Junos® OS

Routing Matrix with a TX Matrix Plus Router Feature Guide

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Junos® OS Routing Matrix with a TX Matrix Plus Router Feature Guide,

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Overview

CHAPTER 1

Product Overview

Overview of a Routing Matrix with a TX Matrix Plus Router

A routing matrix based on a Juniper Networks TX Matrix Plus Router is a multichassis architecture composed of one TX Matrix Plus router and from one to four interconnected T1600 routers.

Components of a Routing Matrix with a TX Matrix Plus Router

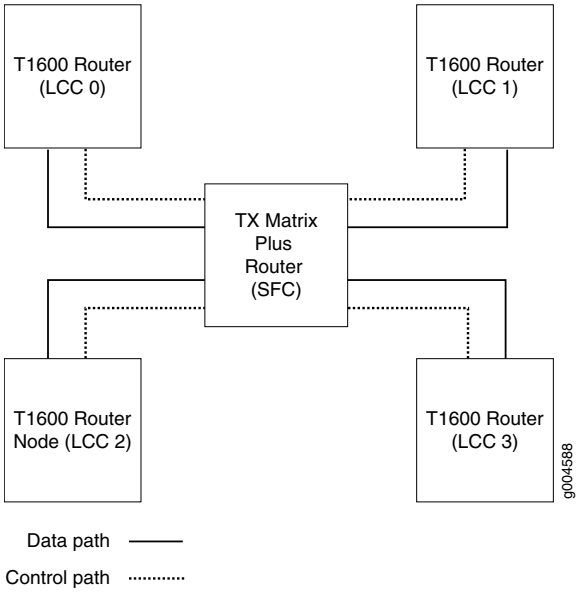
A routing matrix contains two types of chassis: a Juniper Networks TX Matrix Plus Router and Juniper Networks T1600 Core Router.

- TX Matrix Plus router—A routing matrix can contain only one Juniper Networks TX Matrix Plus router. A TX Matrix Plus router is often referred to as the *switch-fabric chassis* (SFC). In the Junos OS command-line interface (CLI), **sfc0** 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 routers—A routing matrix can contain from one to four T1600 routers, numbered from 0 through 3. The T1600 router number is set by the hardware. A T1600 router in a routing matrix is often referred to as a *line-card chassis* (LCC). In the Junos OS CLI, **lcc0** through **lcc3** are used to refer to a T1600 router in a routing matrix. For information about connecting to a T1600 router in a routing matrix, see the *TX Matrix Plus Router Hardware Guide*.

Architecture of a Routing Matrix with a TX Matrix Plus Router

In a routing matrix, the TX Matrix Plus router controls all the connected T1600 routers, as shown in Figure 1 on page 4.

Figure 1: Architecture of a Routing Matrix with a TX Matrix Plus Router



A key element of the routing matrix design is the ability to migrate existing standalone T1600 routers and connect them with a TX Matrix Plus router through fiber-optic cables and Switch Interface Boards (SIBs).

The TX Matrix Plus router connection between the T1600 routers uses a scalable, three-stage switch fabric. This system architecture provides terabit bandwidth expansion capacity and eliminates the use of subscriber line cards to connect devices within points of presence (POPs). As a result, the primary application for the routing matrix is to collapse aggregation and core layers in large POPs and central offices.

Similarly, you can limit which portions of the routing matrix are modified during configuration or maintenance procedures (for example, performing software upgrades or halting Routing Engines).

Managing the Routing Matrix as a Single Router

Although a routing matrix can contain up to five separate physical components, from the perspective of the user interface, the routing matrix appears as a single router for most operations and uses the existing Junos OS CLI.

To manage the multichassis system, some enhancements have been made to the CLI to enable you to select the amount of output you want to display when you issue operational commands. For example, you can specify the entire routing matrix, the TX Matrix Plus router, a specific T1600 router and its Flexible PIC Concentrators (FPCs), or a combination thereof.

When you issue configuration and operational commands on a TX Matrix Plus router, your view of the routing matrix shows a single routing device with a single range of FPC numbers (from **0** through **31** rather than from **0** through **7** for each FPC). As a result, you will need to adjust certain configuration statements to accommodate the global numbering of FPCs installed on the routing matrix, as described in "Using Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router" on page 23.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Global FPC Numbering for Interfaces in the Routing Matrix on page 5
- Routing Engine Connectivity in the Routing Matrix on page 7
- Redundant Host Subsystems in the Routing Matrix on page 8
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router

A routing matrix with a TX Matrix Plus router can contain up to four T1600 routers (line-card chassis) that are assigned numbers, from 0 through 3, depending on the hardware setup and connectivity to the TX Matrix Plus router. In the Junos OS CLI, **lcc 0** through **lcc 3** are used to refer to a T1600 router in a routing matrix. Each T1600 router can contain up to eight Flexible PIC Concentrators (FPCs) in FPC hardware slots labeled 0 through 7. Therefore, a routing matrix with a TX Matrix Plus router can contain up to 32 FPCs.

In the Junos OS CLI, an interface name has the following format:

type-fpc/pic/port

When you specify the ***fpc*** number for a T1600 router in a routing matrix, the Junos OS determines which T1600 router contains the specified FPC. Table 1 on page 5 shows the basic correspondence between FPC hardware slot numbers (**0** through **7**), which are labeled on the T1600 chassis, and routing matrix FPC numbers (**0** through **31**), which are used in the Junos OS CLI.

Table 1: FPC Numbering for T1600 Routers in a Routing Matrix — Basic Correspondence

T1600 Router in a Routing Matrix	Basic Correspondence of FPC Numbering	
	FPC Hardware Slot Numbers	Global FPC Numbers
LCC 0	0 – 7	0 – 7
LCC 1	0 – 7	8 – 15
LCC 2	0 – 7	16 – 23

Table 1: FPC Numbering for T1600 Routers in a Routing Matrix — Basic Correspondence *(continued)*

T1600 Router in a Routing Matrix	Basic Correspondence of FPC Numbering	
	FPC Hardware Slot Numbers	Global FPC Numbers
LCC 3	0 – 7	24 – 31

To easily convert an FPC hardware slot number in a specific LCC (T1600 router) in a routing matrix to the corresponding global FPC number, use the conversion chart shown in Table 2 on page 6. You can use the converted FPC number to configure the interfaces on the TX Matrix Plus router in your routing matrix.

Table 2: FPC Numbering for T1600 Routers in a Routing Matrix — Conversion Chart

Conversion Chart for FPC Numbering									
	LCC 0								
FPC Hardware Slot Numbers	0	1	2	3	4	5	6	7	**Example:** In the interface name **se-1/0/0**, the global FPC number **1** refers to FPC hardware slot **1** in the T1600 router **lcc0**.
Global FPC Numbers	0	1	2	3	4	5	6	7	
	LCC 1								
FPC Hardware Slot Numbers	0	1	2	3	4	5	6	7	**Example:** In the interface name **t1-11/2/0**, the global FPC number **11** refers to FPC hardware slot **3** in the T1600 router **lcc1**.
Global FPC Numbers	8	9	10	11	12	13	14	15	
	LCC 2								
FPC Hardware Slot Numbers	0	1	2	3	4	5	6	7	**Example:** In the interface name **so-20/0/1**, the global FPC number **20** refers to FPC hardware slot **4** in the T1600 router **lcc2**.
Global FPC Numbers	16	17	18	19	20	21	22	23	
	LCC 3								
FPC Hardware Slot Numbers	0	1	2	3	4	5	6	7	**Example:** In the interface name **t3-31/1/0**, the global FPC number **31** refers to the FPC in slot **7** in the T1600 router **lcc3**.
Global FPC Numbers	24	25	26	27	28	29	30	31	

You can use a CLI operational command to display the numbers of the connected FPCs in a routing matrix. To display the FPC numbers in both "global numbering" mode (**0** through **31**, as used to specify an interface name in a routing matrix) and associated "local numbering" mode (LCC number and FPC physical slot number), you can use various forms of the **show chassis location** command. For more information, see "Displaying Chassis Physical Locations for a Routing Matrix with a TX Matrix Plus Router" on page 105.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Routing Engine Connectivity in a Routing Matrix with a TX Matrix Plus Router

The TX Matrix Plus router contains two Connector Interface Panels (CIPs)—one for each Routing Engine—that are referred to as **TXP-CIP-0** and **TXP-CIP-1**. In a routing matrix with a TX Matrix Plus router, all Routing Engines are connected to their respective Control Boards, which in turn are connected to ports on the two CIPs on the TX Matrix Plus router:

- On a TX Matrix Plus router, the Routing Engine (RE-TXP-SFC) and Control Board (TXP-CB) function as a unit, or host subsystem. For each of the two host subsystems in the router, the Junos OS automatically creates two internal Ethernet interfaces, **ixgbe0** and **ixgbe1**, for the two 10-Gigabit Ethernet ports on the Routing Engine. The port at **ixgbe0** connects the TX Matrix Plus Routing Engine to the Routing Engines of every T1600 router configured in the routing matrix.
- On a T1600 router configured in a routing matrix, the Routing Engine (RE-TXP-LCC) and Control Board (LCC-CB) function as a unit, or host subsystem. For each of the two host subsystems in the router, the Junos OS automatically creates two internal Ethernet interfaces, **bcm0** and **em1**, for the two Gigabit Ethernet ports on the Routing Engine. The port at **bcm0** connects the LCC Routing Engine to the Routing Engines of every other T1600 router configured in the routing matrix.

NOTE: **The Routing Engines in the TX Matrix Plus router and in the T1600 routers configured in a routing matrix do not support the management Ethernet interface fxp0 or the internal Ethernet interfaces fxp1 or fxp2.**

Configurations and automated scripts that have been developed for standalone T1600 routers (T1600 routers not configured in a routing matrix) might contain references to the fxp0, fxp1, or fxp2 interfaces.

Before reusing the configurations or scripts on T1600 routers in a routing matrix, update the files as appropriate:

- Edit any command lines that reference the T1600 router management Ethernet interface **fxp0** by replacing "**fxp0**" with "**em0**."
- Ensure that any **show interfaces** commands that are intended to list the T1600 router internal Ethernet interfaces refer to the **bcm0** or **em1** interfaces.

For more detailed information, see the *Junos OS Network Interfaces Configuration Guide* and the *Junos OS Interfaces Command Reference*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
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Redundant Host Subsystems in a Routing Matrix with a TX Matrix Plus Router

The TX Matrix Plus router and every T1600 router in the routing matrix is configured with redundant host subsystems.

- In a TX Matrix Plus router, the independent control planes are connected by two physical links between the two 10-Gigabit Ethernet ports on their respective Routing Engines. The primary link to the remote Routing Engine is at the **ixgbe0** internal 10-Gigabit Ethernet interface. The alternate link to the remote Routing Engine is at the **ixgbe1** internal 10-Gigabit Ethernet interface. If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.
- In a T1600 router in a routing matrix, the independent control planes are connected by two physical links between the Gigabit Ethernet ports on their respective Routing Engines. The primary link to the remote Routing Engine is at the **bcm0** internal Ethernet interface. The alternate link to the remote Routing Engine is at the **em1** internal Ethernet interface. If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.

Two Routing Engines provide redundancy and graceful Routing Engine switchover (GRES) capabilities.

NOTE: If GRES is configured, the CLI command prompt indicates Routing Engine mastership (**{master}** or **{backup}**) and physical slot number (**-re0** or **-re1**).

For example, the following CLI prompt indicates that you are logged in to the master Routing Engine in slot **RE0** of the router with hostname **mylcc3**:

```
{master}
user@mylcc3-re0>
```

The following CLI prompt indicates that you are logged in to the backup Routing Engine in slot **RE1** of the router with hostname **mylcc3**:

```
{backup}
user@mylcc3-re1>
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
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CHAPTER 2

Product Reference Information

System Requirements for a Routing Matrix with a TX Matrix Plus Router

To implement a routing matrix with a TX Matrix Plus router, your system must meet the following minimum requirements:

- Junos OS Release 9.6 or later.
- One Juniper Networks TX Matrix Plus Router.
- Two to four Juniper Networks T1600 Core Routers.

  To connect a T1600 router to the routing matrix, the T1600 router must contain the following components:

  - Two C1800 Routing Engines—Model RE-DUO-C1800-8G
  - Two LCC-CB Control Boards (CBs)—Model CB-LCC
  - Five TXP-T1600 Switch Interface Boards (SIBs)—Model SIB-TXP-T1600
  - One rear fan tray—Model FAN-REAR-TXP-LCC

  For information about upgrading a standalone T1600 router and integrating it into a routing matrix, see the *TX Matrix Plus Router Hardware Guide*.
- Physical Interface Cards (PICs) of your choice. To view a list of supported PICs, see the *T1600 Core Router PIC Guide*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
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Routing Matrix Terms and Acronyms

L

line-card chassis (LCC) — A T640 router or T1600 router installed in a routing matrix.

R

routing matrix — A high capacity, multichassis router. The routing matrix with a TX Matrix router combines multiple T640 routers with a TX Matrix router switch fabric. The routing matrix with a TX Matrix Plus router combines multiple T1600 routers with a TX Matrix Plus router switch fabric.

S

Switch Interface Board (SIB) — On T640 and T1600 routers and on TX Matrix router and TX Matrix Plus routers, a switch fabric plane component that forwards packets from a source Packet Forwarding Engine to a destination Packet Forwarding Engine.

switch-card chassis (SCC) — A TX Matrix router installed in a routing matrix.

switch-fabric chassis (SFC) — A TX Matrix Plus router installed in a routing matrix.

T

TX Matrix Plus router — A high-speed centralized switch fabric that connects multiple T1600 routers in a routing matrix.

TX Matrix router — A high-speed centralized switch fabric that connects multiple T640 routers in a routing matrix.

Related Documentation

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PART 2

Configuration

CHAPTER 3

Product Configuration

Roadmap for Configuring a Routing Matrix with a TX Matrix Plus Router

This topic summarizes the procedure for configuring a routing matrix with a TX Matrix Plus router.

To configure a routing matrix with a TX Matrix Plus router, complete the following tasks:

1. Connect to the Routing Engines of the routing matrix, as described in "Connecting to a Routing Matrix with a TX Matrix Plus Router" on page 16.
2. Create and apply Routing Engine configuration groups, as described in "Using Configuration Groups and Inheritance in a Routing Matrix with a TX Matrix Plus Router" on page 18.

   In general, configuration groups and inheritance of the statements in configuration groups support configuration of various router components. The special Routing Engine configuration groups (**re0**, **re1**, **lcc*n*-re0**, and **lcc*n*-re1**, where *n* is a value from **0** through **3**) offer a simple way to establish hostnames, management interfaces, and default routes for the Routing Engines in the routing matrix.
3. Adjust certain configuration statements to accommodate the global number of FPCs installed on the routing matrix, as described in "Using Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router" on page 23.

4. (Optional) Configure protocols and other features on the routing matrix, as described in "Configuring Protocols and Other Features on a Routing Matrix with a TX Matrix Plus Router" on page 24.

   Other than the expanded range of FPC numbers for interfaces and the requirement to create groups for the routers, you can configure protocols in exactly the same manner as you would for other Juniper Networks routers.

5. (Optional) For T1600 routers in a routing matrix, you can configure PIC-specific features, create an alarm LCCs that do not come online, and take LCCs offline. For more information, see "Configuring Chassis-Specific Features on a Routing Matrix with a TX Matrix Plus Router" on page 25.

6. Commit configurations on the routing matrix, as described in "Committing Configurations on a Routing Matrix with a TX Matrix Plus Router" on page 27.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
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Connecting to a Routing Matrix with a TX Matrix Plus Router

On a routing matrix with a TX Matrix Plus router, you can perform management and service operations on the routing matrix through a Junos OS command-line interface (CLI) session with the TX Matrix Plus router.

BEST PRACTICE: **We recommend that you access a routing matrix by connecting to the master Routing Engine on the TX Matrix Plus router. Under normal operating conditions, you do not need to access or configure the T1600 routers directly.**

This topic contains the following information:

Accessing a Routing Engine by Direct Console Connection to a Serial Port

For an in-band connection to a Routing Engine in the routing matrix, you can attach one or more management console or auxiliary devices to the appropriate serial ports on a Routing Engine in a routing matrix. On a TX Matrix Plus router, the **CONSOLE** or **AUXILIARY** serial ports are located on each control board (TXP-CB). On a T1600 router in a routing

matrix, the **CONSOLE** or **AUXILIARY** serial ports are located on the Connector Interface Panel (CIP). For more information, see the *TX Matrix Plus Router Hardware Guide*

Accessing a Routing Engine by Telnet Access to a Management Ethernet Port

For an out-of-band management connection to a Routing Engine in a routing matrix, you can establish a Telnet session over the network connection to that Routing Engine. On a TX Matrix Plus router, the **ETHERNET** port is located on each TXP-CB. On a T1600 router in a routing matrix, the **ETHERNET** port is located on the CIP.

For a TX Matrix Plus router and for T1600 routers in a routing matrix, the CLI syntax for operational commands and configuration statements refers to the **ETHERNET** management port as the **em0** management Ethernet interface. To use **em0** as a management port, you must configure its logical port, **em0.0**, with a valid IP address. For more information, see the *Junos OS Network Interfaces Configuration Guide*.

Accessing a Routing Engine by Logging In from the CLI of Another Routing Engine

After you are logged in to one Routing Engine in a routing matrix, you can issue the **request routing-engine login** command to connect to another Routing Engine in the routing matrix. For example:

```
{master}
user@hostA-re0> request routing-engine login ?
Possible completions:
  backup               Log in to backup RE
  lcc                  Log in to specific LCC (0..3)
  master               Log in to master RE
  other-routing-engine  Log in to the other Routing Engine
  re0                  Log in to RE0
  re1                  Log in to RE1
  sfc                  Log in to SFC (0..0)

{master}
user@hostA-re0> request routing-engine login sfc 0 ?
Possible completions:
  backup               Log in to backup RE
  master               Log in to master RE
  re0                  Log in to RE0
  re1                  Log in to RE1

{master}
user@hostA-re0> request routing-engine login lcc 3 ?
Possible completions:
  backup               Log in to backup RE
  master               Log in to master RE
  re0                  Log in to RE0
  re1                  Log in to RE1

{master}
user@hostA-re0> request routing-engine login lcc 3 backup re1

--- JUNOS 1.1-11111111.1 built 1111-11-11 11:11:11 UTC
% cli
{backup}
user@hostB-re1>
```

Connecting to a Backup Routing Engine on the TX Matrix Plus Router

To manage the backup Routing Engines on all routers in the routing matrix (for example, to upgrade Junos OS), we recommend that you connect to the backup Routing Engine of the TX Matrix Plus router.

NOTE: If you access a Routing Engine on a T1600 router, the following warning displays:

```
user@host> request routing-engine login lcc 0 re0
--- JUNOS 9.6I built 2009-07-13 8:13:04 UTC
% cli
warning: This chassis is a Line Card Chassis (LCC) in a multichassis
system.
warning: Use of interactive commands should be limited to debugging.
warning: Normal CLI access is provided by the Switch Fabric Chassis
(SFC).
warning: Please logout and log into the SFC to use CLI.
```

Related Documentation

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Using Configuration Groups and Inheritance in a Routing Matrix with a TX Matrix Plus Router

To simplify configuration of individual Routing Engines in a routing matrix with a TX Matrix Plus router, you can create a configuration group for each Routing Engine in the routing matrix:

- Overview of Configuration Groups and Inheritance in a Routing Matrix on page 18
- Creating Configuration Groups in a Routing Matrix on page 19
- Applying a Configuration Group in a Routing Matrix on page 20
- Displaying Inherited Statements on page 20
- Disabling Inheritance of a Configuration Group in the Routing Matrix on page 21
- Using Special Configuration Groups for the Routing Engines in the Routing Matrix on page 21

Overview of Configuration Groups and Inheritance in a Routing Matrix

The configuration groups feature in the Junos OS enables you to create a group containing configuration statements and to direct the inheritance of that group's statements in the rest of the configuration. The same group can be applied to different sections of the

configuration, and different sections of one group's configuration statements can be inherited in different places in the configuration.

Configuration groups enable you to create smaller, more logically constructed configuration files, making it easier to configure and maintain the Junos OS. For example, you can group statements that are repeated in many places in the configuration, such as when configuring interfaces, and thereby limit updates to just the group.

Configuration groups use true inheritance, which involves a dynamic, ongoing relationship between the source of the configuration data and the target of that data. Data values changed in the configuration group are automatically inherited by the target. The target need not contain the inherited information, although the inherited values can be overridden in the target without affecting the source from which they were inherited.

This inheritance model allows you to see only the instance-specific information without seeing the inherited details. A command pipe in configuration mode allows you to display the inherited data.

Creating Configuration Groups in a Routing Matrix

For areas of your configuration to inherit configuration statements, you must first put the statements into a configuration group and then apply that group to the levels in the configuration hierarchy that require the statements.

To create configuration groups in a routing matrix with a TX Matrix Plus router, you can include the **groups** statement at the **[edit]** hierarchy level on the TX Matrix Plus router:

```
[edit]
groups {
   group-name {
      ...configuration-data...
   }
}
```

The ***group-name*** statement specifies the name of a configuration group. You can configure more than one configuration group by specifying multiple ***group-name*** statements at the **[edit groups]** hierarchy level.

You cannot use the prefix **junos-** in a group name because it is reserved for use by the Junos OS. One reason for the naming restriction is a configuration group called **junos-defaults**. This preset configuration group is applied to the configuration automatically. You cannot modify or remove the **junos-defaults** configuration group. For more information about the Junos default configuration group, see "Using Junos OS Defaults Groups" in the *Junos OS CLI User Guide*.

Similarly, the configuration group **juniper-ais** is reserved exclusively for Juniper Advanced Insight Solutions (AIS)-related configuration. For more information about the **juniper-ais** configuration group, see the *Juniper Networks Advanced Insight Solutions Guide*.

Applying a Configuration Group in a Routing Matrix

To have a configuration inherit the statements in a configuration group, include the **apply-groups** statement on the TX Matrix Plus router:

```
apply-groups [ group-names ];
```

Include the **apply-groups [** *group-names* **]** statement anywhere in the configuration that the configuration statements contained in a configuration group are needed.

If you specify more than one group name, list them in order of inheritance priority. The configuration statements in the first group take priority over configuration statements in subsequent groups.

You can include only one **apply-groups** statement at each specific level of the configuration hierarchy. The **apply-groups** statement at a specific hierarchy level lists the configuration groups to be added to the containing statement's list of configuration groups.

Values specified at the specific hierarchy level override values inherited from the configuration group.

Groups listed in nested **apply-groups** statements take priority over groups in outer statements. In the following example, the BGP neighbor 10.0.0.1 inherits configuration data from group one first, then from groups two and three. Configuration data in group one overrides data in any other group. Data from group ten is used only if a statement is not contained in any other group.

```
apply-groups [ eight nine ten ];
protocols {
    apply-groups seven;
    bgp {
        apply-groups [ five six ];
        group some-bgp-group {
            apply-groups four;
            neighbor 10.0.0.1 {
                apply-groups [ one two three ];
            }
        }
    }
}
```

Displaying Inherited Statements

Configuration groups can add some confusion regarding the actual values used by the router, because configuration data can be inherited from configuration groups. To view the actual values used by the router, use the **display inheritance** command after the pipe in a **show** command. This command displays the inherited statements at the level at which they are inherited and the group from which they have been inherited.

The following example shows part of the output of the **show | display inheritance** command that shows configuration statements inherited from the special configuration group **re0**, which contains configuration statements that apply to the Routing Engine in slot 0 (labeled **RE0**) on the TX Matrix Plus router:

```
[edit]
user@host# show | display inheritance
...
system {
    ## 'mysfc0' was inherited from group 're0'
    host-name mysfc0;
    ## 'backup-router' was inherited from group 're0'
    backup-router 192.168.35.254;
}
interfaces {
    ## 'em0' was inherited from group 're0'
    em0 {
        ## '0' was inherited from group 're0'
        unit 0 {
            ## 'inet' was inherited from group 're0'
            family inet {
                ## '192.168.35.95/24' was inherited from group 're0'
                address 192.168.35.95/24;
            }
        }
    }
}
...
```

Disabling Inheritance of a Configuration Group in the Routing Matrix

To disable inheritance of a configuration group at any level except the top level of the hierarchy, include the **apply-groups-except** statement:

```
apply-groups-except [ group-names ];
```

This statement is useful when you use the **apply-group** statement at a specific hierarchy level but also want to override the values inherited from the configuration group for a specific parameter.

Using Special Configuration Groups for the Routing Engines in the Routing Matrix

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. Parameters that are not configured at the **[edit groups]** hierarchy level apply to all Routing Engines in the routing matrix.

To configure configuration groups and apply inheritance for the Routing Engines in a routing matrix with a TX Matrix Plus router, you can include the **groups** statement at the **[edit]** hierarchy level on the TX Matrix Plus router and then include special configuration group names for all the Routing Engines in the routing matrix:

```
[edit]
groups {
    re0 { # Create the group for the SFC master Routing Engine.
        system {
```

```
        host-name sfc0-re0-hostname;
        backup-router ip-address;
        ...
      }
      interfaces {
        em0 {
          unit logical-unit-number {
            ...
          }
      }
    }
    re1 { # Create the group for the SFC backup Routing Engine.
      system {
        host-name sfc0-re1-hostname;
        backup-router ip-address;
        ...
      }
      interfaces {
        em0 {
          unit logical-unit-number {
            ...
          }
      }
    }
    lccn-re0 { # Create the group for the master Routing Engine in a specific LCC.
      system {
        host-name lccN-re0-hostname;
        backup-router ip-address;
        ...
      }
      interfaces {
        em0 {
          unit logical-unit-number {
            ...
          }
      }
    }
    lccn-re1 { # Create the group for the backup Routing Engine in a specific LCC.
      system {
        host-name lccN-re1-hostname;
        backup-router ip-address;
        ...
      }
      interfaces {
        em0 {
          unit logical-unit-number {
            ...
          }
      }
    }
    ...additional-routing-engine-group-configurations...
}
apply-groups [ re0 re1 lccn-re0 lccn-re1 ... ]; # Enable inheritance of the groups.
```

For routers in a routing matrix with a TX Matrix Plus router, you can specify the following special group names:

- **re0**—Configuration statements apply to the Routing Engine in slot 0 (labeled **RE0**) on the TX Matrix Plus router.
- **re1**—Configuration statements apply to the Routing Engine in slot 1 (labeled **RE1**) on the TX Matrix Plus router.
- **lcc*n*-re0**—Configuration statements apply to the Routing Engine in slot 0 (labeled **RE0**) on the T1600 router identified as **lcc*n***, where ***n*** is a value from **0** through **3**.
- **lcc*n*-re1**—Configuration statements applied to the Routing Engine in slot 1 (labeled **RE1**) on the T1600 router identified **lcc*n***, where ***n*** is a value from **0** through **3**.

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.

Each Routing Engine configuration group contains at a minimum the configuration for the Routing Engine hostname and the management Ethernet interface (**em0**). In addition, if each Routing Engine uses a different management interface, the group also should contain the configuration for the backup router and static routes.

Note that apply groups can be nested. For example, any configuration statements that are common to **lcc0-re0** and **lcc0-re1** can be included in a separate configuration group and then added as an apply group to the **lcc0-re0** and **lcc0-re1** groups, which in turn are applied to the main configuration.

For more information about configuring and applying configuration groups, see the *Junos OS CLI User Guide*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Using Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router

When configuring interfaces on a routing matrix with a TX Matrix Plus router, you must adjust the routing matrix configuration to accommodate increased FPC numbers used in interface names.

For example, if you have a Gigabit Ethernet interface installed in FPC slot **7**, PIC slot **0**, port **0** of T1600 router **lcc 3**, you can configure this interface on the TX Matrix Plus router by including the **ge-31/0/0** statement at the **[edit interfaces]** hierarchy level:

```
[edit]
interfaces {
   ge-31/0/0 { # In a standalone T1600 router, the interface is 'ge-7/0/0'.
      unit 0 {
         family inet {
            address ip-address;
         }
      }
   }
}
```

For more information about converting FPC hardware slot numbers on a T1600 router to the global FPC numbers used for interfaces in a routing matrix and vice versa, see "Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router" on page 5 and "Displaying Chassis Physical Locations for a Routing Matrix with a TX Matrix Plus Router" on page 105.

NOTE: When you include the **fpc** statement at the **[edit chassis lcc *lcc-number*]** hierarchy level, specify the FPC hardware slot number (**0** through **7**) as labeled on the T1600 router chassis. Do not specify the corresponding global FPC number (**0** through **31**).

For more information about physically connecting a TX Matrix Plus router and two to four T1600 routers together in a routing matrix, *TX Matrix Plus Router Hardware Guide* For more information about the interface naming conventions for a routing matrix, see the *Junos OS Network Interfaces Configuration Guide*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Configuring Protocols and Other Features on a Routing Matrix with a TX Matrix Plus Router

Other than the expanded range of FPC numbers for interfaces and the requirement to create groups for the T1600 routers, the configuration of a routing matrix with a TX Matrix Plus router is exactly the same as for all other Juniper Networks routers. You can configure routing protocols, Multiprotocol Label Switching (MPLS) applications, virtual private networks (VPNs), routing and forwarding options, and other software features as usual.

For more information about configuring Junos OS-based routers, see the Junos OS configuration guides.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Configuring Chassis-Specific Features on a Routing Matrix with a TX Matrix Plus Router

You can configure chassis-specific features on specific T1600 routers in a routing matrix with a TX Matrix Plus router:

- Configuring PIC-Specific Features on a T1600 Router in a Routing Matrix on page 25
- Configuring an Alarm to Trigger if an LCC in the Routing Matrix Does Not Come Online on page 26
- Configuring an LCC in the Routing Matrix to Stay Offline on page 26
- For More Information on page 26

Configuring PIC-Specific Features on a T1600 Router in a Routing Matrix

You can configure PIC-specific features, such as SONET/SDH framing, on specific T1600 routers in a routing matrix with a TX Matrix Plus router. To configure, include the **lcc** ***lcc-number*** statement at the **[edit chassis]** hierarchy level and specify the PIC-specific feature to configure.

```
[edit]
chassis {
   lcc lcc-number {
      fpc slot-number { # Use the T1600 router FPC hardware slot number.
         pic pic-number {
            ...pic-specific-configuration...
         }
      }
   }
}
```

NOTE: When you include statements at the [edit chassis lcc *lcc-number*] hierarchy level, specify the actual FPC hardware slot number as labeled on the T1600 router chassis. Do not specify the corresponding global FPC number (0 through 31). Global FPC numbering, described in "Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router" on page 5 and in "Displaying Chassis Physical Locations for a Routing Matrix with a TX Matrix Plus Router" on page 105, is used to specify the interface in a routing matrix.

Configuring an Alarm to Trigger if an LCC in the Routing Matrix Does Not Come Online

By default, the Junos OS allows all T1600 routers in the routing matrix to come online. Optionally, you can configure the TX Matrix Plus router to generate an alarm if the T1600 routers in the routing matrix do not come online.

To configure, include the **online-expected** statement at the **[edit chassis lcc *lcc-number*]** hierarchy level on the TX Matrix Plus router:

```
[edit]
chassis{
   lcc lcc-number {
      online-expected;
   }
}
```

If you do not include the **online-expected** statement at any **[edit chassis lcc *lcc-number*]** hierarchy level on the TX Matrix Plus router, no alarm triggers if any T1600 fails to come online.

Configuring an LCC in the Routing Matrix to Stay Offline

If you do not want a T1600 router to be part of the routing matrix, such as while you are performing maintenance on that LCC, you can configure the router to be offline.

To configure a T1600 router to be offline, include the **offline** statement at the **[edit chassis lcc *lcc-number*]** hierarchy level:

```
[edit]
chassis {
   lcc lcc-number {
      offline;
   }
}
```

When you are ready to bring the T1600 router back online, delete the **offline** configuration statement at the **[edit chassis lcc *number*]** hierarchy level.

NOTE: If you do not include the **offline** statement at any **[edit chassis lcc *lcc-number*]** hierarchy level on the TX Matrix Plus router, any T1600 router that is part of the routing matrix is allowed to come online.

For More Information

For more information about chassis-specific statements, see the *Junos OS System Basics Configuration Guide*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33

- Upgrading the Junos OS on the Routing Matrix on page 61

Committing Configurations on a Routing Matrix with a TX Matrix Plus Router

On a routing matrix with a TX Matrix Plus router, you must commit configuration changes on the TX Matrix Plus router rather than on the individual T1600 routers. All configuration changes you commit on the TX Matrix Plus router are distributed to all the T1600 routers in the routing matrix and override any configuration changes committed directly on a T1600 router.

NOTE: If you commit a configuration directly on a T1600 router in a routing matrix, the configuration is not distributed to the TX Matrix Plus router or to the other T1600 routers in the routing matrix.

There are three main ways to commit configurations on a TX Matrix Plus router:

- Committing a Configuration to Both Master and Backup Routing Engines in the Routing Matrix on page 27
- Committing a Configuration to the Master Routing Engines (Only) in the Routing Matrix on page 28
- Synchronizing to the Configuration on the Other Routing Engine on page 28

Committing a Configuration to Both Master and Backup Routing Engines in the Routing Matrix

To commit the same configuration to both the master and backup Routing Engines in the routing matrix, issue the **commit** operational command with the **synchronize** option.

The Routing Engine on which you execute the **commit synchronize** command (the requesting Routing Engine) copies and loads its candidate configuration to the other Routing Engine (the responding Routing Engine). Both Routing Engines then perform a syntax check on the candidate configuration file being committed. If no errors are found, the configuration is activated and becomes the current operational configuration on both Routing Engines.

The **commit synchronize** command makes the active or applied configuration the same for both Routing Engines with the exception of two special configuration groups for Routing Engines:

- Configuration statements specified in the **re0** configuration group are applied only to Routing Engines in slot 0 (designated **re0**).
- Configuration statements specified in the **re1** configuration group are applied only to Routing Engines in slot 1 (designated **re0**).

NOTE: If you do not synchronize the configurations between two Routing Engines and one of them fails, the router may not forward traffic correctly because the backup Routing Engine may have a different configuration.

The following example shows command output for the **commit** command issued on the TX Matrix Plus router with the **synchronize** option:

```
[edit groups]
user@host> set re0 system hostname sfc0–re0–hostname

user@sfc0–re0–hostname> commit synchronize;
sfc0-re0:
configuration check succeeds
lcc0-re1:
commit complete
lcc0-re0:
commit complete
lcc2-re1:
commit complete
lcc2-re0:
commit complete
sfc0-re1:
commit complete
sfc0-re0:
commit complete
```

Committing a Configuration to the Master Routing Engines (Only) in the Routing Matrix

In a routing matrix with a TX Matrix Plus router, issuing the basic form of the **commit** operational command on the TX Matrix Plus router commits the candidate configuration only to the master Routing Engines in the routing matrix.

The following example shows command output for the basic form of the **commit** command:

```
user@host# commit
sfc0-re0:
configuration check succeeds
lcc0-re0:
commit complete
lcc1-re0:
commit complete
sfc0-re0:
commit complete
```

Synchronizing to the Configuration on the Other Routing Engine

In a routing matrix with at TX Matrix Plus router, issuing the **commit synchronize** command with the **force** option directs one Routing Engine to synchronize its configuration with the other.

NOTE: We recommend that you use the force option only if you are unable to resolve the issues that caused the commit synchronize command to fail.

The Routing Engine on which you issue this command (the requesting Routing Engine) copies and loads its candidate configuration to the other Routing Engine (the responding Routing Engine). Both Routing Engines then perform a syntax check on the candidate

configuration file being committed. If no errors are found, the configuration is activated and becomes the current operational configuration on both Routing Engines.

The **commit synchronize** command does not work if the responding Routing Engine has uncommitted configuration changes. However, you can enforce commit synchronization on the Routing Engines by using the **force** option.

NOTE: When you issue the **commit synchronize** command with the **force** option from one Routing Engine, the configuration sessions on the other Routing Engine will be terminated and its configuration synchronized with that on the Routing Engine from which you issued the command.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

CHAPTER 4

Product Configuration Examples

Merging Examples

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. 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 router.

   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 router.

```
system {
    scripts {
        commit {
            file ex-script.xsl;
        }
    }
}
interfaces {
```

```
    em0 {
      disable;
      unit 0 {
        family inet {
          address 10.0.0.1/24;
        }
      }
    }
}
```

2. Merge the contents of the file into your router 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 router.

   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 router.

```
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 router 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

For more information about using the **load** command, see Loading a Configuration from a File and Examples: Loading a Configuration from a File in the *Junos OS CLI User Guide*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33

- Upgrading the Junos OS on the Routing Matrix on page 61

Example Configuration for a Routing Matrix with a TX Matrix Plus Router

The following sections describe an example configuration for a routing matrix with a TX Matrix Plus router:

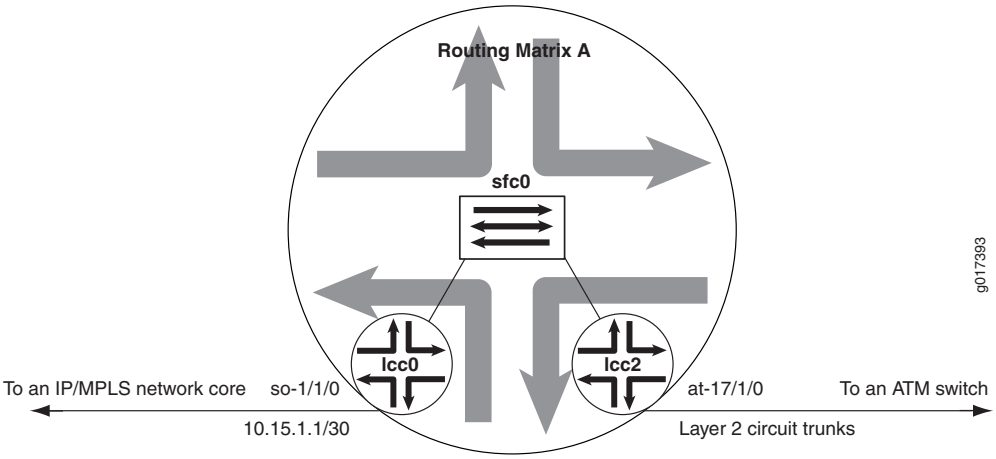
- Example Routing Matrix Topology on page 33
- Example Routing Matrix Configuration on page 34
- Verifying the Example Configuration on page 39

Example Routing Matrix Topology

This example is based on **Routing Matrix A**, a basic routing matrix consisting of a TX Matrix Plus router (**sfc0**) and two T1600 routers (**lcc0** and **lcc2**). Figure 2 on page 33 shows that **Routing Matrix A** is acting as a provider edge (PE) router in a Layer 2 circuit network. SONET interface **so-1/1/0** in the T1600 router designated as **lcc0** connects to an IP/MPLS core network. Asynchronous Transfer Mode 2 (ATM2) intelligent queuing (IQ) interface **at-17/1/0** in the T1600 router designated as **lcc2** runs Layer 2 circuit trunk mode to connect to an ATM switch.

For more information about Layer 2 circuit networks, see the *Junos OS VPNs Configuration Guide*.

Figure 2: Example Topology of a Routing Matrix with a TX Matrix Plus Router



Note the following key considerations for this routing matrix configuration:

- For most operations, you will manage the routing matrix as a single router, executing operational commands and committing configurations on the TX Matrix Plus router 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**, **lcc0-re1**, and **lcc2-re1**. In these Routing Engine

configuration groups, configure hostnames, default routes, and management Ethernet interfaces.

- To configure interfaces, use the routing matrix FPC numbering convention of slots **0** through **31**.
- To enable ATM2 IQ trunk mode and other chassis-based commands, include the **lcc** ***lcc-number*** statement at the **[edit chassis]** hierarchy level and use the hardware FPC slot numbers **0** through **7** of node **lcc2**.
- Configure most other processes as usual, such as routing, class of service (CoS), and firewalls.

Example Routing Matrix Configuration

To configure the example **Routing Matrix A** described in the previous section, commit the following configuration at the TX Matrix Plus router:

```
[edit]
groups { # Create special configuration groups in a routing matrix.
  re0 { # Create a group for the master Routing Engine on TX Matrix Plus router sfc0.
    system {
      host-name mysfc0;
      backup-router 192.168.17.254;
    }
    interfaces { # Configure an IP address for the management interface logical port.
      em0 {
        unit 0 {
          family inet {
            address 192.168.77.158/21;
          }
        }
      }
    }
  }
  re1 { # Create a group for the backup Routing Engine on TX Matrix Plus router sfc0.
    system {
      host-name mysfc0_alt_re;
      backup-router 192.168.17.254;
    }
    interfaces { # Configure an IP address for the management interface logical port.
      em0 {
        unit 0 {
          family inet {
            address 192.168.77.168/21;
          }
        }
      }
    }
  }
  lcc0-re0 { # Create a group for the master Routing Engine on T1600 router lcc0.
    system {
      host-name mylcc0;
      backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
    }
    interfaces { # Configure an IP address for the management interface logical port.
```

```
        em0 {
          unit 0 {
            family inet {
              address 192.168.77.157/21;
            }
          }
        }
      }
    }
    lcc0-re1 { # Create a group for the backup Routing Engine on T1600 router lcc0.
      system {
        host-name mylcc0_alt_re;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
      }
      interfaces { # Configure an IP address for the management interface logical port.
        em0 {
          unit 0 {
            family inet {
              address 192.168.77.169/21;
            }
          }
        }
      }
    }
    lcc2-re0 { # Create a group for the master Routing Engine on T1600 router lcc2.
      system {
        host-name mylcc2;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
      }
      interfaces { # Configure an IP address for the management interface logical port.
        em0 {
          unit 0 {
            family inet {
              address 192.168.77.159/21;
            }
          }
        }
      }
    }
    lcc2-re1 { # Create a group for the backup Routing Engine on T1600 router lcc2.
      system {
        host-name mylcc2_alt_re;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
      }
      interfaces { # Configure an IP address for the management interface logical port.
        em0 {
          unit 0 {
            family inet {
              address 192.168.77.192/21;
            }
          }
        }
      }
    }
  }
  apply-groups [ re0 re1 lcc0-re1 lcc2-re1 lcc0-re0 lcc2-re0 ]; # Enable inheritance.
```

```
system { # Configure system management properties.
  syslog {
    file messages {
      any any;
    }
  }
}
chassis { # You must apply chassis commands to a specific T1600 router.
  lcc 2 { # Specify the T1600 router and the FPC hardware slot of the node.
    fpc 1 { # This FPC is equivalent to slot 17 in the routing matrix.
      pic 1 {
        atm-l2circuit-mode {
          trunk nni;
        }
      }
    }
  }
}
interfaces {
  so-1/1/0 { # This is a SONET interface at FPC 1, PIC 1, port 0
    mtu 9192; # on the T1600 router LCC0.
    unit 0 {
      family inet {
        address 10.15.1.1/30 {
          destination 10.15.1.2;
        }
      }
      family iso;
      family mpls {
        filter {
          input filter_1;
        }
      }
    }
  }
  at-17/1/0 { # This is an ATM2 IQ interface at FPC 1, PIC 1, port 0
    encapsulation atm-ccc-cell-relay; # on the T1600 router LCC2.
    atm-options {
      pic-type atm2;
      scheduler-maps { # CoS on an ATM2 IQ PIC works the same in a routing matrix.
        cos1 { # as it does in a standalone T1600 router.
          forwarding-class ubr {
            priority low;
            transmit-weight percent 25;
          }
          forwarding-class nrtvbr {
            priority low;
            transmit-weight percent 25;
          }
          forwarding-class rtvbr {
            priority low;
            transmit-weight percent 25;
          }
          forwarding-class cbr {
            priority high;
            transmit-weight percent 25;
```

```
            }
        }
        cos2 {
            forwarding-class ubr {
                priority low;
                transmit-weight percent 10;
            }
            forwarding-class nrtvbr {
                priority low;
                transmit-weight percent 20;
            }
            forwarding-class rtvbr {
                priority low;
                transmit-weight percent 30;
            }
            forwarding-class cbr {
                priority high;
                transmit-weight percent 40;
            }
        }
        cos3 {
            forwarding-class ubr {
                priority low;
                transmit-weight percent 40;
            }
            forwarding-class nrtvbr {
                priority low;
                transmit-weight percent 30;
            }
            forwarding-class rtvbr {
                priority low;
                transmit-weight percent 20;
            }
            forwarding-class cbr {
                priority high;
                transmit-weight percent 10;
            }
        }
    }
}
unit 0 {
    trunk-id 0;
    trunk-bandwidth 10m;
    cell-bundle-size 2;
}
unit 1 {
    trunk-id 1;
    trunk-bandwidth 10m;
    cell-bundle-size 1;
    atm-scheduler-map cos1;
}
unit 2 {
    trunk-id 2;
    trunk-bandwidth 10m;
    cell-bundle-size 2;
    atm-scheduler-map cos2;
```

```
        }
        unit 3 {
          trunk-id 3;
          trunk-bandwidth 10m;
          cell-bundle-size 3;
          atm-scheduler-map cos3;
        }
      }
      lo0 {
        unit 0 {
          family inet {
            address 127.0.0.1/32;
            address 10.255.77.158/32 {
              primary;
            }
          }
          family iso {
            address 47.0005.80ff.f800.0000.0108.0001.0102.5507.0158.00;
          }
          family inet6 {
            address 2001:db8::10:255:77:158/32 {
              primary;
            }
          }
        }
      }
    }
    protocols { # You can configure protocols in the routing matrix as usual.
      mpls {
        interface so-1/1/0.0;
      }
      isis {
        interface so-1/1/0.0;
        interface lo0.0;
      }
      ldp {
        interface so-1/1/0.0;
        interface lo0.0;
      }
      l2circuit {
        neighbor 10.255.71.97 {
          interface at-17/1/0.0 {
            virtual-circuit-id 100;
          }
          interface at-17/1/0.1 {
            virtual-circuit-id 101;
          }
          interface at-17/1/0.2 {
            virtual-circuit-id 102;
          }
          interface at-17/1/0.3 {
            virtual-circuit-id 103;
          }
        }
      }
    }
```

```
class-of-service { # You can configure CoS in the routing matrix as usual.
  forwarding-classes {
    queue 0 ubr;
    queue 1 nrtvbr;
    queue 2 rtvbr;
    queue 3 cbr;
  }
  traceoptions {
    flag all;
  }
}
firewall { # You can configure firewalls in the routing matrix as usual.
  family mpls {
    filter filter_1 {
      term plp0 {
        from {
          exp [ 0 2 4 6 ];
        }
        then {
          count LOW;
          loss-priority low;
        }
      }
      term plp1 {
        from {
          exp [ 1 3 5 7 ];
        }
        then {
          count HIGH;
          loss-priority high;
        }
      }
    }
  }
}
```

Verifying the Example Configuration

After you commit the example configuration, described in the previous section, to example **Routing Matrix A**, verify proper operation of the routing matrix. For the example routing matrix topology and configuration described in this topic, you would issue various forms of the following commands on the TX Matrix Plus router:

- **show chassis alarms** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show chassis craft-interface** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show chassis ethernet-switch** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show chassis hardware** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show chassis fpc** <**lcc** *lcc-number*>
- **show chassis lccs**
- **show chassis location** <**fpc** | **interface** | **lcc** *lcc-number* | **sfc** *sfc-number*>

- **show chassis routing-engine** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show chassis sibs** <**lcc** *lcc-number* | **sfc** *sfc-number*>
- **show interfaces terse**
- **show route summary**
- **show system uptime** <**all-lcc** | **lcc** *lcc-number* | **sfc** *sfc-number*>
- **show version** <**all-lcc** | **lcc** *lcc-number* | **sfc** *sfc-number*>

For detailed descriptions of how to use these commands to verify the routing matrix configuration, see "Verifying the Configuration of a Routing Matrix with a TX Matrix Plus Router" on page 40.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Verifying the Configuration of the Routing Matrix on page 40
- Merging Examples on page 31
- Upgrading the Junos OS on the Routing Matrix on page 61

Verifying the Configuration of a Routing Matrix with a TX Matrix Plus Router

In general, when you issue standard operational commands on a TX Matrix Plus router, you receive output from the master Routing Engines of all components in the routing matrix. To display information for the TX Matrix Plus router only, include the **sfc** *sfc-number* option. To limit the output of information for a specific T1600 router within the routing matrix, include the **lcc** *lcc-number* option. To display information for all T1600 routers within the routing matrix (selected commands only), include the **all-lcc** option. Any exceptions to this general rule are mentioned next to the appropriate commands.

The following sections contain examples of specific **show** operational commands you can use to verify the configuration of the example **Routing Matrix A**, described in "Example Configuration for a Routing Matrix with a TX Matrix Plus Router" on page 33:

- Displaying Junos OS Versions on page 41
- Displaying Configured Interfaces on page 44
- Displaying Available Routes on page 45
- Displaying Alarms and System Uptime on page 45
- Displaying Craft Interface Messages on page 46
- Displaying System Uptime on page 48
- Displaying Chassis Hardware and Status on page 49

Displaying Junos OS Versions

The **show version** command provides an excellent example of how you can select output for various components of the routing matrix with a TX Matrix Plus router. If the TX Matrix Plus router (**sfc** *sfc-number*) or a T1600 router (**lcc** *lcc-number*) is not specified in the command, the command displays output for all components.

```
user@host> show version ?
Possible completions:
  <[Enter]>            Execute this command
  brief                Display brief output
  detail               Display detailed output
  invoke-on            Remote command execution
  lcc                  Show software version on specific LCC (0..3)
  sfc                  Show software version on SFC (0..0)
  |                    Pipe through a command
```

You can display information about individual software components in the TX Matrix Plus router, in a specific T1600 router, or the entire routing matrix:

- Displaying Junos OS Versions for All Routers on page 41
- Displaying Junos OS Version for the SFC Only on page 42
- Displaying Junos OS Version for a Specific LCC on page 43
- Displaying Junos OS Versions for All LCCs on page 43

Displaying Junos OS Versions for All Routers

To display the software version for all routing matrix components, issue the **show version** command on the TX Matrix Plus router:

```
user@mysfc0> show version
sfc0-re0:
--------------------------------------------------------------------------
Hostname: mysfc0
Model: txp
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]

lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6-20090713.1]
```

```
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]

lcc2-re0:
--------------------------------------------------------------------------
Hostname: mylcc2
Model: t1600
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]
```

Displaying Junos OS Version for the SFC Only

To display the software version for the TX Matrix Plus router only, include the **sfc *number*** option:

```
user@mysfc> show version sfc 0
sfc0-re0
--------------------------------------------------------------------------
Hostname: mysfc0
Model: txp
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
```

```
JUNOS Routing Software Suite [9.6-20090713.1]
```

Displaying Junos OS Version for a Specific LCC

To display the software version for a specific T1600 router, include the **lcc** option:

```
user@host> show version lcc 0
lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]
```

Displaying Junos OS Versions for All LCCs

To display the software versions for all T1600 routers, include the **all-lcc** option:

```
user@host> show version all-lcc
lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]

lcc2-re0
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6-20090713.1]
JUNOS Base OS Software Suite [9.6-20090713.1]
```

```
JUNOS Kernel Software Suite [9.6-20090713.1]
JUNOS Crypto Software Suite [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.1]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.1]
JUNOS Online Documentation [9.6-20090713.1]
JUNOS Voice Services Container package [9.6-20090713.1]
JUNOS Border Gateway Function package [9.6-20090713.1]
JUNOS Services AACL Container package [9.6-20090713.1]
JUNOS Services LL-PDF Container package [9.6-20090713.1]
JUNOS Services Stateful Firewall [9.6-20090713.1]
JUNOS AppId Services [9.6-20090713.1]
JUNOS IDP Services [9.6-20090713.1]
JUNOS Routing Software Suite [9.6-20090713.1]
```

Displaying Configured Interfaces

Although individual FPCs are installed in each of the T1600 routers, the routing matrix is designed to collect interface information centrally at the TX Matrix Plus router. To display available interfaces in the routing matrix, issue a **show interfaces** command on the TX Matrix Plus router:

```
user@host> show interfaces terse
Interface               Admin Link Proto Local                 Remote
so-1/0/0                up    up
so-1/1/0                up    up
so-1/1/0.0              up    up   inet  10.15.1.1            --> 10.15.1.2
                                   iso
                                   mpls
so-1/3/0                up    down
at-2/1/0                up    up
ge-2/2/0                up    up
so-3/3/0                up    up
so-3/3/1                up    up
so-3/3/2                up    down
so-3/3/3                up    down
so-16/0/0               up    down
so-16/0/1               up    down
so-16/0/2               up    down
so-16/0/3               up    up
ge-16/1/0               up    down
so-17/0/0               up    down
at-17/1/0               up    up
at-17/1/0.0             up    up   ccc
at-17/1/0.1             up    up   ccc
at-17/1/0.2             up    up   ccc
at-17/1/0.3             up    up   ccc
at-17/1/1               up    up
ge-17/2/0               up    up
ge-17/2/1               up    up
so-17/3/0               up    down
so-19/0/0               up    down
so-19/1/0               up    down
so-19/2/0               up    down
so-19/3/0               up    down
bcm0                    up    up
bcm0.0                  up    up   tnp   4
dsc                     up    up
em0                     up    up
em0.0                   up    up   tnp   4
```

```
fxp0                    up    up
fxp0.0                  up    up   inet  192.168.77.158/21
gre                     up    up
ipip                    up    up
lo0                     up    up
lo0.0                   up    up   inet  10.255.70.158       --> 0/0
                                        127.0.0.1           --> 0/0
                                   iso
47.0005.80ff.f800.0000.0108.0001.0102.5507.0158.00
                                   inet6 2001:db8::10:255:70:158
                                         fe80::280:42ff:fe13:269d
lo0.16385               up    up   inet
                                   inet6 fe80::280:42ff:fe13:269d
lsi                     up    up
mtun                    up    up
pimd                    up    up
pime                    up    up
tap                     up    up
```

Displaying Available Routes

When you need to verify route information for a routing matrix, you must issue operational commands on the TX Matrix Plus router. To display available routes for the routing matrix, issue a **show route** command:

```
user@host> 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
inet.3: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
                 LDP:      1 routes,      1 active
iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
              Direct:      1 routes,      1 active
mpls.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
                MPLS:      3 routes,      3 active
                 LDP:      2 routes,      2 active
               L2CKT:      2 routes,      2 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
l2circuit.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
                 LDP:      1 routes,      1 active
               L2CKT:      4 routes,      4 active
```

Displaying Alarms and System Uptime

To display alarms for all routing matrix components, issue the **show chassis alarms** command at the TX Matrix Plus router:

```
user@host> show chassis alarms
sfc0-re0:
--------------------------------------------------------------------------
2 alarms currently active
Alarm time               Class  Description
```

```
2009-07-10 02:27:46 PDT  Minor  LCC 0 Minor Errors
2009-07-09 17:12:29 PDT  Major  LCC 2 Major Errors

lcc0-re0:
--------------------------------------------------------------------------
1 alarms currently active
Alarm time               Class  Description
2009-07-10 02:27:46 PDT  Minor  PEM 1 Absent

lcc2-re0:
--------------------------------------------------------------------------
1 alarms currently active
Alarm time               Class  Description
2009-07-09 17:12:29 PDT  Major  PEM 1 Not OK
```

Displaying Craft Interface Messages

To display the messages that are currently displayed on the craft interface for all routing matrix components, issue the **show chassis craft-interface** command at the master Routing Engine of the TX Matrix Plus router:

```
user@host> show chassis craft-interface
sfc0-re0:
--------------------------------------------------------------------------
FPM Display Contents:
    +--------------------+
    |mysfc0              |
    |2 Alarms active     |
    |R: LCC 0 Minor Error|
    |R: LCC 2 Major Error|
    +--------------------+

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:
    +--------------------+
    |mylcc0              |
    |1 Alarms active     |
    |R: PEM 1 Absent     |
    +--------------------|

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:
    +--------------------+
    |mylcc2              |
    |1 Alarms active     |
    |R: PEM 1 Not 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  *   *   *   *   *
```

Displaying System Uptime

To display the amount of time the routing matrix components have been in operation, issue the **show system uptime** command on the TX Matrix Plus router:

```
user@host> show system uptime
sfc0-re0:
--------------------------------------------------------------------------
Current time: 2009-07-10 07:55:56 PDT
System booted: 2009-07-09 17:08:41 PDT (14:47:15 ago)
Protocols started: 2009-07-09 17:09:22 PDT (14:46:34 ago)
```

```
Last configured: 2009-07-09 17:08:28 PDT (14:47:28 ago) by root
 7:55AM  up 14:47, 1 user, load averages: 0.00, 0.00, 0.00

lcc0-re0:
--------------------------------------------------------------------------
Current time: 2009-07-10 07:55:56 PDT
System booted: 2009-07-09 17:07:40 PDT (14:48:16 ago)
Last configured: 2009-07-09 17:08:43 PDT (14:47:13 ago) by root
 7:55AM  up 14:48, 0 users, load averages: 0.07, 0.02, 0.01

lcc2-re0:
--------------------------------------------------------------------------
Current time: 2009-07-10 07:55:56 PDT
System booted: 2009-07-09 17:07:33 PDT (14:48:23 ago)
Last configured: 2009-07-09 17:08:47 PDT (14:47:09 ago) by root
 7:55AM  up 14:48, 0 users, load averages: 0.00, 0.00, 0.00
```

Displaying Chassis Hardware and Status

To display the hardware inventory for a routing matrix with a TX Matrix Plus router, you can select output for the TX Matrix Plus router only, a specific T1600 router, or all components. If a specific component (**sfc** or **lcc**) is not specified as an option in the command, the default output displays information for the entire routing matrix.

```
user@host> show chassis hardware ?
Possible completions:
  <[Enter]>            Execute this command
  clei-models          Display CLEI barcode and model number for orderable FRUs
  detail               Include RAM and disk information in output
  extensive            Display ID EEPROM information
  lcc                  Display chassis-specific information (0..3)
  models               Display serial number and model number for orderable FRUs

  sfc                  Display chassis-specific information (0..0)
  |                    Pipe through a command
```

You can display information about individual hardware components in the TX Matrix Plus router, in a specific T1600 router, or the entire routing matrix:

- Displaying Information About All Hardware Components on page 49
- Displaying Information About SIBs on page 52
- Displaying Information About Routing Engines on page 53
- Displaying Information About FPCs on page 56
- Displaying Information About LCCs on page 56

Displaying Information About All Hardware Components

To display all hardware components in a routing matrix, issue the **show chassis hardware** command on the TX Matrix Plus router:

```
user@host> show chassis hardware
sfc0-re0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1131103AHB      TXP
Midplane         REV 05   710-022574   TS4035            SFC Midplane
```

```
FPM Display      REV 01   710-024027   DR4982           TXP FPM Display
CIP 0            REV 02   710-023792   DS4568           TXP CIP
CIP 1            REV 02   710-023792   DS4562           TXP CIP
PEM 1            VER 01   740-027463   123456           Power Entry Module
Routing Engine 0 REV 01   740-026942   737A-1024        RE-DUO-2600
Routing Engine 1 REV 01   740-026942   737A-1008        RE-DUO-2600
CB 0             REV 01   710-022606   DP8889           SFC Control Board
CB 1             REV 05   710-022606   DW1103           SFC Control Board
SPMB 0                    BUILTIN                       SFC Switch CPU
SPMB 1                    BUILTIN                       SFC Switch CPU
SIB F13 0        REV 03   750-024564   DT9486           F13 SIB
  B Board        REV 02   710-023431   DT6550           F13 SIB Mezz
SIB F13 1        REV 03   750-024564   DT9456           F13 SIB
  B Board        REV 02   710-023431   DT6562           F13 SIB
SIB F13 3        REV 04   710-022600   DX0900           F13 SIB
  B Board        REV 03   710-023431   DX0957           F13 SIB Mezz
SIB F13 4        REV 04   750-024564   DW5753           F13 SIB
  B Board        REV 03   710-023431   DW9034           F13 SIB Mezz
SIB F13 6        REV 03   750-024564   DT9483           F13 SIB
  B Board        REV 02   710-023431   DT6558           F13 SIB Mezz
SIB F13 7        REV 04   750-024564   DW5790           F13 SIB
  B Board        REV 03   710-023431   DW9072           F13 SIB Mezz
SIB F13 8        REV 04   710-022600   DX0833           F13 SIB
  B Board        REV 03   710-023431   DX0938           F13 SIB Mezz
SIB F13 9        REV 03   750-024564   DT9465           F13 SIB
  B Board        REV 02   710-023431   DT6574           F13 SIB Mezz
SIB F13 11       REV 04   750-024564   DW5756           F13 SIB
  B Board        REV 03   710-023431   DW9072           F13 SIB Mezz
SIB F13 12       REV 04   750-024564   DW5749           F13 SIB
  B Board        REV 03   710-023431   DW9050           F13 SIB Mezz
SIB F2S 0/0      REV 03   710-022603   DV0063           F2S SIB
  B Board        REV 03   710-023787   DT9917           F2S SIB Mezz
SIB F2S 0/2      REV 03   710-022603   DV0090           F2S SIB
  B Board        REV 03   710-023787   DT9994           F2S SIB Mezz
SIB F2S 0/4      REV 03   710-022603   DV0076           F2S SIB
  B Board        REV 03   710-023787   DT9930           F2S SIB Mezz
SIB F2S 0/6      REV 03   710-022603   DV0035           F2S SIB
  B Board        REV 03   710-023787   DT9951           F2S SIB Mezz
SIB F2S 1/0      REV 03   710-022603   DV0067           F2S SIB
  B Board        REV 03   710-023787   DT9922           F2S SIB Mezz
SIB F2S 1/2      REV 03   710-022603   DV0036           F2S SIB
  B Board        REV 03   710-023787   DT9950           F2S SIB Mezz
SIB F2S 1/4      REV 03   710-022603   DV0085           F2S SIB
  B Board        REV 03   710-023787   DT9935           F2S SIB Mezz
SIB F2S 1/6      REV 03   710-022603   DV0028           F2S SIB
  B Board        REV 03   710-023787   DT9960           F2S SIB Mezz
SIB F2S 2/0      REV 03   710-022603   DV0047           F2S SIB
  B Board        REV 03   710-023787   DT9965           F2S SIB Mezz
SIB F2S 2/2      REV 03   710-022603   DV0023           F2S SIB
  B Board        REV 03   710-023787   DT9927           F2S SIB Mezz
SIB F2S 2/4      REV 03   710-022603   DV0046           F2S SIB
  B Board        REV 03   710-023787   DT9946           F2S SIB Mezz
SIB F2S 2/6      REV 03   710-022603   DV0025           F2S SIB
  B Board        REV 03   710-023787   DT9914           F2S SIB Mezz
SIB F2S 3/0      REV 03   710-022603   DV0110           F2S SIB
  B Board        REV 03   710-023787   DT9944           F2S SIB Mezz
SIB F2S 3/2      REV 03   710-022603   DV0056           F2S SIB
  B Board        REV 03   710-023787   DT9979           F2S SIB Mezz
SIB F2S 3/4      REV 03   710-022603   DV0024           F2S SIB
  B Board        REV 03   710-023787   DT9920           F2S SIB Mezz
SIB F2S 3/6      REV 03   710-022603   DV0108           F2S SIB
```

```
  B Board        REV 03   710-023787   DT9989           F2S SIB Mezz
SIB F2S 4/0      REV 02   710-022603   DT2821           F2S SIB
  B Board        REV 02   710-023787   DT1719           F2S SIB Mezz
SIB F2S 4/2      REV 03   710-022603   DV0031           F2S SIB
  B Board        REV 03   710-023787   DT9953           F2S SIB Mezz
SIB F2S 4/4      REV 03   710-022603   DV0094           F2S SIB
  B Board        REV 03   710-023787   DT9918           F2S SIB Mezz
SIB F2S 4/6      REV 03   710-022603   DV0022           F2S SIB
  B Board        REV 03   710-023787   DT9943           F2S SIB Mezz
Fan Tray 0       REV 02   710-024029   DP5653           Front Fan Tray
Fan Tray 1       REV 02   760-024497   DP5661           Front Fan Tray
Fan Tray 2       REV 02   760-024502   DP5660           Rear Fan Tray
Fan Tray 3       REV 02   760-024502   DR8267           Rear Fan Tray
Fan Tray 4       REV 02   760-024502   DR8265           Rear Fan Tray
Fan Tray 5       REV 02   760-024502   DR8272           Rear Fan Tray
```

lcc0-re0:

```
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1090A04AHA      T1600
Midplane         REV 01   710-017247   RB8601            T-series Backplane
FPM GBUS         REV 09   710-002901   JW7364            T640 FPM Board
FPM Display      REV 05   710-002897   JY6782            FPM Display
CIP              REV 06   710-002895   JW7565            T-series CIP
PEM 0            Rev 14   740-002595   SL26454           Power Entry Module
PEM 1            Rev 15   740-002595   SM30230           Power Entry Module
SCG 0            REV 03   710-003423   HA4517            T640 Sonet Clock Gen.
SCG 1            REV 04   710-003423   HF6049            T640 Sonet Clock Gen.
Routing Engine 0 REV 00   740-026941   737F-1051         RE-DUO-1800
Routing Engine 1 REV 01   740-026941   737F-1095         RE-DUO-1800
CB 0             REV 05   710-022597   DV4262            LCC Control Board
CB 1             REV 06   710-022597   DX4009            LCC Control Board
FPC 7            REV 01   710-010845   JB7158            FPC Type 4
  CPU            REV 02   710-011481   JB6048            FPC CPU-Enhanced
  MMB 0          REV 06   710-010842   JP1703            ST-MMB
SPMB 0           REV 04   710-023321   DV3863            LCC Switch CPU
SPMB 1           REV 04   710-023321   DW3634            LCC Switch CPU
SIB 1            REV 07   710-022594   DW4208            LCC SIB
  B Board        REV 07   710-023185   DW3944            LCC SIB Mezz
SIB 2            REV 07   710-022594   DW4205            LCC SIB
  B Board        REV 07   710-023185   DW3945            LCC SIB Mezz
SIB 3            REV 07   710-022594   DW4218            LCC SIB
  B Board        REV 07   710-023185   DW3931            LCC SIB Mezz
SIB 4            REV 07   710-022594   DW4183            LCC SIB
  B Board        REV 07   710-023185   DW3936            LCC SIB Mezz
Fan Tray 0                                                Front Top Fan Tray
Fan Tray 1                                                Front Bottom Fan Tray
Fan Tray 2                                                Rear Fan Tray
```

lcc2-re0:

```
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1102900AHA      T1600
Midplane         REV 03   710-017247   RC3766            T-series Backplane
FPM GBUS         REV 10   710-002901   DR1415            T640 FPM Board
FPM Display      REV 01   710-021387   DN7019            T1600 FPM Display
CIP              REV 06   710-002895   DP6012            T-series CIP
PEM 0            Rev 07   740-017906   UC26613           Power Entry Module 3x80
PEM 1            Rev 07   740-017906   UC26544           Power Entry Module 3x80
```

```
SCG 0            REV 15   710-003423   DR0914           T640 Sonet Clock Gen.
Routing Engine 0 REV 01   740-026941   737F-1032        RE-DUO-1800
Routing Engine 1 REV 01   740-026941   737F-1024        RE-DUO-1800
CB 0             REV 05   710-022597   DV4260           LCC Control Board
CB 1             REV 01   710-022597   DM1159           LCC Control Board
FPC 0            REV 12   710-013037   DR1172           FPC Type 4-ES
  CPU            REV 08   710-016744   DR0997           ST-PMB2
  PIC 0          REV 11   750-017405   DP8833           4x 10GE (LAN/WAN) XFP
    Xcvr 0               NON-JNPR     344512071800039  XFP-10G-SR
  MMB 0          REV 04   710-016036   DR0651           ST-MMB2
  MMB 1          REV 04   710-016036   DR0803           ST-MMB2
FPC 1            REV 07   710-013560   DP9980           E2-FPC Type 3
  CPU            REV 05   710-013563   DR0088           FPC CPU-Enhanced
  PIC 0          REV 22   750-007141   DR1955           10x 1GE(LAN), 1000 BASE

  PIC 1          REV 22   750-007141   DR1944           10x 1GE(LAN), 1000 BASE

  PIC 2          REV 22   750-007141   DR1963           10x 1GE(LAN), 1000 BASE

  PIC 3          REV 07   750-015217   DN4835           8x 1GE(TYPE3), IQ2
    Xcvr 0       REV 01   740-011613   P9F1AQL          SFP-SX
  MMB 0          REV 07   710-010171   DP1350           MMB-5M3-288mbit
  MMB 1          REV 07   710-010171   DP1386           MMB-5M3-288mbit
FPC 2            REV 14   710-010845   DN1255           FPC Type 4
  CPU            REV 06   710-011481   DM9414           FPC CPU-Enhanced
  MMB 0          REV 01   710-016606   DP1869           ST-MMB
SPMB 0           REV 04   710-023321   DV3859           LCC Switch CPU
SPMB 1           REV 01   710-023321   DM1161           LCC Switch CPU
SIB 0            REV 07   710-022594   DW4197           LCC SIB
  B Board        REV 07   710-023185   DW3916           LCC SIB Mezz
SIB 1            REV 06   710-022594   DT8266           LCC SIB
  B Board        REV 06   710-023185   DT5793           LCC SIB Mezz
SIB 2            REV 07   710-022594   DW4184           LCC SIB
  B Board        REV 07   710-023185   DW3915           LCC SIB Mezz
SIB 3            REV 06   710-022594   DT8271           LCC SIB
  B Board        REV 04   710-023185   DS2323           LCC SIB Mezz
SIB 4            REV 06   710-022594   DT8238           LCC SIB
  B Board        REV 06   710-023185   DT5783           LCC SIB Mezz
Fan Tray 0                                             Front Top Fan Tray
Fan Tray 1                                             Front Bottom Fan Tray
Fan Tray 2                                             Rear Fan Tray -- Rev 2
```

Displaying Information About SIBs

To display all the SIBs in the entire routing matrix, issue the **show chassis sibs** command on the TX Matrix Plus router.

```
user@host> show chassis sibs
sfc0-re0:
--------------------------------------------------------------------------
Slot  State              Type          Uptime
 0    Online             SIB F13        1 hour, 27 minutes, 13 seconds
 1    Online             SIB F13        1 hour, 26 minutes, 56 seconds
 2    Invalid
 3    Online             SIB F13        1 hour, 28 minutes, 23 seconds
 4    Online             SIB F13        1 hour, 28 minutes, 20 seconds
 5    Invalid
 6    Fault              SIB F13
 7    Online             SIB F13        1 hour, 27 minutes, 56 seconds
 8    Online             SIB F13        1 hour, 27 minutes, 48 seconds
```

```
 9    Online            SIB F13       1 hour, 27 minutes, 31 seconds
10    Invalid
11    Online            SIB F13       1 hour, 27 minutes, 24 seconds
12    Online            SIB F13       1 hour, 27 minutes, 21 seconds
13    Invalid
14    Invalid
15    Invalid
0/0   Online            SIB F2S       1 hour, 27 minutes, 20 seconds
0/2   Online            SIB F2S       1 hour, 27 minutes, 19 seconds
0/4   Online            SIB F2S       1 hour, 27 minutes, 17 seconds
0/6   Online            SIB F2S       1 hour, 27 minutes, 16 seconds
1/0   Online            SIB F2S       1 hour, 28 minutes, 30 seconds
1/2   Online            SIB F2S       1 hour, 28 minutes, 28 seconds
1/4   Online            SIB F2S       1 hour, 28 minutes, 27 seconds
1/6   Online            SIB F2S       1 hour, 28 minutes, 26 seconds
2/0   Online            SIB F2S       1 hour, 28 minutes, 19 seconds
2/2   Online            SIB F2S       1 hour, 28 minutes, 18 seconds
2/4   Online            SIB F2S       1 hour, 28 minutes, 17 seconds
2/6   Online            SIB F2S       1 hour, 28 minutes, 16 seconds
3/0   Online            SIB F2S       1 hour, 27 minutes, 55 seconds
3/2   Online            SIB F2S       1 hour, 27 minutes, 53 seconds
3/4   Online            SIB F2S       1 hour, 27 minutes, 52 seconds
3/6   Online            SIB F2S       1 hour, 27 minutes, 51 seconds
4/0   Online            SIB F2S       1 hour, 27 minutes, 31 seconds
4/2   Online            SIB F2S       1 hour, 27 minutes, 29 seconds
4/4   Online            SIB F2S       1 hour, 27 minutes, 28 seconds
4/6   Online            SIB F2S       1 hour, 27 minutes, 27 seconds
```

lcc0-re0:

```
--------------------------------------------------------------------------
Slot  State               Uptime
 0    Empty
 1    Online            1 hour, 1 minute, 55 seconds
 2    Fault
 3    Online            1 hour, 1 minute, 51 seconds
 4    Online            1 hour, 1 minute, 49 seconds
```

lcc2-re0:

```
--------------------------------------------------------------------------
Slot  State               Uptime
 0    Online            1 hour, 1 minute, 2 seconds
 1    Online            1 hour, 1 minute, 17 seconds
 2    Check             1 hour, 1 minute, 15 seconds
 3    Online            1 hour, 1 minute, 6 seconds
 4    Online            1 hour, 1 minute, 4 seconds
```

Displaying Information About Routing Engines

To display information about all master Routing Engines in the routing matrix, issue the **show chassis routing-engine** command on the TX Matrix Plus router:

```
user@host> show chassis routing-engine
sfc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 28 degrees C / 82 degrees F
```

```
    CPU temperature             42 degrees C / 107 degrees F
    DRAM                      3327 MB
    Memory utilization          13 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     2 percent
      Interrupt                  0 percent
      Idle                      98 percent
    Model                        RE-TXP-SFC
    Serial ID                    737A-1024
    Start time                   2009-07-09 17:08:13 PDT
    Uptime                       14 hours, 55 minutes, 39 seconds
    Last reboot reason           Router rebooted after a normal shutdown.
    Load averages:               1 minute   5 minute  15 minute
                                     0.00       0.00       0.00
Routing Engine status:
 Slot 1:
    Current state                Backup
    Election priority            Backup (default)
    Temperature                 29 degrees C / 84 degrees F
    CPU temperature             45 degrees C / 113 degrees F
    DRAM                      3327 MB
    Memory utilization          11 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                     100 percent
    Model                        RE-TXP-SFC
    Serial ID                    737A-1008
    Start time                   2009-07-08 12:38:29 PDT
    Uptime                       1 day, 19 hours, 25 minutes, 35 seconds
    Last reboot reason           Router rebooted after a normal shutdown.

lcc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                Master
    Election priority            Master (default)
    Temperature                 33 degrees C / 91 degrees F
    CPU temperature             47 degrees C / 116 degrees F
    DRAM                      3327 MB
    Memory utilization          12 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     2 percent
      Interrupt                  0 percent
      Idle                      98 percent
    Model                        RE-TXP-LCC
    Serial ID                    737F-1051
    Start time                   2009-07-09 17:06:52 PDT
    Uptime                       14 hours, 56 minutes, 37 seconds
    Last reboot reason           Router rebooted after a normal shutdown.
    Load averages:               1 minute   5 minute  15 minute
                                     0.00       0.02       0.00
Routing Engine status:
 Slot 1:
```

```
    Current state                  Backup
    Election priority              Backup (default)
    Temperature                 33 degrees C / 91 degrees F
    CPU temperature             47 degrees C / 116 degrees F
    DRAM                      3327 MB
    Memory utilization           9 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                     100 percent
    Model                          RE-TXP-LCC
    Serial ID                      737F-1095
    Start time                     2009-07-08 12:40:14 PDT
    Uptime                         1 day, 19 hours, 24 minutes, 1 second
    Last reboot reason             Router rebooted after a normal shutdown.

lcc2-re0:
--------------------------------------------------------------------------
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 30 degrees C / 86 degrees F
    CPU temperature             45 degrees C / 113 degrees F
    DRAM                      3327 MB
    Memory utilization          12 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     2 percent
      Interrupt                  0 percent
      Idle                      98 percent
    Model                          RE-TXP-LCC
    Serial ID                      737F-1032
    Start time                     2009-07-09 17:06:53 PDT
    Uptime                         14 hours, 56 minutes, 48 seconds
    Last reboot reason             Router rebooted after a normal shutdown.
    Load averages:                 1 minute   5 minute  15 minute
                                       0.01       0.01       0.00
Routing Engine status:
  Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    Temperature                 30 degrees C / 86 degrees F
    CPU temperature             44 degrees C / 111 degrees F
    DRAM                      3327 MB
    Memory utilization           9 percent
    CPU utilization:
      User                       0 percent
      Background                 0 percent
      Kernel                     0 percent
      Interrupt                  0 percent
      Idle                     100 percent
    Model                          RE-TXP-LCC
    Serial ID                      737F-1024
    Start time                     2009-07-08 12:37:52 PDT
    Uptime                         1 day, 19 hours, 26 minutes, 22 seconds
```

```
    Last reboot reason              Router rebooted after a normal shutdown.
```

Displaying Information About FPCs

To display information about FPCs in a routing matrix, issue the **show chassis fpc** command. Because there are no FPCs in a TX Matrix Plus router, there is no **sfc** option available for this command.

```
user@host> show chassis fpc
lcc0-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty
  1  Empty
  2  Empty
  3  Empty
  4  Empty
  5  Empty
  6  Empty
  7  Online            49      4          0       1024        7         49

lcc2-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            47      8          0       2048        6         24
  1  Online            28      4          0       1024        4         49
  2  Online            39      5          0       1024        7         49
  3  Empty
  4  Empty
  5  Empty
  6  Empty
  7  Empty
```

Displaying Information About LCCs

You can also check to see if the TX Matrix Plus router and T1600 routers are communicating correctly within the routing matrix. To verify that the T1600 routers have proper connectivity to the routing matrix, issue the **show chassis lccs** command. In this example, there are two T1600 routers in the routing matrix.

```
user@host> show chassis lccs
Slot  State               Uptime
 0    Online              15 hours, 5 minutes, 58 seconds
 1    Empty
 2    Online              15 hours, 5 minutes, 58 seconds
 3    Empty
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33

- Upgrading the Junos OS on the Routing Matrix on page 61

PART 3

Administration

CHAPTER 5

Upgrading the Junos OS

Upgrading the Junos OS on a Routing Matrix with a TX Matrix Plus Router

When you upgrade the Junos OS on a routing matrix with a TX Matrix Plus router, the new image is loaded onto the TX Matrix Plus router (**sfc0**) and distributed to all of the connected T1600 routers (**lcc0**, **lcc1**, **lcc2**, and **lcc3**).

NOTE: Throughout this task description, the terms *TX Matrix Plus router* and *T1600 router* refer to the routing matrix switch-fabric chassis (SFC) and line-card chassis (LCC), respectively.

Before you begin upgrading the Junos OS on a routing matrix, be sure you have:

- Sufficient free disk space on each Routing Engine in the routing matrix. To determine the amount of disk space currently available on all Routing Engines of the routing matrix, issue the **show system storage** operational command.
- Sufficient DRAM on each Routing Engine in the routing matrix. To determine the amount of DRAM currently available on all the Routing Engines in the routing matrix, issue the **show chassis routing-engine** operational command.
- Compatible models of Routing Engines (master and backup) in the routing matrix. For this release of Junos OS, the TX Matrix Plus router must contain two model RE-DUO-C2600-16G Routing Engines, and each T1600 router in the routing matrix must contain two model RE-DUO-C1800-8G Routing Engines. To determine the Routing Engine models installed in the Routing Engines in a routing matrix, issue the **show**

chassis hardware operational command with the **models** option. Hardware component model numbers are listed in the **FRU model number** column.

- The same version of Junos OS running on all Routing Engines in the routing matrix.

  NOTE: **The routing matrix does not operate properly unless all master Routing Engines are running the same version of Junos OS.**

  Different versions of the Junos OS can use different message formats that might be incompatible, particularly when graceful Routing Engine switchover (GRES) is enabled. For more information about GRES, see "Understanding Graceful Routing Engine Switchover in the Junos OS" and "Configuring Graceful Routing Engine Switchover" in the *Junos OS High Availability Configuration Guide*.

  Because the procedure for upgrading the Junos OS includes switching of the Routing Engine mastership, we recommend that the same version of Junos OS is running on all Routing Engines in the routing matrix. To determine the versions of Junos OS running on the Routing Engines in a routing matrix, issue the **show version invoke-on** operational command.

BEST PRACTICE: **By default, the Routing Engine in slot 0 (re0) is the master and the one in slot 1 (re1) is the backup. You can modify the default Routing Engine mastership by including the routing-engine *slot-number* (master | backup | disabled) statement at the [edit chassis redundancy] hierarchy level. However, it is considered best practice to make sure that all master Routing Engines are re0 and all backup Routing Engines are re1 (or vice versa). Throughout this task description, the master Routing Engine is re0 and the backup Routing Engine is re1 in all routers in the routing matrix.**

This topic includes the following tasks:

1. Logging In to the Master Routing Engine on the TX Matrix Plus Router on page 63
2. Disabling Routing Engine Redundancy and GRES on the Routing Matrix on page 63
3. Installing Junos OS on the Backup Routing Engines on page 65
4. Loading Software on the Backup Routing Engines on page 73
5. Switching Routing Engine Mastership to the Backup Routing Engines on page 75
6. Installing Software on the New Default Master Routing Engines on page 77
7. Loading Software on the New Default Master Routing Engines on page 77
8. Optional: Switching Routing Engine Mastership Back to the Default Master Routing Engines on page 80
9. Restoring the Original Configuration on page 81
10. Backing Up the Routing Engines on page 82

Logging In to the Master Routing Engine on the TX Matrix Plus Router

Log in to the master Routing Engine on the TX Matrix Plus router.

NOTE: During the upgrade process, in-band management connections to the routing matrix are lost each time you reboot the system (first, to load the new software onto the backup Routing Engines and later, to load the new software onto the master Routing Engines). Therefore, we recommend that you perform the software upgrade procedure out-of-band, over a direct console connection to the TX Matrix Plus router using Secure Shell (SSH) or Telnet. Connect the system console device to the asynchronous serial port (labeled **CONSOLE**) on the Control Board (CB) associated with the master Routing Engine.

To log in to the master Routing Engine on the TX Matrix Plus router and start the Junos OS CLI:

1. At a management console attached to the master Routing Engine (**re0**) on the TX Matrix Plus router, log in to the Junos OS CLI using a root administration account:

   ```
   login: root
   Password: ••••••••••

   --- Junos 9.6R1.0 built 2009-07-13 08:52:23 UTC
   ```

   NOTE: From the factory, the root administration user account is not associated with a password.

   ```
   Amnesiac (ttyd0)

   login: root
   ```

   However, you must add a password to the root administration account before you can successfully commit a configuration.

2. At the shell prompt (**%**), start the Junos OS CLI:

   ```
   % cli
   {master}
   root@mysfc0-re0>
   ```

Disabling Routing Engine Redundancy and GRES on the Routing Matrix

By default, graceful Routing Engine switchover (GRES) is disabled. To enable GRES on a router, you can include the **graceful-switchover** statement at the **[edit chassis redundancy]** hierarchy level:

```
[edit]
chassis {
   redundancy { # This enables Routing Engine redundancy on the router
```

```
        graceful-switchover; # This enables GRES on the router
    }
}
```

The procedure for upgrading the Junos OS on a routing matrix with a TX Matrix Plus router includes tasks that entail disruption of traffic processing by the affected Routing Engines:

- Upgrading the software on all the backup Routing Engines.
- Switching the Routing Engine mastership to the backup Routing Engines.
- Upgrading the software on all the master Routing Engines.
- Switching the Routing Engine mastership back to the master Routing Engines.

If GRES is enabled on any routers in the routing matrix, disable this feature.

To disable GRES on all routers in the routing matrix:

1. Enter configuration mode:

```
{master}
root@mysfc0-re0> configure
Entering configuration mode
```

NOTE: In the example shown in this step, the form of CLI prompt (beginning with either **{master}** or **{backup}** and displaying either **-re0** or **-re1** in the hostname portion of the prompt) indicates that GRES is enabled on that router.

2. Display the Routing Engine redundancy stanza:

```
{master}
[edit]
root@mysfc0-re0# show chassis
...
  redundancy {
    graceful-switchover;
  }
...
```

3. Disable Routing Engine redundancy in the candidate configuration. If GRES is enabled, it is removed with the **redundancy** stanza:

```
{master}
[edit]
root@mysfc0-re0# delete chassis redundancy
```

4. Verify that the **graceful-routing** statement has been removed (if it was previously enabled) with the **redundancy** stanza from the **[edit chassis]** hierarchy level of the candidate configuration:

```
[edit]
root@mysfc0# show chassis
```

NOTE: You can also issue the **show system switchover all-chassis** operational command to display Routing Engine graceful switchover information

5. Commit the configuration on all Routing Engines in the routing matrix and, if the configuration contains no errors and the commit succeeds, exit CLI configuration mode:

```
[edit]
root@mysfc0# commit synchronize and-quit
sfc0-re0:
configuration check succeeds
lcc0-re1:
commit complete
lcc0-re0:
commit complete
lcc2-re1:
commit complete
lcc2-re0:
commit complete
sfc0-re1:
commit complete
sfc0-re0:
commit complete

root@mysfc0>
```

Installing Junos OS on the Backup Routing Engines

Install the new version of Junos OS on the backup Routing Engines (**re1**) of all the routers in the routing matrix while leaving the currently running version of Junos OS running on the master Routing Engines (**re0**). This allows the master Routing Engines to continue operations, minimizing the disruption to the routing matrix and your network.

To install the new version of Junos OS on all backup Routing Engines in the routing matrix:

1. At a management console attached to the backup Routing Engine (**re1**) on the TX Matrix Plus router, log in to the Junos OS CLI using a root administration account:

```
login: root
Password: ••••••••••

--- Junos 9.6R1.0 built 2009-07-13 08:52:23 UTC
```

2. At the shell prompt (**%**), start the Junos OS CLI:

```
% cli
root@mysfc0_alt_re>
```

3. To install the new Junos OS on the backup Routing Engines (**re1**) in the routing matrix, issue the **request system software add** operational command at the TX Matrix Plus router, and specify the new Junos OS image file.

The following example shows sample output for the **request system software add** command:

```
root@mysfc0_alt_re> request system software add
/var/tmp/jinstall-9.6R1.2-domestic-signed.tgz


Pushing bundle to lcc0-re1
Pushing bundle to lcc2-re1

Validating on lcc0-re1
Checking compatibility with configuration
Initializing...
Using jbase-9.6R1.0
Verified manifest signed by PackageProduction_9_6_0
Using /var/tmp/jinstall-9.6R1.2-domestic-signed.tgz
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Using jinstall-9.6R1.2-domestic.tgz
Using jbundle-9.6R1.2-domestic.tgz
Checking jbundle requirements on /
Using jbase-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using /var/validate/chroot/tmp/jbundle/jboot-9.6R1.2.tgz
Using jkernel-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jcrypto-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jpfe-9.6R1.2.tgz
Using jdocs-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jroute-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jservices-9.6R1.2.tgz
Auto-deleting old jservices-voice ...
Removing /opt/sdk/jservices-voice ...
Removing jservices-voice-bsg-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-voice ...
Verified jservices-voice-bsg-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /var/sw/pkg ...
Creating /opt/sdk/jservices-voice ...
Storing jservices-voice-bsg-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-voice/jservices-voice-bsg ->
/var/sw/pkg/jservices-voice-bsg-9.6R1.2.tgz...
Auto-deleting old jservices-bgf ...
Removing /opt/sdk/jservices-bgf ...
Removing jservices-bgf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-bgf ...
Verified jservices-bgf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-bgf ...
Storing jservices-bgf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-bgf/jservices-bgf-pic ->
/var/sw/pkg/jservices-bgf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-aacl ...
Removing /opt/sdk/jservices-aacl ...
Removing jservices-aacl-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-aacl ...
Verified jservices-aacl-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-aacl ...
```

```
Storing jservices-aacl-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-aacl/jservices-aacl-pic ->
/var/sw/pkg/jservices-aacl-pic-9.6R1.2.tgz...
Auto-deleting old jservices-llpdf ...
Removing /opt/sdk/jservices-llpdf ...
Removing jservices-llpdf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-llpdf ...
Verified jservices-llpdf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-llpdf ...
Storing jservices-llpdf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-llpdf/jservices-llpdf-pic ->
/var/sw/pkg/jservices-llpdf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-sfw ...
Removing /opt/sdk/jservices-sfw ...
Removing jservices-sfw-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-sfw ...
Verified jservices-sfw-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-sfw ...
Storing jservices-sfw-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-sfw/jservices-sfw-pic ->
/var/sw/pkg/jservices-sfw-pic-9.6R1.2.tgz...
Auto-deleting old jservices-appid ...
Removing /opt/sdk/jservices-appid ...
Removing jservices-appid-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-appid ...
Verified jservices-appid-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-appid ...
Storing jservices-appid-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-appid/jservices-appid-pic ->
/var/sw/pkg/jservices-appid-pic-9.6R1.2.tgz...
Auto-deleting old jservices-idp ...
Removing /opt/sdk/jservices-idp ...
Removing jservices-idp-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-idp ...
Verified jservices-idp-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-idp ...
Storing jservices-idp-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-idp/jservices-idp-pic ->
/var/sw/pkg/jservices-idp-pic-9.6R1.2.tgz...
Hardware Database regeneration succeeded
Validating against /config/juniper.conf.gz
mgd: commit complete
Validation succeeded

Validating on lcc2-re1
Checking compatibility with configuration
Initializing...
Using jbase-9.6R1.0
Verified manifest signed by PackageProduction_9_6_0
Using /var/tmp/jinstall-9.6R1.2-domestic-signed.tgz
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Using jinstall-9.6R1.2-domestic.tgz
Using jbundle-9.6R1.2-domestic.tgz
Checking jbundle requirements on /
Using jbase-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using /var/validate/chroot/tmp/jbundle/jboot-9.6R1.2.tgz
```

```
Using jkernel-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jcrypto-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jpfe-9.6R1.2.tgz
Using jdocs-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jroute-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jservices-9.6R1.2.tgz
Auto-deleting old jservices-voice ...
Removing /opt/sdk/jservices-voice ...
Removing jservices-voice-bsg-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-voice ...
Verified jservices-voice-bsg-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /var/sw/pkg ...
Creating /opt/sdk/jservices-voice ...
Storing jservices-voice-bsg-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-voice/jservices-voice-bsg ->
/var/sw/pkg/jservices-voice-bsg-9.6R1.2.tgz...
Auto-deleting old jservices-bgf ...
Removing /opt/sdk/jservices-bgf ...
Removing jservices-bgf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-bgf ...
Verified jservices-bgf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-bgf ...
Storing jservices-bgf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-bgf/jservices-bgf-pic ->
/var/sw/pkg/jservices-bgf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-aacl ...
Removing /opt/sdk/jservices-aacl ...
Removing jservices-aacl-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-aacl ...
Verified jservices-aacl-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-aacl ...
Storing jservices-aacl-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-aacl/jservices-aacl-pic ->
/var/sw/pkg/jservices-aacl-pic-9.6R1.2.tgz...
Auto-deleting old jservices-llpdf ...
Removing /opt/sdk/jservices-llpdf ...
Removing jservices-llpdf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-llpdf ...
Verified jservices-llpdf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-llpdf ...
Storing jservices-llpdf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-llpdf/jservices-llpdf-pic ->
/var/sw/pkg/jservices-llpdf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-sfw ...
Removing /opt/sdk/jservices-sfw ...
Removing jservices-sfw-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-sfw ...
Verified jservices-sfw-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-sfw ...
Storing jservices-sfw-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-sfw/jservices-sfw-pic ->
/var/sw/pkg/jservices-sfw-pic-9.6R1.2.tgz...
```

```
Auto-deleting old jservices-appid ...
Removing /opt/sdk/jservices-appid ...
Removing jservices-appid-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-appid ...
Verified jservices-appid-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-appid ...
Storing jservices-appid-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-appid/jservices-appid-pic ->
/var/sw/pkg/jservices-appid-pic-9.6R1.2.tgz...
Auto-deleting old jservices-idp ...
Removing /opt/sdk/jservices-idp ...
Removing jservices-idp-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-idp ...
Verified jservices-idp-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-idp ...
Storing jservices-idp-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-idp/jservices-idp-pic ->
/var/sw/pkg/jservices-idp-pic-9.6R1.2.tgz...
Hardware Database regeneration succeeded
Validating against /config/juniper.conf.gz
mgd: commit complete
Validation succeeded

Validating on sfc0-re1
Checking compatibility with configuration
Initializing...
Using jbase-9.6R1.0
Verified manifest signed by PackageProduction_9_6_0
Using /var/tmp/jinstall-9.6R1.2-domestic-signed.tgz
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Using jinstall-9.6R1.2-domestic.tgz
Using jbundle-9.6R1.2-domestic.tgz
Checking jbundle requirements on /
Using jbase-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using /var/validate/chroot/tmp/jbundle/jboot-9.6R1.2.tgz
Using jkernel-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jcrypto-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jpfe-9.6R1.2.tgz
Using jdocs-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jroute-9.6R1.2.tgz
Verified manifest signed by PackageProduction_9_6_0
Using jservices-9.6R1.2.tgz
Auto-deleting old jservices-voice ...
Removing /opt/sdk/jservices-voice ...
Removing jservices-voice-bsg-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-voice ...
Verified jservices-voice-bsg-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /var/sw/pkg ...
Creating /opt/sdk/jservices-voice ...
Storing jservices-voice-bsg-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-voice/jservices-voice-bsg ->
/var/sw/pkg/jservices-voice-bsg-9.6R1.2.tgz...
Auto-deleting old jservices-bgf ...
Removing /opt/sdk/jservices-bgf ...
```

```
Removing jservices-bgf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-bgf ...
Verified jservices-bgf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-bgf ...
Storing jservices-bgf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-bgf/jservices-bgf-pic ->
/var/sw/pkg/jservices-bgf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-aacl ...
Removing /opt/sdk/jservices-aacl ...
Removing jservices-aacl-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-aacl ...
Verified jservices-aacl-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-aacl ...
Storing jservices-aacl-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-aacl/jservices-aacl-pic ->
/var/sw/pkg/jservices-aacl-pic-9.6R1.2.tgz...
Auto-deleting old jservices-llpdf ...
Removing /opt/sdk/jservices-llpdf ...
Removing jservices-llpdf-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-llpdf ...
Verified jservices-llpdf-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-llpdf ...
Storing jservices-llpdf-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-llpdf/jservices-llpdf-pic ->
/var/sw/pkg/jservices-llpdf-pic-9.6R1.2.tgz...
Auto-deleting old jservices-sfw ...
Removing /opt/sdk/jservices-sfw ...
Removing jservices-sfw-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-sfw ...
Verified jservices-sfw-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-sfw ...
Storing jservices-sfw-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-sfw/jservices-sfw-pic ->
/var/sw/pkg/jservices-sfw-pic-9.6R1.2.tgz...
Auto-deleting old jservices-appid ...
Removing /opt/sdk/jservices-appid ...
Removing jservices-appid-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-appid ...
Verified jservices-appid-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-appid ...
Storing jservices-appid-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-appid/jservices-appid-pic ->
/var/sw/pkg/jservices-appid-pic-9.6R1.2.tgz...
Auto-deleting old jservices-idp ...
Removing /opt/sdk/jservices-idp ...
Removing jservices-idp-pic-9.6R1.0.tgz from /var/sw/pkg ...
Notifying mspd ...
Installing new jservices-idp ...
Verified jservices-idp-pic-9.6R1.2.tgz signed by PackageProduction_9_6_0
Creating /opt/sdk/jservices-idp ...
Storing jservices-idp-pic-9.6R1.2.tgz in /var/sw/pkg ...
Link: /opt/sdk/jservices-idp/jservices-idp-pic ->
/var/sw/pkg/jservices-idp-pic-9.6R1.2.tgz...
Hardware Database regeneration succeeded
Validating against /config/juniper.conf.gz
mgd: commit complete
```

```
Validation succeeded
Done with validate on all chassis

lcc0-re1:
Installing package '/var/tmp/jinstall-9.6R1.2-domestic-signed.tgz' ...
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_6_0

WARNING:     This package will load JUNOS 9.6R1.2 software.
WARNING:     It will save JUNOS configuration files, and SSH keys
WARNING:     (if configured), but erase all other files and information
WARNING:     stored on this machine.  It will attempt to preserve dumps
WARNING:     and log files, but this can not be guaranteed.  This is the
WARNING:     pre-installation stage and all the software is loaded when
WARNING:     you reboot the system.

Saving the config files ...
NOTICE: uncommitted changes have been saved in
/var/db/config/juniper.conf.pre-install
Installing the bootstrap installer ...

WARNING:     A REBOOT IS REQUIRED TO LOAD THIS SOFTWARE CORRECTLY. Use
the
WARNING:     'request system reboot' command when software installation
is
WARNING:     complete. To abort the installation, do not reboot your
system,
WARNING:     instead use the 'request system software delete jinstall'
WARNING:     command as soon as this operation completes.

Saving package file in /var/sw/pkg/jinstall-9.6R1.2-domestic-signed.tgz
...
Saving state for rollback ...

lcc2-re1:
Installing package '/var/tmp/jinstall-9.6R1.2-domestic-signed.tgz' ...
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_6_0

WARNING:     This package will load JUNOS 9.6R1.2 software.
WARNING:     It will save JUNOS configuration files, and SSH keys
WARNING:     (if configured), but erase all other files and information
WARNING:     stored on this machine.  It will attempt to preserve dumps
WARNING:     and log files, but this can not be guaranteed.  This is the
WARNING:     pre-installation stage and all the software is loaded when
WARNING:     you reboot the system.

Saving the config files ...
NOTICE: uncommitted changes have been saved in
/var/db/config/juniper.conf.pre-install
Installing the bootstrap installer ...

WARNING:     A REBOOT IS REQUIRED TO LOAD THIS SOFTWARE CORRECTLY. Use
the
WARNING:     'request system reboot' command when software installation
is
WARNING:     complete. To abort the installation, do not reboot your
system,
WARNING:     instead use the 'request system software delete jinstall'
```

```
WARNING:     command as soon as this operation completes.

Saving package file in /var/sw/pkg/jinstall-9.6R1.2-domestic-signed.tgz
...
Saving state for rollback ...

sfc0-re1:
Installing package '/var/tmp/jinstall-9.6R1.2-domestic-signed.tgz' ...
Verified jinstall-9.6R1.2-domestic.tgz signed by PackageProduction_9_6_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_6_0

WARNING:     This package will load JUNOS 9.6R1.2 software.
WARNING:     It will save JUNOS configuration files, and SSH keys
WARNING:     (if configured), but erase all other files and information
WARNING:     stored on this machine.  It will attempt to preserve dumps
WARNING:     and log files, but this can not be guaranteed.  This is the
WARNING:     pre-installation stage and all the software is loaded when
WARNING:     you reboot the system.

Saving the config files ...
NOTICE: uncommitted changes have been saved in
/var/db/config/juniper.conf.pre-install
Installing the bootstrap installer ...

WARNING:     A REBOOT IS REQUIRED TO LOAD THIS SOFTWARE CORRECTLY. Use
the
WARNING:     'request system reboot' command when software installation
is
WARNING:     complete. To abort the installation, do not reboot your
system,
WARNING:     instead use the 'request system software delete jinstall'
WARNING:     command as soon as this operation completes.

Saving package file in /var/sw/pkg/jinstall-9.6R1.2-domestic-signed.tgz
...
Saving state for rollback ...

root@host>
```

For more information on the **request system software add** command, see the *Junos OS System Basics and Services Command Reference*.

Loading Software on the Backup Routing Engines

To start running the newly installed Junos OS on all the backup Routing Engines in the routing matrix, you must reboot those Routing Engines. The Routing Engines reboot from the boot device on which the software was just installed. Each reboot operation can take between 5 and 10 minutes to complete.

NOTE: This is your last chance to abort the upgrade of the Junos OS on the backup Routing Engines. If you want to abort the software upgrade, do not reboot the backup Routing Engines.

If you choose to abort the software upgrade, you can remove the new Junos OS package or bundle from the router by issuing the request system software delete operational command and specifying the jinstall command.

To start running the new Junos OS on the backup Routing Engines:

1. To reboot all the backup Routing Engines (**re1**), issue the **request system reboot** operational command at the backup Routing Engine one theTX Matrix Plus router. At the warning message and prompt, type **yes** to allow the command to proceed:

```
root@mysfc0_alt_ret> request system reboot


Reboot the system ? [yes,no] (no) yes

rebooting lcc0-re1
Rebooting lcc2-re1
Shutdown NOW!
Reboot consistency check bypassed - jinstall 9.6R1.2 will complete
installation upon reboot
[pid 23517]

root@mysfc0_alt_re>

*** FINAL System shutdown message from root@host-sfc0-re1> ***

System going down IMMEDIATELY

rlogin: connection closed

root@host>
```

   All of the backup Routing Engines (**re1**) in the routing matrix reboot from the boot devices on which the software was just installed, which loads the new Junos OS. Each reboot operation can take between 5 and 10 minutes to complete.

   When the backup Routing Engine on the TX Matrix Plus router (**sfc0-re1**) finishes rebooting, the management console attached to the backup Routing Engine on the TX Matrix Plus router displays the login prompt.

2. Log in to the TX Matrix Plus backup Routing Engine (**sfc0-re1**) and issue the **show version** command to verify the version of the software installed:

```
root@mysfc0_alt_re> show version
```

sfc0-re1:

```
--------------------------------------------------------------------------
Hostname: mysfc0_alt_re
Model: txp
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]
```

lcc0-re1:

```
--------------------------------------------------------------------------
Hostname: mylcc0_alt_re
Model: t1600
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]
```

lcc2-re1:

```
--------------------------------------------------------------------------
Hostname: mylcc2_alt_re
Model: t1600
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]
```

Switching Routing Engine Mastership to the Backup Routing Engines

The new Junos OS is now running on all the backup Routing Engines (**re1**) in the routing matrix. Next, you must install and load the same new software on the master Routing Engines (**re0**) of the routing matrix.

While the Junos OS is being upgraded (installed and then loaded), the Routing Engine on which you are performing the software upgrade does not route traffic. Therefore, to minimize disruption to network operation, you need to temporarily switch Routing Engine mastership over to the backup Routing Engines (**re1**), which are now running the new version of Junos OS.

To switch Routing Engine mastership over to the backup Routing Engines:

1. At a management console attached to the master Routing Engine (**re0**) on the TX Matrix Plus router, log in to the Junos OS CLI using a root administration account:

   login: **root**
   Password: **••••••••**

   --- Junos 9.6R1.0 built 2009-07-13 08:52:23 UTC

2. At the shell prompt (**%**), start the Junos OS CLI:

   % **cli**
   root@mysfc0>

3. To transfer Routing Engine mastership to the backup Routing Engine (**re1**) for all routers in the routing matrix, issue the **request chassis routing-engine master** command with the **switch** and **all-chassis** options.

   CAUTION: Switching Routing Engine mastership causes traffic to be disrupted.

   At the warning message and prompt, type **yes** to allow the command to proceed:

```
root@mysfc0> request chassis routing-engine master switch all-chassis

warning: Traffic will be interrupted while the PFE is re-initialized
Toggle mastership between routing engines ? [yes,no] (no) yes

lcc0-re0:
--------------------------------------------------------------------------
warning: Traffic will be interrupted while the PFE is re-initialized
Resolving mastership...
Complete. The other routing engine becomes the master.

lcc2-re0:
--------------------------------------------------------------------------
warning: Traffic will be interrupted while the PFE is re-initialized
Resolving mastership...
Complete. The other routing engine becomes the master.

sfc0-re0:
```

```
--------------------------------------------------------------------------
warning: Traffic will be interrupted while the PFE is re-initialized
Resolving mastership...
Complete. The other routing engine becomes the master.
```

4. To verify that the *default* backup Routing Engines (installed in slot 1) are now operating the *elected* master Routing Engines, issue the **show chassis routing-engine** command at the TX Matrix Plus router:

```
root@mysfc0> show chassis routing-engine
sfc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Backup
    Election priority              Master (default)
    ...output_truncated...

Routing Engine status:
 Slot 1:
    Current state                  Master
    Election priority              Backup (default)
    ...output_truncated...

lcc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Backup
    Election priority              Master (default)
    ...output_truncated...

                                       0.02       0.07       0.11
Routing Engine status:
 Slot 1:
    Current state                  Master
    Election priority              Backup (default)
    ...output_truncated...

lcc2-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Backup
    Election priority              Master (default)
    ...output_truncated...

Routing Engine status:
 Slot 1:
    Current state                  Master
    Election priority              Backup (default)
    ...output_truncated...
```

The default backup Routing Engines (**re1**), which are now running the new version of Junos OS, are temporarily operating as the elected master Routing Engines. This enables you to avoid disruption to network operation while you install and load the new version of Junos OS on the default master Routing Engines (**re0**) .

Installing Software on the New Default Master Routing Engines

To install the new version of Junos OS on the new default master Routing Engines (**re0**) in the routing matrix, issue the **request system software add** operational command at the default master Routing Engine (**re0** in this procedure) of the TX Matrix Plus router, and specify the new Junos OS image file.

NOTE: The default backup Routing Engines (re1), which are now running the new version of Junos OS, are operating as the elected master Routing Engines. This enables you to avoid disruption to network operation while you install and load the new version of Junos OS on the default master Routing Engines (re0).

The following example of the **request system software add** command is truncated, but the command output is similar to the output displayed when you installed the new software on the default backup Routing Engines:

```
root@mysfc0> request system software add /var/tmp/jinstall-9.6R1.1-domestic-signed.tgz

Pushing bundle to lcc0-re0
Pushing bundle to lcc2-re0
...output_truncated...
```

Loading Software on the New Default Master Routing Engines

To start running the newly installed Junos OS on all the default master Routing Engines in the routing matrix, you must reboot those Routing Engines. The Routing Engines reboot from the boot device on which the software was just installed. Each reboot operation can take between 5 and 10 minutes to complete.

NOTE: This is your last chance to abort the upgrade of the Junos OS on the default master Routing Engines. If you want to abort the software upgrade, do not reboot the default master Routing Engines. However, aborting the software upgrade procedure at this point this is not recommend, because the default backup routing Engines are already running the new Junos OS.

If you choose to abort the software upgrade, you can remove the new Junos OS package or bundle from the router by issuing the request system software delete operational command and specifying the jinstall command.

To start running the new Junos OS on the default master Routing Engines:

1. To reboot all the default master Routing Engines (**re0**), issue the **request system reboot** operational command at the TX Matrix Plus router.

   At the warning message and prompt, type **yes** to allow the command to proceed:

   ```
   root@mysfc0> request system reboot
   Reboot the system ? [yes,no] (no) yes
   ```

```
Rebooting lcc0-re1
Rebooting lcc2-re1
Shutdown NOW!
Reboot consistency check bypassed - jinstall 9.6R1.2 will complete
installation upon reboot
[pid 23517]

*** FINAL System shutdown message from root@mysfc0> ***
System going down IMMEDIATELY

root@mysfc0> Jul 23 14:00:52 Waiting (max 60 seconds) for system process
 `vnlru' to stop...done
Waiting (max 60 seconds) for system process `bufdaemon' to stop...done
Waiting (max 60 seconds) for system process `syncer' to stop...
Syncing disks, vnodes remaining...1 1 1 0 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
done

syncing disks... All buffers synced.
Uptime: 26m26s
recorded reboot as normal shutdown
Rebooting...
```

All of the default master Routing Engines (**re0**) in the routing matrix reboot from the boot devices on which the software was just installed, which loads the new Junos OS. Each reboot operation can take between 5 and 10 minutes to complete.

```
...router_boot_sequence...
```

When the default master Routing Engine on the TX Matrix Plus router (**sfc0-re0**) finishes rebooting, the management console attached to the default master Routing Engine on the TX Matrix Plus router displays the login prompt.

```
var/pdb/profile_db initialized

Profile database initialized
Local package initialization:.
kern.securelevel: -1 -> 1
starting local daemons:.
Thu Jul 23 14:11:00 PDT 2009

login:
```

The new version of Junos OS is loaded and running on the new default master Routing Engines

2. At a management console attached to the new default master Routing Engine (**re1**) on the TX Matrix Plus router, log in to the Junos OS CLI using a root administration account:

```
Thu Jul 23 14:11:00 PDT 2009

login: root
Password: ••••••••••

--- JUNOS 9.6R1.2 built 2009-07-13 08:52:23 UTC
```

3. Issue the **show version** command to verify the version of the software installed:


```
root@mysfc0> show version
sfc0-re0:
--------------------------------------------------------------------------
Hostname: mysfc0
Model: txp
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]

lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]

lcc2-re0:
--------------------------------------------------------------------------
Hostname: mylcc2
Model: t1600
JUNOS Base OS boot [9.6R1.2]
JUNOS Base OS Software Suite [9.6R1.2]
JUNOS Kernel Software Suite [9.6R1.2]
JUNOS Crypto Software Suite [9.6R1.2]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6R1.2]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6R1.2]
JUNOS Online Documentation [9.6R1.2]
JUNOS Voice Services Container package [9.6R1.2]
JUNOS Border Gateway Function package [9.6R1.2]
JUNOS Services AACL Container package [9.6R1.2]
JUNOS Services LL-PDF Container package [9.6R1.2]
JUNOS Services Stateful Firewall [9.6R1.2]
JUNOS AppId Services [9.6R1.2]
JUNOS IDP Services [9.6R1.2]
JUNOS Routing Software Suite [9.6R1.2]
```

Optional: Switching Routing Engine Mastership Back to the Default Master Routing Engines

The *default backup* Routing Engines (**re1**) are still operating as the *elected master* Routing Engines while the default master Routing Engines (**re0**) are operating as the elected backup Routing Engines.

To avoid confusion about which Routing Engine in any router is the master and which is the backup, you should switch the Routing Engine mastership assignment back to the original designations (with the **re0** Routing Engines operating as the master Routing Engines and the **re1** Routing Engines operating as the backup Routing Engines).

NOTE: Switching Routing Engine mastership causes traffic to be disrupted.

However, if you need to avoid another disruption to traffic while the Routing Engine mastership is switched on all the routers, you can skip this task.

To switch Routing Engine mastership back to the default master Routing Engine (**re0**) on all routers in the routing matrix:

1. Transfer Routing Engine mastership to the backup Routing Engine (**re1**) for all routers in the routing matrix. To do this, issue the **request chassis routing-engine master** command and specify the **switch** and **all-chassis** options.

   At the warning message and prompt, type **yes** to allow the command to proceed:

   ```
   root@mysfc0> request chassis routing-engine master switch all-chassis
   warning: Traffic will be interrupted while the PFE is re-initialized
   Toggle mastership between routing engines ? [yes,no] (no) yes

   lcc0-re0:
   --------------------------------------------------------------------------
   warning: Traffic will be interrupted while the PFE is re-initialized
   Resolving mastership...
   Complete. The local routing engine becomes the master.

   lcc2-re0:
   --------------------------------------------------------------------------
   warning: Traffic will be interrupted while the PFE is re-initialized
   Resolving mastership...
   Complete. The local routing engine becomes the master.

   sfc0-re0:
   --------------------------------------------------------------------------
   warning: Traffic will be interrupted while the PFE is re-initialized
   Resolving mastership...
   Complete. The local routing engine becomes the master.
   ```

2. Verify that Routing Engine mastership has indeed switched back to the default master Routing Engines (**re0**) in the routing matrix. To display Routing Engine mastership information, issue the **show chassis routing-engine** command at the TX Matrix Plus router:

   ```
   root@mysfc0> show chassis routing-engine
   sfc0-re0:
   ```

```
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Master
    Election priority              Master (default)
    ...output_truncated...

Routing Engine status:
 Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    ...output_truncated...

lcc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Master
    Election priority              Master (default)
    ...output_truncated...

Routing Engine status:
 Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    ...output_truncated...

lcc2-re0:
--------------------------------------------------------------------------
Routing Engine status:
 Slot 0:
    Current state                  Master
    Election priority              Master (default)
    ...output_truncated...

Routing Engine status:
 Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    ...output_truncated...
```

Restoring the Original Configuration

After you have installed the new Junos OS and are satisfied that it is running properly on all Routing Engines, restore the routing matrix to the original configuration (that existed before you deleted it at the beginning of this procedure) and then back up the configuration change.

To restore the previous configuration and then create a configuration backup, perform the following steps at the master Routing Engine of the TX Matrix Plus router:

1. Restore the routing matrix configuration that existed before you deleted it at the start of this procedure:

```
{master}
root@mysfc0-re0> configure
Entering configuration mode
```

```
{master}
root@mysfc0# rollback 1
load complete
```

2. Commit the configuration changes on all Routing Engines, which activates the original configuration, and then return to operational mode:

```
{master}
root@mysfc0-re0# commit synchronize and-quit
sfc0-re0:
configuration check succeeds
lcc0-re1:
commit complete
lcc0-re0:
commit complete
lcc2-re1:
commit complete
lcc2-re0:
commit complete
sfc0-re1:
commit complete
sfc0-re0:
commit complete

{master}
root@mysfc0-re0>
```

Backing Up the Routing Engines

Back up the currently running and active file system partitions on each Routing Engine to standby partitions that are not running. Specifically, the root file system (**/**) is backed up to **/altroot**, and **/config** is backed up to **/altconfig**. The root and **/config** file systems are on each Routing Engine's flash drive, and the **/altroot** and **/altconfig** file systems are on Routing Engine's hard drive.

CAUTION: After you run the **request system snapshot** command, you cannot return to the previous version of the software, because the running and backup copies of the software are identical.

To back up the Routing Engines of the routing matrix:

1. To back up the master Routing Engines (**re0**) in the routing matrix, issue the **request system snapshot** command.

   The following example shows sample output for backing up the master Routing Engines:

```
{master}
root@mysfc0-re0> request system snapshot
sfc0-re0:
--------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (220MB) on hard-disk media / partition (ad1s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad1s1e)...
Copying '/dev/ad0s1a' to '/dev/ad1s1a' .. (this may take a few minutes)
```

```
Copying '/dev/ad0s1e' to '/dev/ad1s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config

lcc0-re0:
--------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (220MB) on hard-disk media / partition (ad1s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad1s1e)...
Copying '/dev/ad0s1a' to '/dev/ad1s1a' .. (this may take a few minutes)
Copying '/dev/ad0s1e' to '/dev/ad1s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config

lcc2-re0:
--------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (220MB) on hard-disk media / partition (ad1s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad1s1e)...
Copying '/dev/ad0s1a' to '/dev/ad1s1a' .. (this may take a few minutes)
Copying '/dev/ad0s1e' to '/dev/ad1s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config
```

2. To transfer Routing Engine mastership back to the default backup Routing Engines, issue the **request chassis routing-engine** command with the **switch** and **all-chassis** options.

   CAUTION: Switching Routing Engine mastership causes traffic to be disrupted.

   At the warning message and prompt, type **yes** to allow the operation to proceed

```
{master}
root@mysfc0-re0> request chassis routing-engine master switch all-chassis
Toggle mastership between routing engines ? [yes,no] (no) yes

lcc0-re0:
--------------------------------------------------------------------------
Resolving mastership...
Complete. The other routing engine becomes the master.

lcc2-re0:
--------------------------------------------------------------------------
Resolving mastership...
Complete. The other routing engine becomes the master.

sfc0-re0:
--------------------------------------------------------------------------
Resolving mastership...
Complete. The other routing engine becomes the master.
```

3. To back up the backup Routing Engines (**re1**), issue the **request system snapshot** operational command at the backup Routing Engine on the TX Matrix Plus router.

   The following examples shows sample command output for backing up the backup Routing Engines:

```
{master}
root@mysfc0-re1> request system snapshot
sfc0-re1:
```

```
------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (220MB) on hard-disk media / partition (ad1s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad1s1e)...
Copying '/dev/ad0s1a' to '/dev/ad1s1a' .. (this may take a few minutes)
Copying '/dev/ad0s1e' to '/dev/ad1s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config

lcc0-re1:
------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (223MB) on hard-disk media / partition (ad2s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad2s1e)...
Copying '/dev/ad0s1a' to '/dev/ad2s1a' .. (this may take a few minutes)
Copying '/dev/ad0s1e' to '/dev/ad2s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config

lcc2-re1:
------------------------------------------------------------------------
Verifying compatibility of destination media partitions...
Running newfs (220MB) on hard-disk media / partition (ad1s1a)...
Running newfs (24MB) on hard-disk media /config partition (ad1s1e)...
Copying '/dev/ad0s1a' to '/dev/ad1s1a' .. (this may take a few minutes)
Copying '/dev/ad0s1e' to '/dev/ad1s1e' .. (this may take a few minutes)
The following filesystems were archived: / /config
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Troubleshooting: Upgrade Failure Due to Insufficient Disk Space on page 84
- Troubleshooting: Upgrade Failure Due to Insufficient DRAM
- Troubleshooting: Upgrade Failure Due to Mixed Software on page 90

Troubleshooting: Software Upgrade Failure Due to Insufficient Free Disk Space on a Routing Matrix with a TX Matrix Plus Router

Problem In a routing matrix with a TX Matrix Plus router, a successful upgrade of the Junos OS requires sufficient free disk space on all Routing Engines of the TX Matrix Plus router and connected T1600 routers.

If the amount of free disk space on a Routing Engine is insufficient to install the Junos OS, you might receive a warning that the **/var** filesystem is low on free disk space, similar to the following message:

```
WARNING: The /var filesystem is low on free disk space.
WARNING: This package requires 1075136k free, but there
WARNING: is only 666502k available.
```

Cause The amount of free disk space necessary to upgrade a Routing Engine with a new version of the Junos OS can vary from one release to another. Check the *Junos OS Release Notes* for the software version you are installing.

To determine the amount of free disk space on each Routing Engine in the routing matrix, issue the **show system storage** command on the master Routing Engine and also on the backup Routing Engine on the TX Matrix Plus router. The command output is organized by chassis: **sfc0**, **lcc0**, **lcc1**, **lcc2**, and **lcc3**.

NOTE: When you issue the **show system storage** command on a TX Matrix Plus master Routing Engine, the command is broadcast to the master Routing Engines (only) on all T1600 routers in the routing matrix. Similarly, when you issue the **show system storage** command on a TX Matrix Plus backup Routing Engine, the command is broadcast to the backup Routing Engines (only) on all T1600 routers in the routing matrix.

The following example shows sample output for the **show system storage** command when it is issued on the master Routing Engine in slot 0 on the TX Matrix Plus router:

```
root@mysfc0> show system storage
sfc0-re0:
--------------------------------------------------------------------------
Filesystem             Size       Used      Avail  Capacity   Mounted on
/dev/ad0s1a            3.4G       179M       3.2G        5%  /
devfs                  1.0K       1.0K         0B      100%  /dev
devfs                  1.0K       1.0K         0B      100%  /dev/
/dev/md0                33M        33M         0B      100%  /packages/mnt/jbase
/dev/md1               217M       217M         0B      100%
/packages/mnt/jkernel-9.6-20090624.0
/dev/md2                66M        66M         0B      100%
/packages/mnt/jpfe-T-9.6-20090624.0
/dev/md3               4.1M       4.1M         0B      100%
/packages/mnt/jdocs-9.6-20090624.0
/dev/md4                57M        57M         0B      100%
/packages/mnt/jroute-9.6-20090624.0
/dev/md5                15M        15M         0B      100%
/packages/mnt/jcrypto-9.6-20090624.0
/dev/md6                34M        34M         0B      100%
/packages/mnt/jpfe-common-9.6-20090624.0
/dev/md7               2.0G       8.0K       1.8G        0%  /tmp
/dev/md8               2.0G       878K       1.8G        0%  /mfs
/dev/ad0s1e            383M        90K       379M        0%  /config
procfs                 4.0K       4.0K         0B      100%  /proc
/dev/ad1s1f             24G       8.7G        13G       40%  /var

lcc0-re0:
--------------------------------------------------------------------------
Filesystem             Size       Used      Avail  Capacity   Mounted on
/dev/ad0s1a            3.4G       179M       2.9G        6%  /
devfs                  1.0K       1.0K         0B      100%  /dev
devfs                  1.0K       1.0K         0B      100%  /dev/
/dev/md0                33M        33M         0B      100%  /packages/mnt/jbase
/dev/md1               217M       217M         0B      100%
/packages/mnt/jkernel-9.6-20090629.0
/dev/md2                66M        66M         0B      100%
```

```
/packages/mnt/jpfe-T-9.6-20090629.0
/dev/md3                4.1M       4.1M         0B      100%
/packages/mnt/jdocs-9.6-20090629.0
/dev/md4                 57M        57M         0B      100%
/packages/mnt/jroute-9.6-20090629.0
/dev/md5                 15M        15M         0B      100%
/packages/mnt/jcrypto-9.6-20090629.0
/dev/md6                 34M        34M         0B      100%
/packages/mnt/jpfe-common-9.6-20090629.0
/dev/md7                2.0G       8.0K       1.8G        0%  /tmp
/dev/md8                2.0G       344K       1.8G        0%  /mfs
/dev/ad0s1e             383M        14K       352M        0%  /config
procfs                  4.0K       4.0K         0B      100%  /proc
/dev/ad1s1f              24G       3.7G        18G       17%  /var

lcc2-re0:
--------------------------------------------------------------------------
Filesystem              Size       Used      Avail  Capacity   Mounted on
/dev/ad0s1a             3.4G       178M       2.9G        6%  /
devfs                   1.0K       1.0K         0B      100%  /dev
devfs                   1.0K       1.0K         0B      100%  /dev/
/dev/md0                 32M        32M         0B      100%  /packages/mnt/jbase
/dev/md1                217M       217M         0B      100%
/packages/mnt/jkernel-9.6I20090626
/dev/md2                 66M        66M         0B      100%
/packages/mnt/jpfe-T-9.6I20090626
/dev/md3                4.1M       4.1M         0B      100%
/packages/mnt/jdocs-9.6I20090626
/dev/md4                 57M        57M         0B      100%
/packages/mnt/jroute-9.6I20090626
/dev/md5                 15M        15M         0B      100%
/packages/mnt/jcrypto-9.6I20090626
/dev/md6                 34M        34M         0B      100%
/packages/mnt/jpfe-common-9.6I20090626
/dev/md7                2.0G      10.0K       1.8G        0%  /tmp
/dev/md8                2.0G       346K       1.8G        0%  /mfs
/dev/ad0s1e             383M        14K       352M        0%  /config
procfs                  4.0K       4.0K         0B      100%  /proc
/dev/ad1s1f              24G        12G       9.4G       57%  /var
```

Solution To resolve the issue of insufficient free disk space on a Routing Engine to perform a Junos OS upgrade on that router, perform the following steps:

1. To free up space in the file system, you can log in to a particular Routing Engine and then issue the **request system storage cleanup** command. This command deletes rotating log files in **/var/log** that are not current, temporary files in **/var/tmp** that have not been modified within the last two days, and all crash files in **/var/crash**. The command output first lists the files proposed for deletion and then prompts you to proceed to delete these storage cleanup candidates.

   NOTE: Although the command prompts you before deleting files, you can issue the command with the **dry-run** option, which causes the command to only list the cleanup candidates without offering to remove them.

   The following example shows sample output for the **request system storage cleanup** command with the **dry-run** option included:

```
root@mysfc0> request system storage cleanup dry-run

Currently rotating log files, please wait.
This operation can take up to a minute.

List of files to delete:

         Size Date         Name
     2B Jun 16 12:46 /var/crash/bounds
  80.4M Jun 15 14:56 /var/crash/cores/kernel.0.090615.1455
  80.4M Jun 15 15:46 /var/crash/cores/kernel.1.090615.1546
  80.4M Jun 15 15:58 /var/crash/cores/kernel.2.090615.1558
  80.4M Jun 16 12:47 /var/crash/cores/kernel.3.090616.1246
  30.6M Jun 15 15:05 /var/crash/cores/vmcore.0.090615.1455.tgz
  33.5M Jun 15 16:33 /var/crash/cores/vmcore.1.090615.1546.tgz
  35.9M Jun 15 17:52 /var/crash/cores/vmcore.2.090615.1558.tgz
  48.0M Jun 16 13:47 /var/crash/cores/vmcore.3.090616.1246.tgz
   504B Jun 15 14:55 /var/crash/info.0
   504B Jun 15 15:46 /var/crash/info.1
   505B Jun 15 15:58 /var/crash/info.2
   505B Jun 16 12:46 /var/crash/info.3
 258.1K Jun 23 16:26 /var/log/chassisd.1.gz
 259.2K Jun 17 08:41 /var/log/chassisd.2.gz
  39.6K Jun 15 13:03 /var/log/dcd.0.gz
   716B Jun 15 13:43 /var/log/install.0.gz
  1669B Jun 13 18:05 /var/log/install.1.gz

  ...output_truncated...

     4B Jun 27 10:37 /var/tmp/idp_license_info
 263.6M Jun 11 16:25 /var/tmp/jbundle-9.6-20090611.1-domestic.tgz
 263.8M Jun 24 13:44 /var/tmp/jbundle-9.6-20090624.0-domestic.tgz
 268.7M Jun 11 15:14 /var/tmp/jinstall-9.6-20090611.1-domestic-signed.tgz

 268.8M Jun 23 23:04 /var/tmp/jinstall-9.6-20090624.0-domestic-signed.tgz

  22.9K Jun 22 10:33 /var/tmp/memprobe
1024.0K Jun 16 16:16 /var/tmp/p737a_BIOS_0_A_D.ROM
1024.0K Jun 16 16:17 /var/tmp/p737f_BIOS_0_0_S.ROM
Delete these files ? [yes,no] (no)
```

2. You can use the following file management operational commands to display information about the directories and files on a Routing Engine, but you must include the chassis and Routing Engine specifiers in the pathname:

   - To display detailed information about a file or directory contents, issue the **file list** command with the **detail** option.
   - To display the contents of a file, issue the **file show** command.
   - To compare the contents of two files, issue the **file compare** command.

3. In addition to or instead of using the **request system storage cleanup** command to delete unnecessary files, you can use the following file management commands to delete or move files on a Routing Engine, but you must include the chassis and Routing Engine specifiers in the pathname:

   - To delete files, issue the **file delete** command.
   - To copy files, issue the **file copy** command.
   - To rename files, issue the **file rename** command.

   If you elect to use the **request system storage cleanup** command to automatically delete files, issue the command without the **dry-run** option, and then type **yes** when the CLI prompts to proceed with deleting the candidate files. The following truncated example shows sample output for the **request system storage cleanup** command:

```
root@mysfc0> request system storage cleanup dry-run
Currently rotating log files, please wait.
This operation can take up to a minute.

List of files to delete:

         Size Date         Name
        2B Jun 16 12:46 /var/crash/bounds
      80.4M Jun 15 14:56 /var/crash/cores/kernel.0.090615.1455
      80.4M Jun 15 15:46 /var/crash/cores/kernel.1.090615.1546

      ...output_truncated...

1024.0K Jun 16 16:16 /var/tmp/p737a_BIOS_0_A_D.ROM
1024.0K Jun 16 16:17 /var/tmp/p737f_BIOS_0_0_S.ROM
Delete these files ? [yes,no] (no) yes
```

4. After sufficient free disk space is available on the Routing Engines on which you are upgrading the Junos OS, attempt the upgrade procedure again.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

- Troubleshooting: Upgrade Failure Due to Insufficient DRAM
- Troubleshooting: Upgrade Failure Due to Mixed Software on page 90

Troubleshooting: Software Upgrade Failure Due to Mixed Software Versions on a Routing Matrix with a TX Matrix Plus Router

Problem In a routing matrix with a TX Matrix Plus router, a successful upgrade of the Junos OS requires that all Routing Engines of the TX Matrix Plus router and connected T1600 routers are running the same version of software.

If the software versions on the Routing Engines are not aligned, the software upgrade process will return an error.

Cause Different versions of the Junos OS can have incompatible message formats, particularly if graceful routing engine switchover (GRES) is enabled. Because the steps in the upgrade process include changing Routing Engine mastership, running the same version of software is recommended.

To display the hostname and version information about the software running on all routers in a routing matrix, issue the **show version** command with the **invoke-on all-routing-engines** option.

In the following example, a routing matrix consists of a TX Matrix Plus router (**sfc0**) and two connected T1600 routers (**lcc0** and **lcc2**), with all three routers containing redundant host subsystems. The sample output from the **show version** command shows that a different version of the Junos OS is installed on the TX Matrix Plus router's backup Routing Engine (**sfc0-re1**), while all the other Routing Engines have Junos OS Release **9.6R1.0** installed.

In the following sample output, the backup Routing Engine on the TX Matrix Plus router is running a version of Junos OS that is different from the software on the other Routing Engines:

```
root@mysfc0> show version invoke-on all-routing-engines
sfc0-re0:
--------------------------------------------------------------------------
Hostname: mysfc0
Model: txp
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]
```



```
lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]

lcc2-re0:
--------------------------------------------------------------------------
Hostname: mylcc2
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]

sfc0-re1:
--------------------------------------------------------------------------
Hostname: mysfc0_alt_re
Model: txp
JUNOS Base OS boot [1.1-11111111.1]
JUNOS Base OS Software Suite [1.1-11111111.1]
JUNOS Kernel Software Suite [1.1-11111111.1]
JUNOS Crypto Software Suite [1.1-11111111.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [1.1-11111111.1]
JUNOS Packet Forwarding Engine Support (T-Series) [1.1-11111111.1]
JUNOS Online Documentation [1.1-11111111.1]
JUNOS Voice Services Container package [1.1-11111111.1]
JUNOS Border Gateway Function package [1.1-11111111.1]
JUNOS Services AACL Container package [1.1-11111111.1]
JUNOS Services LL-PDF Container package [1.1-11111111.1]
JUNOS Services Stateful Firewall [1.1-11111111.1]
JUNOS AppId Services [1.1-11111111.1]
JUNOS IDP Services [1.1-11111111.1]
JUNOS Routing Software Suite [1.1-11111111.1]
```

lcc0-re1:

```
--------------------------------------------------------------------------
Hostname: mylcc0_alt_re
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]
```

lcc2-re1:

```
--------------------------------------------------------------------------
Hostname: mylcc2_alt_re
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]
```

Solution To synchronize the Junos OS versions running on the Routing Engines in a routing matrix, perform the following steps on each Routing Engine that has an incorrect version of Junos OS installed:

1. Log in to the Routing Engine that has the incorrect version of Junos OS installed. To log in to a Routing Engine, issue the **request routing-engine login** command.

   In the example scenario, the backup Routing Engine on the TX Matrix Plus router is running an incorrect version of software. To log in to that Routing Engine, you would enter the following command:

   ```
   root@mysfc0> request routing-engine login other-routing-engine

   --- JUNOS 1.1-11111111.1 built 1111-11-11 11:11:11 UTC
   % cli
   root@mysfc0_alt_re>
   ```

   NOTE: Throughout the software upgrade procedure instructions, we assume that the master Routing Engines are in slot 0 and the backup Routing Engines are in slot 1, which is the recommended installation. Therefore, we could issue the request routing-engine login command with the re1 option (instead of the other-routing-engine option) and obtain the same results.

2. If the appropriate software package or bundle is not already present on the Routing Engine that has the incorrect version of Junos OS installed, copy the software onto the Routing Engine.

   For more information, see the *Junos OS Release Notes* and the *Junos OS Installation and Upgrade Guide*.

3. To install a software package or bundle on the Routing Engine that has the incorrect version of Junos OS installed, use the **request system software add** command.

4. When all the Routing Engines in the routing matrix are running the same version of the Junos OS, try the software upgrade procedure again.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61
- Troubleshooting: Upgrade Failure Due to Insufficient Disk Space on page 84
- Troubleshooting: Upgrade Failure Due to Insufficient DRAM

Troubleshooting: Software Upgrade Failure Due to Mixed Software Versions on a Routing Matrix with a TX Matrix Plus Router

Problem In a routing matrix with a TX Matrix Plus router, a successful upgrade of the Junos OS requires that all Routing Engines of the TX Matrix Plus router and connected T1600 routers are running the same version of software.

If the software versions on the Routing Engines are not aligned, the software upgrade process will return an error.

Cause Different versions of the Junos OS can have incompatible message formats, particularly if graceful routing engine switchover (GRES) is enabled. Because the steps in the upgrade process include changing Routing Engine mastership, running the same version of software is recommended.

To display the hostname and version information about the software running on all routers in a routing matrix, issue the **show version** command with the **invoke-on all-routing-engines** option.

In the following example, a routing matrix consists of a TX Matrix Plus router (**sfc0**) and two connected T1600 routers (**lcc0** and **lcc2**), with all three routers containing redundant host subsystems. The sample output from the **show version** command shows that a different version of the Junos OS is installed on the TX Matrix Plus router's backup Routing Engine (**sfc0-re1**), while all the other Routing Engines have Junos OS Release **9.6R1.0** installed.

In the following sample output, the backup Routing Engine on the TX Matrix Plus router is running a version of Junos OS that is different from the software on the other Routing Engines:

```
root@mysfc0> show version invoke-on all-routing-engines
sfc0-re0:
--------------------------------------------------------------------------
Hostname: mysfc0
Model: txp
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]

lcc0-re0:
--------------------------------------------------------------------------
Hostname: mylcc0
Model: t1600
```

```
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]

lcc2-re0:
--------------------------------------------------------------------------
Hostname: mylcc2
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]

sfc0-re1:
--------------------------------------------------------------------------
Hostname: mysfc0_alt_re
Model: txp
JUNOS Base OS boot [1.1-11111111.1]
JUNOS Base OS Software Suite [1.1-11111111.1]
JUNOS Kernel Software Suite [1.1-11111111.1]
JUNOS Crypto Software Suite [1.1-11111111.1]
JUNOS Packet Forwarding Engine Support (M/T Common) [1.1-11111111.1]
JUNOS Packet Forwarding Engine Support (T-Series) [1.1-11111111.1]
JUNOS Online Documentation [1.1-11111111.1]
JUNOS Voice Services Container package [1.1-11111111.1]
JUNOS Border Gateway Function package [1.1-11111111.1]
JUNOS Services AACL Container package [1.1-11111111.1]
JUNOS Services LL-PDF Container package [1.1-11111111.1]
JUNOS Services Stateful Firewall [1.1-11111111.1]
JUNOS AppId Services [1.1-11111111.1]
JUNOS IDP Services [1.1-11111111.1]
JUNOS Routing Software Suite [1.1-11111111.1]

lcc0-re1:
--------------------------------------------------------------------------
Hostname: mylcc0_alt_re
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
```

```
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]
```

lcc2-re1:

```
--------------------------------------------------------------------------
Hostname: mylcc2_alt_re
Model: t1600
JUNOS Base OS boot [9.6-20090713.0]
JUNOS Base OS Software Suite [9.6-20090713.0]
JUNOS Kernel Software Suite [9.6-20090713.0]
JUNOS Crypto Software Suite [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (M/T Common) [9.6-20090713.0]
JUNOS Packet Forwarding Engine Support (T-Series) [9.6-20090713.0]
JUNOS Online Documentation [9.6-20090713.0]
JUNOS Voice Services Container package [9.6-20090713.0]
JUNOS Border Gateway Function package [9.6-20090713.0]
JUNOS Services AACL Container package [9.6-20090713.0]
JUNOS Services LL-PDF Container package [9.6-20090713.0]
JUNOS Services Stateful Firewall [9.6-20090713.0]
JUNOS AppId Services [9.6-20090713.0]
JUNOS IDP Services [9.6-20090713.0]
JUNOS Routing Software Suite [9.6-20090713.0]
```

Solution To synchronize the Junos OS versions running on the Routing Engines in a routing matrix, perform the following steps on each Routing Engine that has an incorrect version of Junos OS installed:

1. Log in to the Routing Engine that has the incorrect version of Junos OS installed. To log in to a Routing Engine, issue the **request routing-engine login** command.

   In the example scenario, the backup Routing Engine on the TX Matrix Plus router is running an incorrect version of software. To log in to that Routing Engine, you would enter the following command:

   ```
   root@mysfc0> request routing-engine login other-routing-engine

   --- JUNOS 1.1-11111111.1 built 1111-11-11 11:11:11 UTC
   % cli
   root@mysfc0_alt_re>
   ```

   NOTE: Throughout the software upgrade procedure instructions, we assume that the master Routing Engines are in slot 0 and the backup Routing Engines are in slot 1, which is the recommended installation. Therefore, we could issue the **request routing-engine login** command with the **re1** option (instead of the **other-routing-engine** option) and obtain the same results.

2. If the appropriate software package or bundle is not already present on the Routing Engine that has the incorrect version of Junos OS installed, copy the software onto the Routing Engine.

   For more information, see the *Junos OS Release Notes* and the *Junos OS Installation and Upgrade Guide*.

3. To install a software package or bundle on the Routing Engine that has the incorrect version of Junos OS installed, use the **request system software add** command.

4. When all the Routing Engines in the routing matrix are running the same version of the Junos OS, try the software upgrade procedure again.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61
- Troubleshooting: Upgrade Failure Due to Insufficient Disk Space on page 84
- Troubleshooting: Upgrade Failure Due to Insufficient DRAM

CHAPTER 6

Managing Files and Processes

Managing Files on Routing Engines in a Routing Matrix with a TX Matrix Plus Router

This topic summarizes key file management issues useful in operating a routing matrix with a TX Matrix Plus router:

Displaying a List of Files

To display a list of files on a Routing Engine in a routing matrix with a TX Matrix Plus router, issue the **file list** operational management command.

- To display a list of files on a different chassis, include the chassis specifier (**lcc0**, **lcc1**, **lcc2**, or **lcc3**) in the directory or file pathname.
- To display a list of files on a different Routing Engine, include the Routing Engine specifier (**re0** or **re1**) in the directory or file pathname.

The following sample command displays the list of files in the **/var/tmp** directory on Routing Engine **re0** in the line-card chassis **lcc0**:

```
user@host> file list lcc0-re0:/var/tmp
lcc0-re0:
--------------------------------------------------------------------------
/var/tmp/:
.gdbinit
.pccardd
Test/
chassisd*
chassisd.nathan*
check_time*
cores/
```

```
diagTestPrep*
diagtest*
diagtest.regress*
do_switchovers*
dump_test*
err.manoj.log
esw_clearstats*
esw_counter*
esw_debug*
esw_debug_ge*
esw_filt_test*
esw_filter_tnp_addr*
esw_getstats*
esw_phy*
esw_stats*
```

Displaying the Contents of a File

To display the contents of a file, issue the **file show** operational command. To specify a file that is not local to the Routing Engine from which the command is issued, include chassis and Routing Engine information in the filename.

The following sample command displays the contents of the **.gdbinit** file in the **/var/tmp** directory on the master Routing Engine of the T1600 router **lcc0**:

```
user@host> file show lcc0-re0:/var/tmp/.gdbinit
lcc0-re0:
--------------------------------------------------------------------------
######################################################################
# Settings
######################################################################

set print pretty

######################################################################
# Basic stuff
######################################################################

define msgbuf
        printf "%s", msgbufp->msg_ptr
end
# hex dump of a block of memory
# usage: dump address length
define dump
   p $arg0, $arg1
   set $ch = $arg0
   set $j = 0
   set $n = $arg1
   while ($j < $n)
        #printf "%x %x ",&$ch[$j],$ch[$j]
        printf "%x ",$ch[$j]
        set $j = $j + 1
        if (!($j % 16))
                printf "\n"
        end
   end
```

```
end
```

Copying Files

To copy files from one place to another on the same router or between different routers in the routing matrix, use the **file copy** operational management command. To specify a file that is not local to the Routing Engine from which the command is issued, include chassis and Routing Engine information in the filename.

The following sample command is used to copy the file **sample.txt** from the **/tmp** directory on **sfc0-re1** (the backup Routing Engine in the TX Matrix Plus router) to the **/var/tmp** directory on **lcc0-re1** (the backup Routing Engine in one of the connected T1600 routers):

```
user@host> file copy sfc0-re1:/tmp/sample.txt lcc0-re1:/var/tmp
```

Renaming Files

To rename a file, use the **file rename** operational management command. To specify a file that is not local to the Routing Engine from which the command is issued, include chassis and Routing Engine information in the filename.

The following sequence of sample commands lists the files in the **/var/tmp** directory on **sfc0-re0** (the master Routing Engine of the TX Matrix Plus router), renames one of the files (changing **dcd.core** to **dcd.core.990415**), and then lists the files in the **/var/tmp** directory again to show the newly named file:

```
user@host> file list sfc0-re0:/var/tmp
dcd.core
rpd.core
snmpd.core

user@host> file rename sfc0-re0:/var/tmp/dcd.core /var/tmp/dcd.core.990413


user@host> file list sfc0-re0:/var/tmp
dcd.core.990413
rpd.core
snmpd.core
```

Deleting Files

To delete a file, use the **file delete** operational management command. To specify a file that is not local to the Routing Engine from which the command is issued, include chassis and Routing Engine information in the filename.

The following sequence of sample command lists the files in the **/var/tmp** directory on **sfc0-re0** (the master Routing Engine on the TX Matrix Plus router), deletes the file **snmpd.core** from that directory, and then lists the files in the directory again:

```
user@host> file list lcc0-re0:/var/tmp
dcd.core
rpd.core
snmpd.core

user@host> file delete lcc0-re0:/var/tmp/snmpd.core
```

```
user@host> file list /var/tmp
dcd.core
rpd.core
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Managing System Processes in a Routing Matrix with a TX Matrix Plus Router

Some system processes in a routing matrix with a TX Matrix Plus run on the TX Matrix Plus router and some run on the T1600 routers. For example, the routing protocol process (rpd) runs exclusively on the TX Matrix Plus router. To restart the routing protocol process for the entire routing matrix, issue the **restart routing** command on the TX Matrix Plus router:

```
user@host> restart routing ?
Possible completions:
  <[Enter]>            Execute this command
  gracefully           Gracefully restart the process
  immediately          Immediately restart (SIGKILL) the process
  logical-system       Name of logical system
  soft                 Soft reset (SIGHUP) the process
  |                    Pipe through a command
```

Other processes run on both the TX Matrix Plus router and the T1600 routers. To restart the chassis process that manages PICs, FPCs, and other hardware components, issue the **restart chassis-control** command on the TX Matrix Plus router and select the **all**, **all-lcc**, or **lcc** ***lcc-number*** option:

```
user@host> restart chassis-control ?
Possible completions:
  <[Enter]>            Execute this command
  all-chassis          Restart software process on all chassis
  all-lcc              Restart software process on all LCC chassis
  gracefully           Gracefully restart the process
  immediately          Immediately restart (SIGKILL) the process
  lcc                  Restart software process on specific LCC (0..3)
  sfc                  Restart software process on SFC (0..0)
  soft                 Soft reset (SIGHUP) the process
  |                    Pipe through a command
```

To restart the SNMP process, issue the **restart snmp** command on the TX Matrix Plus router and select the **all**, **all-lcc**, or **lcc** ***lcc-number*** option:

```
user@host> restart snmp ?
Possible completions:
  <[Enter]>            Execute this command
  all-chassis          Restart software process on all chassis
  all-lcc              Restart software process on all LCC chassis
  gracefully           Gracefully restart the process
  immediately          Immediately restart (SIGKILL) the process
```

```
lcc                 Restart software process on specific LCC (0..3)
sfc                 Restart software process on SFC (0..0)
soft                Soft reset (SIGHUP) the process
|                   Pipe through a command
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

CHAPTER 7

Managing Hardware Components

Displaying Chassis Physical Locations for a Routing Matrix with a TX Matrix Plus Router

In a routing matrix with a TX Matrix Plus router, you can use the **show chassis location** operational command to display the physical locations of hardware components in the routing matrix:

- To display the router physical location descriptions defined in the **location** configuration statement at the **[edit system]** hierarchy level, issue the **show chassis location** operational command. To limit the command output to the **location** configuration settings for the TX Matrix Plus router (SFC) only, include the **sfc *0*** option. To limit the command output to the **location** configuration settings for a particular T1600 router (LCC), include the **lcc *lcc-number*** option. For example:

```
user@host> show chassis location sfc 0

sfc0-re0:
--------------------------------------------------------------------------

country-code: US
postal-code: 94404
Building: Building 2, Floor: 2
```

- To display the numbers of the connected Flexible PIC Concentrators (FPCs) in both routing matrix “global numbering” mode (**0** through **31**, as used to specify an interface name in a routing matrix) and associated “local numbering” mode (LCC number and FPC slot number), include the **fpc** option. Example:

```
user@host> show chassis location fpc

Global FPC    LCC     Local FPC
     1          0         1
     2          0         2
     3          0         3
    16          2         6
    17          2         1
    19          2         3
```

- To display the T1600 router (or line-card chassis) number and FPC number associated with a particular interface name, include the **interface by-name** ***interface-name*** option. For example:

```
user@host> show chassis location interface by-name ge-16/3/7.1

Interface Name: ge-16/3/7.0, LCC: 2, FPC: 6
```

- To display the interface name associated with a particular FPC, include the **interface by-slot lcc** ***lcc-number*** **fpc** ***fpc-slot-number*** option. For example:

```
user@host> show chassis location interface by-slot lcc 2 fpc 6

Global FPC: 16
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Displaying the Status of the Switching Fabric Topology of a Routing Matrix with a TX Matrix Plus Router

In a routing matrix with a TX Matrix Plus router, each of the five control planes contains various types of Switch Interface Boards (SIBs) that forward packets from a source Packet Forwarding Engine to a destination Packet Forwarding Engine.

You can use the **show chassis fabric topology** operational command to check the status of the SIB connections between the TX Matrix Plus router and the connected T1600 routers:

- To display the fabric topology states for the entire routing matrix, issue the **show chassis fabric toplogy** command. To limit the command output to a particular TXP-F13 SIB, also include the SIB slot number as a command option.
- To display the fabric topology states for the TX Matrix Plus router, include the **sfc** ***number*** option. To further limit the command output to a particular TXP-F13 SIB, also include the SIB slot number as a command option.

- To display the fabric topology states for a particular T1600 router, include the **lcc** ***lcc-number*** option. To further limit the command output to a particular TXP-F13 SIB, also include the SIB slot number as a command option.

To display the fabric topology state for the TX Matrix Plus router only, issue the **show fabric topology** command with the **sfc** option. The command output displays the fabric link status for transmit-side links and receive-side links for each of the 16 TXP-F13 SIB slots in the TX Matrix Plus router. For every TXP-F13 SIB, the following information is listed:

- Transmit-side link status—The state of each link from the TXP-F13 SIB to the TXP-T1600 SIB on a directly connected T1600 router. A TXP-F13 SIB connects to 2 different T1600 routers, and each connection consists of 128 links.
- Receive-side link status—The state of each link to the TXP-F13 SIB from the TXP-T1600 SIB on a directly connected T1600 router.

Example:

```
user@host> show chassis fabric topology sfc 0 0
sfc0-re0:
--------------------------------------------------------------------------

SIB:0
=====

Out-Links:
==========
SFC0_F13_SIB_36     -> LCC00_ST_SIB_L00                 Status
=====================================================================
SF_3_00_FB_D(04,11) -> FPC0_T_SG(0,0,0)_FB_D(04,11)     OK
SF_3_00_FB_D(04,10) -> FPC0_T_SG(0,0,1)_FB_D(04,10)     OK
SF_3_00_FB_D(04,09) -> FPC0_T_SG(0,0,2)_FB_D(04,09)     OK
SF_3_00_FB_D(04,08) -> FPC0_T_SG(0,0,3)_FB_D(04,08)     OK
SF_3_00_FB_D(04,07) -> FPC0_T_SG(0,0,4)_FB_D(04,07)     OK
SF_3_00_FB_D(04,06) -> FPC0_T_SG(0,0,5)_FB_D(04,06)     OK
SF_3_00_FB_D(04,05) -> FPC0_T_SG(0,0,6)_FB_D(04,05)     OK
SF_3_00_FB_D(04,04) -> FPC0_T_SG(0,0,7)_FB_D(04,04)     OK
SF_3_01_FB_B(16,11) -> FPC4_T_SG(2,0,0)_FB_B(16,11)     OK

...output_truncated...

SF_3_15_FB_C(09,08) -> FPC3_B_SG(1,3,7)_FB_C(09,08)     OK
PG(0,0)_FB_D(05,11) -> PC(0,0)_FB_D(05,11)              OK
PG(1,0)_FB_C(11,11) -> PC(1,0)_FB_C(11,11)              OK
PG(2,0)_FB_B(17,11) -> PC(2,0)_FB_B(17,11)              OK
PG(3,0)_FB_A(23,11) -> PC(3,0)_FB_A(23,11)              OK

In-Links:
==========
LCC00_ST_SIB_L00              -> SFC0_F13_SIB_36        Status
=====================================================================
FPC0_T_SG(0,0,0)_FB_D(01,11)  -> SF_1_00_FB_D(01,11)    LOS
FPC0_T_SG(0,0,1)_FB_D(01,10)  -> SF_1_00_FB_D(01,10)    LOS
FPC0_T_SG(0,0,2)_FB_D(01,09)  -> SF_1_00_FB_D(01,09)    LOS
FPC0_T_SG(0,0,3)_FB_D(01,08)  -> SF_1_00_FB_D(01,08)    LOS
FPC0_T_SG(0,0,4)_FB_D(01,07)  -> SF_1_00_FB_D(01,07)    LOS
FPC0_T_SG(0,0,5)_FB_D(01,06)  -> SF_1_00_FB_D(01,06)    LOS
FPC0_T_SG(0,0,6)_FB_D(01,05)  -> SF_1_00_FB_D(01,05)    LOS
```

```
FPC0_T_SG(0,0,7)_FB_D(01,04)  -> SF_1_00_FB_D(01,04)    LOS
FPC4_T_SG(2,0,0)_FB_B(13,11)  -> SF_1_01_FB_B(13,11)    LOS

...output_truncated...

FPC3_B_SG(1,3,7)_FB_C(06,08)  -> SF_1_15_FB_C(06,08)    LOS
PG(0,0)_FB_D(02,11)           -> PC(0,0)_FB_D(02,11)    LOS
PG(1,0)_FB_C(08,11)           -> PC(1,0)_FB_C(08,11)    LOS
PG(2,0)_FB_B(14,11)           -> PC(2,0)_FB_B(14,11)    LOS
PG(3,0)_FB_A(20,11)           -> PC(3,0)_FB_A(20,11)    LOS

Out-Links:
=========
SFC0_F13_SIB_36     -> LCC01_ST_SIB_L00                 Status
=======================================================================
SF_3_00_FB_D(28,11) -> FPC0_T_SG(0,0,0)_FB_D(28,11)     OK
SF_3_00_FB_D(28,10) -> FPC0_T_SG(0,0,1)_FB_D(28,10)     OK
SF_3_00_FB_D(28,09) -> FPC0_T_SG(0,0,2)_FB_D(28,09)     OK
SF_3_00_FB_D(28,08) -> FPC0_T_SG(0,0,3)_FB_D(28,08)     OK
SF_3_00_FB_D(28,07) -> FPC0_T_SG(0,0,4)_FB_D(28,07)     OK
SF_3_00_FB_D(28,06) -> FPC0_T_SG(0,0,5)_FB_D(28,06)     OK
SF_3_00_FB_D(28,05) -> FPC0_T_SG(0,0,6)_FB_D(28,05)     OK
SF_3_00_FB_D(28,04) -> FPC0_T_SG(0,0,7)_FB_D(28,04)     OK
SF_3_01_FB_B(40,11) -> FPC4_T_SG(2,0,0)_FB_B(40,11)     OK

...output_truncated...

SF_3_15_FB_C(33,08) -> FPC3_B_SG(1,3,7)_FB_C(33,08)     OK
PG(4,0)_FB_D(29,11) -> PC(4,0)_FB_D(29,11)              OK
PG(5,0)_FB_C(35,11) -> PC(5,0)_FB_C(35,11)              OK
PG(6,0)_FB_B(41,11) -> PC(6,0)_FB_B(41,11)              OK
PG(7,0)_FB_A(47,11) -> PC(7,0)_FB_A(47,11)              OK

In-Links:
==========
LCC01_ST_SIB_L00              -> SFC0_F13_SIB_36        Status
=======================================================================
FPC0_T_SG(0,0,0)_FB_D(25,11)  -> SF_1_00_FB_D(25,11)    LOS
FPC0_T_SG(0,0,1)_FB_D(25,10)  -> SF_1_00_FB_D(25,10)    LOS
FPC0_T_SG(0,0,2)_FB_D(25,09)  -> SF_1_00_FB_D(25,09)    LOS
FPC0_T_SG(0,0,3)_FB_D(25,08)  -> SF_1_00_FB_D(25,08)    LOS
FPC0_T_SG(0,0,4)_FB_D(25,07)  -> SF_1_00_FB_D(25,07)    LOS
FPC0_T_SG(0,0,5)_FB_D(25,06)  -> SF_1_00_FB_D(25,06)    LOS
FPC0_T_SG(0,0,6)_FB_D(25,05)  -> SF_1_00_FB_D(25,05)    LOS
FPC0_T_SG(0,0,7)_FB_D(25,04)  -> SF_1_00_FB_D(25,04)    LOS
FPC4_T_SG(2,0,0)_FB_B(37,11)  -> SF_1_01_FB_B(37,11)    LOS

...output_truncated...

FPC3_B_SG(1,3,7)_FB_C(30,08)  -> SF_1_15_FB_C(30,08)    LOS
PG(4,0)_FB_D(26,11)           -> PC(4,0)_FB_D(26,11)    LOS
PG(5,0)_FB_C(32,11)           -> PC(5,0)_FB_C(32,11)    LOS
PG(6,0)_FB_B(38,11)           -> PC(6,0)_FB_B(38,11)    LOS
PG(7,0)_FB_A(44,11)           -> PC(7,0)_FB_A(44,11)    LOS
```

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15

- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Displaying the Status of Control Board Ethernet Switch Ports in a Routing Matrix with a TX Matrix Plus Router

The following sections describe the Ethernet switches on the Control Boards in a routing matrix with a TX Matrix Plus router and how you can use the **show chassis ethernet-switch** operational command to display information about the ports on Control Board Ethernet switches:

- Ethernet Switches on Control Boards in the Routing Matrix on page 109
- Status of Ports on Control Board Ethernet Switches on page 111
- Error Statistics for Ports on Control Board Ethernet Switches on page 111
- Traffic Statistics for Ports on Control Board Ethernet Switches on page 112

Ethernet Switches on Control Boards in the Routing Matrix

In a routing matrix with a TX Matrix Plus router, the SFC and all connected LCCs contain redundant host subsystems. For each host subsystem in a T1600 router in a routing matrix, the Control Board (LCC-CB) contains a Gigabit Ethernet switch. For each host subsystem in a TX Matrix Plus router, the Control Board (TXP-CB) contains a 10-Gigabit Ethernet switch and a Gigabit Ethernet switch, which are connected.

These switches support the following connectivity between Routing Engines in the routing matrix:

- Connectivity Between SFC and LCC Routing Engines on page 109
- Connectivity Between SFC Master and Backup Routing Engines on page 110
- Connectivity Between LCC Master and Backup Routing Engines on page 110

Connectivity Between SFC and LCC Routing Engines

In a routing matrix with a TX Matrix Plus router, the SFC master Routing Engine and every LCC master Routing Engine are connected, enabling the multi-chassis system to operate as a single routing system. The SFC backup Routing Engine and every LCC backup Routing Engine are likewise connected.

This connectivity entails the 10-Gigabit and Gigabit Ethernet switches on the TXP-CB and the Gigabit Ethernet switch on the LCC-CB:

1. The 10-Gigabit Ethernet port on the SFC Routing Engine (automatically configured at the **ixgbe0** internal Ethernet interface) connects to the 10-Gigabit Ethernet switch on the *local Control Board*.
2. On the SFC local Control Board, he 10-Gigabit Ethernet switch connects to the Gigabit Ethernet switch.

3. The Gigabit Ethernet switch on the SFC Control Board connects to the Gigabit Ethernet switch of every LCC Control Board.
4. On every LCC Routing Engine, the Gigabit Ethernet port (automatically configured at the **bcm0** internal Ethernet inteface) connects to the Gigabit Ethernet switch on the *local Control Board*.

Connectivity Between SFC Master and Backup Routing Engines

In a routing matrix with a TX Matrix Plus router, the independent control planes of an SFC are connected by two physical links between the two 10-Gigabit Ethernet ports on their respective Routing Engines.

This connectivity entails the 10-Gigabit Ethernet switches on the local and remote TXP-CBs:

- The primary link to the remote Routing Engine is at the **ixgbe0** interface on the SFC Routing Engine. The **ixgbe0** interface—in addition to connecting the SFC Routing Engine to the Routing Engines of the connected LCCs—also connects the SFC Routing Engine to the 10-Gigabit Ethernet port accessed by the **ixgbe1** interface on the *remote Routing Engine*.
- The alternate link to the remote Routing Engine is the 10-Gigabit Ethernet port at the **ixgbe1** interface on the Routing Engine. This second port connects the Routing Engine to the 10-Gigabit Ethernet switch on the *remote Control Board*, which in turn connects to the 10-Gigabit Ethernet port at the **ixgbe0** interface on the *remote Routing Engine*.

If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.

Connectivity Between LCC Master and Backup Routing Engines

In a routing matrix with a TX Matrix Plus router, the independent control planes of an LCC are connected by two physical links between the two Gigabit Ethernet ports on their respective Routing Engines.

This connectivity entails the Gigabit Ethernet switches on the local and remote LCC-CBs:

- The primary link to the remote Routing Engine is at the **bcm0** interface on the LCC Routing Engine. The **bcm0** interface—in addition to connecting the LCC Routing Engine to the SFC Routine Engine—also connects the LCC Routing Engine to the Gigabit Ethernet port accessed by the **em1** interface on the *remote Routing Engine*.
- The alternate link to the remote Routing Engine is at the Gigabit Ethernet port at the **em1** interface on the local Routing Engine. This second port connects the local Routing Engine to the Gigabit Ethernet switch on the *remote Control Board*, which in turn connects to the Gigabit Ethernet port at the **bcm0** interface on the *remote Routing Engine*.

If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.

Status of Ports on Control Board Ethernet Switches

To display port status information for the ports on the Control Board Ethernet switches in the routing matrix, use the following form of the **show chassis ethernet-switch** operational command:

show chassis ethernet-switch <sfc *sfc-number* | lcc *lcc-number*>

You can control the scope of the command output as follows:

- To display the status of the switch ports on the Control Boards in every router in the routing matrix, issue the **show chassis ethernet-switch** command without any command options.
- To limit the output to the status of the ports on the 10-Gigabit Ethernet switch and the Gigabit Ethernet switch on the two Control Boards in the SFC, issue the **show chassis ethernet-switch** command with the **sfc *sfc-number*** option, where ***sfc-number*** is **0**.
- To limit the output to the status of the ports on the Gigabit Ethernet switch in the two Control Boards in a specific LCC, issue the **show chassis ethernet-switch** operational command with the **lcc *lcc-number*** option, where ***lcc-number*** is a value from **0** through **3**.

Error Statistics for Ports on Control Board Ethernet Switches

To display the numbers and types of errors accumulated on the connected ports of Control Board Ethernet switches in the routing matrix, use the following form of the **show chassis ethernet-switch** operational command:

show chassis ethernet-switch errors <sfc *sfc-number* | lcc *lcc-number*>
<switch *switch-type-number*> <*switch-port-number*>

You can control the scope of the command output as follows:

- To display error information for ports on Control Board Ethernet switches in every router in the routing matrix, issue the **show chassis ethernet-switch errors** command (applying only the **errors** command option).
- To limit the command output, you add any combination of the following command options:
  - Chassis—To filter the output on a specific chassis, you can include either the **sfc *sfc-number*** option (where ***sfc-number*** is **0**) or the **lcc *lcc-number*** option (where ***lcc-number*** is a value from **0** through **3**).
  - SFC Control Board Ethernet Switch Type—If the command output includes information for Control Board Ethernet switches in an SFC (that is, if you applied either the **errors** option alone or the **errors sfc *sfc-number*** option), you can filter the SFC portion of the output on a specific switch type. To limit SFC Control Board Ethernet switch port error information, include the **switch *switch-type-number*** option. The ***switch-type-number*** value can be **0** (the 10-Gigabit Ethernet switch type) or **1** (the Gigabit Ethernet switch type). The ***switch-type-number* 2** is reserved for future use.

- Control Board Ethernet Switch Port Number—To filter the output on a specific switch port number, include the ***switch-port-number*** option, where ***switch-port-number*** is a value from **0** through **27**.

Traffic Statistics for Ports on Control Board Ethernet Switches

To display the traffic statistics accumulated on the connected ports of Control Board Ethernet switches in the routing matrix, use the following form of the **show chassis ethernet-switch** operational command:

show chassis ethernet-switch statistics <sfc *sfc-number* | lcc *lcc-number*> <switch *switch-type-number*> <*switch-port-number*>

You can control the scope of the command output as follows:

- To display traffic statistics for Ethernet ports on Control Board switches in every router in the routing matrix, issue the **show chassis ethernet-switch statistics** command (applying only the **statistics** command option).
- To limit the command output, you can add any combination of the following command options:
  - Chassis—To filter the output on a specific chassis, you can include either the **sfc *sfc-number*** option (where ***sfc-number*** is **0**) or the **lcc *lcc-number*** option (where ***lcc-number*** is a value from **0** through **3**).
  - SFC Control Board Ethernet Switch Type—If the command output includes information for Control Board Ethernet switches in an SFC (that is, if you applied either the **statistics** option alone or the **statistics sfc *sfc-number*** option), you can filter the SFC portion of the output on a specific switch type. To limit SFC Control Board Ethernet switch port error information, include the **switch *switch-type-number*** option. The ***switch-type-number*** value can be **0** (the 10-Gigabit Ethernet switch type) or **1** (the Gigabit Ethernet switch type). The ***switch-type-number* 2** is reserved for future use.
  - Control Board Ethernet Switch Port Number—To filter the output on a specific switch port number, include the ***switch-port-number*** option, where ***switch-port-number*** is a value from **0** through **27**.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Enabling and Disabling Hardware Components of a Routing Matrix with a TX Matrix Plus Router

You can temporarily disable certain hardware components (such as FPCs, PICs, and SIBs) that belong to the TX Matrix Plus router and T1600 routers in the routing matrix. To do so, issue the appropriate **request chassis** command and include the **sfc** or **lcc** option as needed.

NOTE: If you issue a chassis-related command that references FPCs, we recommend that you use the FPC hardware slot number (0 through 7) of the specific T1600 router and specify its corresponding LCC number.

```
user@host> request chassis ?
Possible completions:
  cb                   Change Control Board status
  cip                  Change Connector Interface Panel status
  fpc                  Change Flexible PIC Concentrator status
  fpm                  Change craft interface status
  lcc                  Change LCC status
  pic                  Change Physical Interface Card status
  routing-engine       Change Routing Engine status
  scg                  Change SONET Clock Generator status
  sib                  Change Switch Interface Board status
  spmb                 Change Switch Processor Mezzanine Board status

user@host> request chassis cb ?
Possible completions:
  lcc                  Change Control Board status (0..3)
  offline              Take CB offline
  online               Bring CB online
  sfc                  Change Control Board status (0..0)
  slot                 CB slot number (0..1)

user@host> request chassis cip ?
Possible completions:
  offline              Take CIP offline
  online               Bring CIP online
  slot                 CIP slot number (0..1)

user@host> request chassis fpc ?
Possible completions:
  lcc                  Change Flexible PIC Concentrator status of specific LCC
  offline              Take FPC offline
  online               Bring FPC online
  restart              Restart FPC
  slot                 FPC slot number (0..31)

user@host> request chassis fpm ?
Possible completions:
  lcc                  Change craft interface status (0..3)
  resync               Resynchronize craft interface
  sfc                  Change craft interface status (0..0)

user@host> request chassis lcc ?
Possible completions:
  offline              Take LCC offline
```

```
  online               Bring LCC online
  slot                 LCC Slot (0..3)

user@host> request chassis pic ?
Possible completions:
  fpc-slot             Slot number of FPC that houses PIC (0..31)
  lcc                  Change Physical Interface Card status of specific LCC
  offline              Take PIC offline
  online               Bring PIC online
  pic-slot             PIC slot number (0..3)

user@host> request chassis routing-engine ?
Possible completions:
  master               Set Routing Engine mastership

user@host> request chassis scg ?
Possible completions:
  lcc                  Change SONET Clock Generator status (0..3)
  offline              Take SCG offline
  online               Bring SCG online
  slot                 SCG slot number (0..1)

user@host> request chassis sib ?
Possible completions:
  all-lcc              Change Switch Interface Board status
  f13                  Change SIB F13 status
  f2s                  Change SIB F2S status
  lcc                  Change Switch Interface Board status (0..3)
  offline              Take SIB offline
  online               Bring SIB online
  slot                 SIB slot number (0..15)

user@host> request chassis spmb ?
Possible completions:
  lcc                  Control operation of an SPMB (0..3)
  restart              Restart SPMB
  sfc                  Control operation of an SPMB (0..0)
  slot                 SPMB slot number (0..1)
```

The routing matrix extends the concept of taking specific hardware components offline or online to include an entire T1600 router in a routing matrix. To enable or disable a T1600 router in a routing matrix, issue the **request chassis lcc slot *lcc-number* (offline | online)** command:

```
user@host> request chassis lcc ?
Possible completions:
  offline              Take LCC offline
  online               Bring LCC online
  slot                 LCC Slot (0..3)
```

Although you can enter the routing matrix-based slot number when you issue the **request chassis fpc** command, output from **show chassis** commands always references the FPC hardware slot number (**0** through **7**) of the specific T1600 router and its corresponding LCC number. As a result, we recommend that you include the FPC hardware slot number when you issue **request chassis** or **show chassis** commands, as shown in the following example.

First, issue the **request chassis fpc** command with the routing matrix-based FPC slot number of **19**:

```
user@host> request chassis fpc offline slot 19
```



```
lcc2-re0:
--------------------------------------------------------------------------
Offline initiated, use "show chassis fpc" to verify
```

However, when you issue the **show chassis fpc** command to check the result, the output displays the change using node-centric terminology: FPC slot number **3** on T1600 router **LCC2** (the equivalent of routing matrix slot **19**).

```
user@host> show chassis fpc
lcc0-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty
  1  Online            31      2          0       256         7         44
  2  Online            28      1          0       256         7         44
  3  Online            31      2          0       256        14         44
  4  Empty
  5  Empty
  6  Empty
  7  Empty

lcc2-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            31      2          0       256        14         44
  1  Online            30      2          0       256         7         44
  2  Empty
  3 Offline     --- Offlined by cli command ---
  4  Empty
  5  Empty
  6  Empty
  7  Empty
```

To bring the same FPC back online, use the slot number and LCC number from the previous command output:

```
user@host> request chassis fpc online lcc 2 slot 3
lcc2-re0:
--------------------------------------------------------------------------
Online initiated, use "show chassis fpc" to verify
```

Once you bring the FPC back online, reissue the **show chassis fpc** command to see that the FPC slot and LCC number you used in the last command now matches the command output:

```
user@host> show chassis fpc
lcc0-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Empty
  1  Online            31      1          0       256         7         44
  2  Online            28      1          0       256         7         44
  3  Online            31      3          0       256        14         44
  4  Empty
  5  Empty
  6  Empty
  7  Empty
```

```
lcc2-re0:
--------------------------------------------------------------------------
                     Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt      DRAM (MB) Heap     Buffer
  0  Online            31      3          0       256         14         44
  1  Online            30      1          0       256          7         44
  2  Empty
  3 Present     0   0    0    0    0    0
  4  Empty
  5  Empty
  6  Empty
  7  Empty
```

For more information about converting FPC hardware slot numbers on a T1600 router to the global FPC numbers used in a routing matrix and vice versa, see "Global FPC Numbering for Interfaces in a Routing Matrix with a TX Matrix Plus Router" on page 5 and "Displaying Chassis Physical Locations for a Routing Matrix with a TX Matrix Plus Router" on page 105.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

Rebooting and Halting Hardware Components of the Routing Matrix with a TX Matrix Plus Router

In a routing matrix with a TX Matrix Plus router, you can control which hardware component is rebooted or halted. If you reboot or halt the TX Matrix Plus router, by default you also reboot or halt the master Routing Engines on all T1600 routers. To reboot a specific component, issue the **request system reboot** command with the **all-lcc**, **lcc**, or **sfc** option.

```
user@host> request system reboot ?
Possible completions:
  <[Enter]>            Execute this command
  all-chassis          Reboot all chassis
  all-lcc              Reboot all LCC chassis
  at                   Time at which to perform the operation
  in                   Number of minutes to delay before operation
  lcc                  Reboot specific LCC (0..3)
  media                Boot media for next boot
  message              Message to display to all users
  other-routing-engine  Reboot the other Routing Engine
  sfc                  Reboot SFC (0..0)
  |                    Pipe through a command
```

```
user@host> request system reboot
Reboot the system ? [yes,no] (no) yes
Rebooting lcc0-re0
Rebooting lcc1-re0
```

Similarly, to halt a specific component in a routing matrix, issue the **request system halt** command with the **all-lcc**, **lcc**, or **sfc** option.

CAUTION: Before entering this command, you must have access to the TX Matrix Plus console port and the console ports of all of the LCCs in order to bring up the Routing Engines.

```
user@host> request system halt ?
Possible completions:
  <[Enter]>            Execute this command
  all-chassis          Halt all chassis
  all-lcc              Halt all LCC chassis
  at                   Time at which to perform the operation
  both-routing-engines  Halt both Routing Engines
  in                   Number of minutes to delay before operation
  lcc                  Halt specific LCC (0..3)
  media                Boot media for next boot
  message              Message to display to all users
  other-routing-engine  Halt other Routing Engine
  sfc                  Halt SFC (0..0)
  |                    Pipe through a command
```

Issuing the **request system halt both-routing-engines** command on a TX Matrix Plus router halts both Routing Engines in the TX Matrix Plus router and both Routing Engines in all T1600 routers in the routing matrix. To reboot a Routing Engine that has been halted, you must connect through the console. For more information about system commands, see the *Junos OS System Basics and Services Command Reference*.

Related Documentation

- Routing Matrix with a TX Matrix Plus Router Solutions Page
- Overview of a Routing Matrix with a TX Matrix Plus Router on page 3
- Roadmap for Configuring the Routing Matrix on page 15
- Example Configuration for the Routing Matrix on page 33
- Upgrading the Junos OS on the Routing Matrix on page 61

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