Alarm time                 Class  Description
2012-07-19 10:04:18 UTC    Minor  SIB 2 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 1 Temperature Warm
2012-07-19 10:04:18 UTC    Minor  SIB 0 Temperature Warm
```

Meaning

The output shows information about the chassis alarms that are active. Verify the following information:

- Date and time the alarm was first recorded.

- Severity class for this alarm: **Minor** or **Major**.

- The **Description** field displays information about chassis components such as the cooling system or power supplies. For example, **Temperature Warm** indicates that the chassis temperature exceeded the warm-temperature threshold, and you must ensure to provide sufficient cooling for the component. For more details on alarm information and actions to be taken, see the *Troubleshooting the TX Matrix Plus Cooling System*.