JUNOS Feature Guides

Routing Matrix Feature Guide

Release 9.4

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Chapter 1

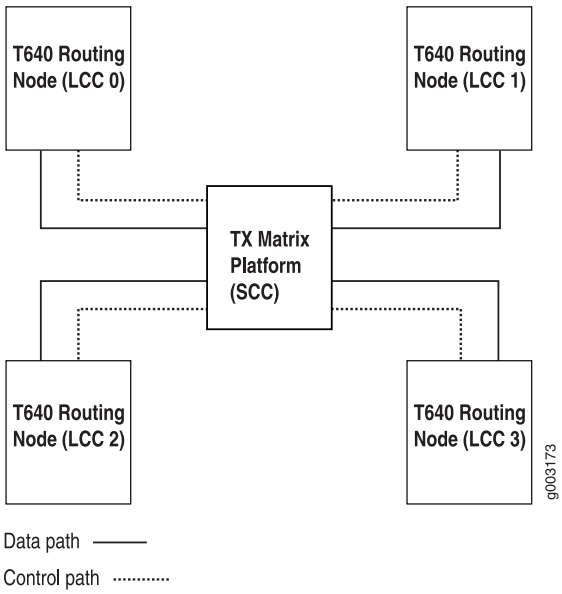
Routing Matrix Concepts and Reference Material

Overview of the Routing Matrix

The routing matrix is the first multichassis product from Juniper Networks. The T640 and T320 routing platforms were the first core routers that provided scalable bandwidth and intelligent networking features with a capacity of 80 to 640 gigabits per second (Gbps) of throughput. A key part of the T-series design was the ability to scale individual T640 routing nodes to 2.5 terabits of bandwidth by combining them in a multichassis configuration. Such scalability is now available with the routing matrix.

The physical system of a routing matrix consists of one TX Matrix platform and from one to four T640 routing nodes, as shown in Figure 1 on page 4. A key element of the routing matrix design is the ability to migrate existing T640 routing nodes and connect them with the TX Matrix platform through fiber-optic cables and Switch Interface Boards (SIBs).

Figure 1: Routing Matrix Architecture



The TX Matrix platform connection between the T640 routing nodes 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.

The routing matrix appears as a single router to the operator and utilizes the existing JUNOS command-line interface (CLI) for configuration and management. To manage this multichassis system, some enhancements have been made to the CLI that allow you to select the amount of output you wish to receive when you issue operational commands. You can specify the entire routing matrix, the TX Matrix platform, a specific T640 routing node and its Flexible PIC Concentrators (FPCs), or a combination thereof.

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).

Identifying Routing Matrix Components

A routing matrix contains two types of chassis:

- TX Matrix platform—

  There is only one TX Matrix platform per routing matrix. It is referred to as the switch-card chassis (scc) in the JUNOS CLI.

- T640 routing nodes—

  There can be one to four T640 routing nodes in a routing matrix. These are referred to as line-card chassis 0 through 3 (lcc0–lcc3) in the JUNOS CLI. The

T640 routing node number is set by the hardware. See the *TX Matrix Platform Hardware Guide* for further information on installing and connecting the hardware.

Viewing the Routing Matrix as a Single Routing Platform

Even though a routing matrix can be comprised of five separate physical components (a TX Matrix platform and up to four T640 routing nodes), it is best if you consider a routing matrix as a single routing platform. When you issue configuration and operational commands on the TX Matrix platform, your view of the routing matrix shows a single routing device with a high number of FPCs and PICs. For a detailed discussion of FPC numbering in a routing matrix, see "Routing Matrix FPC Numbering" on page 13.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- System Requirements for the Routing Matrix on page 6
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Routing Matrix FPC Numbering

A routing matrix can contain up to four T640 routing nodes, and each T640 routing node can contain up to eight FPCs (numbered 0 through 7). Therefore, the routing matrix as a whole can consist of up to 32 FPCs (numbered 0 through 31).

Each T640 routing node is assigned a number (LCCs 0 through 3) that depends upon the hardware setup and connectivity to the TX Matrix platform. Table 1 on page 5 shows the basic correspondence between the FPC hardware slot numbers in T640 routing nodes and the FPC assignments recognized by a routing matrix.

Table 1: FPC Correspondence Between T640 Routing Nodes and the Routing Matrix

T640 Routing Node	T640 FPC Range	Routing Matrix FPC Range
LCC 0	0–7	0–7
LCC 1	0–7	8–15
LCC 2	0–7	16–23
LCC 3	0–7	24–31

To easily convert FPC numbers in the T640 routing nodes to the correct FPC number in a routing matrix, 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 platform in your routing matrix.

Table 2: T640 to Routing Matrix FPC Conversion Chart

FPC Numbering	T640 Routing Nodes							
	LCC 0							
T640 FPC Slots	0	1	2	3	4	5	6	7
Routing Matrix FPC Slots Equivalent	0	1	2	3	4	5	6	7
	LCC 1							
T640 FPC Slots	0	1	2	3	4	5	6	7
Routing Matrix FPC Slots Equivalent	8	9	10	11	12	13	14	15
	LCC 2							
T640 FPC Slots	0	1	2	3	4	5	6	7
Routing Matrix FPC Slots Equivalent	16	17	18	19	20	21	22	23
	LCC 3							
T640 FPC Slots	0	1	2	3	4	5	6	7
Routing Matrix FPC Slots Equivalent	24	25	26	27	28	29	30	31

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Adjusting the Configuration to Accommodate Increased FPC Numbers on page 13
- Overview of the Routing Matrix on page 3
- Example: Routing Matrix Configuration on page 28

System Requirements for the Routing Matrix

To implement the TX Matrix platform, your system must meet these minimum requirements:

- JUNOS Release 7.0 or later
- One TX Matrix platform
- Two Juniper Networks T640 routing nodes
- Physical Interface Cards (PICs) of your choice (To view a list of supported PICs, see the *T640 Routing Node PIC Guide*)

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
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Terms and Acronyms for the Routing Matrix

L

line-card chassis (LCC) A T640 routing node installed in a routing matrix.

R

routing matrix A high capacity, multichassis routing platform that combines multiple T640 routing nodes with a TX Matrix platform switch fabric.

S

Switch Interface Board (SIB) On T640 routing nodes and the TX Matrix platform, a switch fabric plane component that forwards packets from a source Packet Forwarding Engine to a destination Packet Forwarding Engine in a routing matrix.

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

T

TX Matrix platform A high-speed centralized switch fabric that connects multiple T640 routing nodes in a routing matrix.

Chapter 2

Configuring a Routing Matrix

Roadmap to Configuring a Routing Matrix

When you configure the Routing Matrix, you should do some or all of the following:

- You must connect to the Routing Engines of the routing matrix. For information on how to do this, see "Connecting to a Routing Matrix" on page 10.
- You must configure groups that support the components of the routing matrix. Groups offer a simple way to establish hostnames, management interfaces, and default routes. For more information on how to do this, see "Configuring Groups to Support Routing Matrix Components" on page 12.
- You can adjust the configuration to accommodate the number of FPCs installed on the routing matrix. For information on FPC numbering, see "Routing Matrix FPC Numbering" on page 13. For information on configuring the routing matrix to accommodate FPCs, see "Adjusting the Configuration to Accommodate Increased FPC Numbers" on page 13.
- You can configure protocols and other features on the routing matrix. Other than the expanded range of FPC numbers for interfaces and the requirement to create groups for the T640 routing nodes, you can configure protocols in exactly the same manner as you would for other Juniper Networks routing platforms.

- For T640 routing nodes, you can configure PIC-specific features, create an alarm for nodes that do not come online, and take a node offline. For more information, see “Option: Configuring Chassis-Specific Statements” on page 14.
- As with every JUNOS routing platform, you must commit configurations on the routing matrix before they take effect. For information on how to do this, see “Committing Configurations on a Routing Matrix” on page 15.
- When you upgrade the software on the routing matrix, the new image is loaded on the TX Matrix and distributed to all T640 routing nodes. For more information, see “Upgrading the Software for a Routing Matrix” on page 16.
- For information about managing system processes in the routing matrix, see “Managing System Processes in the Routing Matrix” on page 19.
- For information about rebooting the routing matrix or halting routing matrix software components, see “Rebooting and Halting Routing Matrix Components” on page 20.
- For information about enabling or temporarily disabling routing matrix hardware components, see “Enabling and Disabling Specific Routing Matrix Hardware Components” on page 21.
- For information about managing files on the routing matrix, see “Managing Files on Routing Engines in a Routing Matrix” on page 24.
- For information about commonly used commands for the routing matrix, see “Miscellaneous Commands for a Routing Matrix” on page 25.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
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Connecting to a Routing Matrix

The TX Matrix platform and every T640 routing node can each be configured with two Routing Engines to provide redundancy and graceful Routing Engine switchover capabilities. You can connect to each Routing Engine in the following ways:

- Console/AUX—Asynchronous access via the console and auxiliary ports on the TX Matrix platform or T640 routing node Connector Interface Panel (CIP).
- Management Ethernet—Telnet access via the Fast Ethernet ports on the TX Matrix platform or T640 routing node CIPs.
- CLI login from one Routing Engine to another—All Routing Engines in the routing matrix are connected to their respective control boards, which in turn are connected to the CIP on the TX Matrix platform (see the *TX Matrix Platform Hardware Guide* for more details). After you log in to one Routing Engine, you can connect to another Routing Engine as follows:

```
user@router> request routing-engine login ?
```

```
Possible completions:
  backup               Log in to backup RE
  lcc                  Log in to 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

user@router>  request routing-engine login lcc ?
Possible completions:
  <lcc>                Log in to LCC (0..3)

user@router>  request routing-engine login lcc 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
```

NOTE: Because the routing matrix appears as a single routing platform, we recommend that you access the master Routing Engine of the TX Matrix platform to perform all configuration tasks for the routing matrix. Under normal operating conditions, you do not need to access or configure the T640 routing nodes directly. If you access a Routing Engine on a T640 routing node, the following warning is displayed:

```
user@router> request routing-engine login lcc 0 re0

--- JUNOS 7.0-20040625.1 built 2004-06-25 19:51:38 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 Card Chassis (SCC).
warning: Use 'request routing-engine login scc' to log into the SCC.
```

To manage the backup Routing Engines on all components (for example, to upgrade JUNOS software), log in to the TX Matrix platform backup Routing Engine and perform the necessary operations.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
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Configuring Groups to Support Routing Matrix Components

For easy maintenance of the chassis in a routing matrix, you can add a configuration group for each Routing Engine in the T640 routing nodes and TX Matrix platform. The configuration groups added to the TX Matrix platform configuration offer a simple way to establish hostnames, management interfaces, and default routes. In the example below, groups re0 and re1 refer to the TX Matrix platform Routing Engines, while groups lcc0-re0 and lcc0-re1 refer to the Routing Engines on T640 routing node LCC0. To configure groups for the TX Matrix platform, include the re0 and re1 statements at the [edit groups] hierarchy level. To configure groups for the T640 routing nodes, include the lcc*number*-re0 and lcc*number*-re1 statements at the [edit groups] hierarchy level.

```
[edit]
groups {
    re0 {
        system {
            host-name hostname-scc-re0;
            backup-router ip-address;
        }
        interfaces {
            fxp0 {
                unit 0 {
                    family inet {
                        address ip-address;
                    }
                }
            }
        }
    }
    re1 {
        system {
            host-name hostname-scc-re1;
            backup-router ip-address;
        }
        interfaces {
            fxp0 {
                unit 0 {
                    family inet {
                        address ip-address;
                    }
                }
            }
        }
    }
    lcc0-re0 {
        system {
            host-name hostname-lcc0-re0;
            backup-router ip-address;
        }
        interfaces {
            fxp0 {
                unit 0 {
                    family inet {
                        address ip-address;
```

```
            }
          }
        }
      }
    }
    lcc0-re1 {
      system {
        host-name hostname-lcc0-re1;
        backup-router ip-address;
      }
      interfaces {
        fxp0 {
          unit 0 {
            family inet {
              address ip-address;
            }
          }
        }
      }
    }
  }
  apply-groups [ re0 re1 lcc0-re0 lcc0-re1 ];
```

Note that apply groups can be nested. For example, any configuration statements that are common to lcc0-re0 and lcc0-re1 can be put into a separate 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 configuration groups, see the *JUNOS CLI User Guide*.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
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Adjusting the Configuration to Accommodate Increased FPC Numbers

You must adjust the routing matrix configuration to accommodate increased FPC numbers.

For example, if you have a Gigabit Ethernet interface installed in FPC slot 7, PIC slot 0, port 0 of T640 routing node LCC 3, you can configure this interface on the TX Matrix platform by including the ge-31/0/0 statement at the [edit interfaces] hierarchy level.

```
[edit]
interfaces {
  ge-31/0/0 {
    unit 0 {
      family inet {
        address ip-address;
      }
```

```
        }
    }
}
```

For more information about physically connecting T640 routing nodes and a TX Matrix platform together in a routing matrix, see the *TX Matrix Platform Hardware Guide*. For more information about the interface-naming conventions for a routing matrix, see the *JUNOS Network Interfaces Configuration Guide*.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Routing Matrix FPC Numbering on page 13
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Configuring Protocols and Other Features

Other than the expanded range of FPC numbers for interfaces and the requirement to create groups for the T640 routing nodes, the configuration of a routing matrix is exactly the same as for all other Juniper Networks routing platforms. 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 on configuring JUNOS-based routing platforms, see the JUNOS configuration guides.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
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Option: Configuring Chassis-Specific Statements

You can configure PIC-specific features, such as SONET/SDH framing, on specific T640 routing nodes within the routing matrix. To do so, include the lcc *lcc-number* statement at the [edit chassis] hierarchy level and specify the chassis-specific feature to configure.

```
[edit]
chassis {
    lcc lcc-number {
        fpc slot-number { # Use the T640 routing node FPC hardware slot number.
            pic pic-number {
                ...
            }
        }
    }
```

```
}
```

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 T640 routing node chassis. Do not use the routing matrix-based FPC number shown in Table 2 on page 6.

By default, the JUNOS software allows all T640 routing nodes in the routing matrix to come online. Optionally, you can configure the TX Matrix platform to generate an alarm if the T640 routing nodes in the routing matrix do not come online. To configure, include the online-expected statement at the [edit chassis lcc *number*] hierarchy level on the TX Matrix platform.

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

If you do not want a T640 routing node to be part of the routing matrix, you can configure it to be offline. This is useful when you are performing maintenance on a T640 routing node. To configure a T640 routing node so that it is offline, include the offline statement at the [edit chassis lcc *number*] hierarchy level.

```
[edit chassis lcc number]
offline;
```

When you are ready to bring the T640 routing node back online, delete the offline configuration statement at the [edit chassis lcc *number*] hierarchy level.

NOTE: If you do not configure the online-expected or offline statement, any T640 routing node that is part of the routing matrix is allowed to come online. However, if a T640 routing node does not come online, the TX Matrix platform does not generate an alarm.

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

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Committing Configurations on a Routing Matrix

You must commit configuration changes for a routing matrix on the TX Matrix platform rather than on the individual T640 routing nodes. If you commit a configuration directly on a T640 routing node within a routing matrix, the configuration is not distributed to the TX Matrix platform or the other T640 routing nodes in the routing matrix. Conversely, all configuration changes you commit on

the TX Matrix platform are distributed to all the T640 routing nodes in the routing matrix and override any changes committed directly on a T640 routing node.

There are two main ways to commit configurations on a TX Matrix platform. When you issue the commit synchronize command, you synchronize the configurations of both the primary and backup Routing Engines on the TX Matrix platform and the primary and backup Routing Engines of all the associated T640 routing nodes.

```
user@router# commit synchronize
scc-re0:
configuration check succeeds
lcc0-re1:
commit complete
lcc0-re0:
commit complete
lcc1-re1:
commit complete
lcc1-re0:
commit complete
scc-re1:
commit complete
scc-re0:
commit complete
```

If you issue the basic form of the commit command on the TX Matrix platform, this action updates only the master Routing Engines of the TX Matrix platform and the T640 routing nodes in the routing matrix.

```
user@router# commit
scc-re0:
configuration check succeeds
lcc0-re0:
commit complete
lcc1-re0:
commit complete
scc-re0:
commit complete
```

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Upgrading the Software for a Routing Matrix

By default, when you upgrade software on the TX Matrix platform, the new image is loaded onto the TX Matrix platform and distributed to all T640 routing nodes in the routing matrix. To upgrade software for the entire routing matrix, issue the request system software add command:

```
user@router> request system software add
jbundle-7.0-20040705.0-domestic-signed.tgz
user@router> ...test/jinstall-9.1-daily-domestic.tgz reboot no-validate
```

```
Fetching package...
Pushing bundle to lcc0-re0
Pushing bundle to lcc2-re0

lcc0-re0:
Installing package '/var/tmp/mchassis-install.tgz' ...
Verified jinstall-9.1-20081002.0-domestic.tgz signed by PackageProduction_9_1_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_1_0

WARNING:     This package will load JUNOS 9.1-20081002.0 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-9.1-20081002.0-domestic-signed.tgz
...
Saving state for rollback ...

lcc2-re0:
Installing package '/var/tmp/mchassis-install.tgz' ...
Verified jinstall-9.1-20081002.0-domestic.tgz signed by PackageProduction_9_1_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_1_0

WARNING:     This package will load JUNOS 9.1-20081002.0 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-9.1-20081002.0-domestic-signed.tgz
```

```
...
Saving state for rollback ...

scc-re0:
Installing package '/var/tmp/mchassis-install.tgz' ...
Verified jinstall-9.1-20081002.0-domestic.tgz signed by PackageProduction_9_1_0
Adding jinstall...
Verified manifest signed by PackageProduction_9_1_0

WARNING:     This package will load JUNOS 9.1-20081002.0 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-9.1-20081002.0-domestic-signed.tgz
...
Saving state for rollback ...

Rebooting lcc0-re0

Rebooting lcc2-re0

Rebooting scc-re0

{master}
regress@anatole>

*** FINAL System shutdown message from user@router ***
System going down IMMEDIATELY
```

When you complete the software installation and reboot the TX Matrix platform, all T640 routing nodes also reboot and all devices in the routing matrix execute the new software.

To upgrade the backup Routing Engines, log in to the backup Routing Engine on the TX Matrix platform before you issue the request system software add command.

You can also update the software on the TX Matrix platform only or on a specific T640 routing node as needed by including the lcc or scc option.

NOTE: The master Routing Engines in all components of a routing matrix must run the same version of software in order to operate. As a result, we recommend that you upgrade all components simultaneously and upgrade individual components only in rare cases.

NOTE: We recommend you run the same JUNOS software release on the master and backup Routing Engines on all components of a routing matrix. If you elect to run different JUNOS software releases on the Routing Engines, a change in Routing Engine mastership can cause one or all T640 routing nodes to be logically disconnected from the TX Matrix platform. It is also a best practice to make sure that all master Routing Engines are re0 and all backup Routing Engines are re1 (or vice versa).

NOTE: You must use the same Routing Engine model in all LCC and SCC components of a routing matrix. For example, a routing matrix with an SCC using an RE-A-2000 and an LCC using an RE-1600 is not supported.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Managing System Processes in the Routing Matrix

Some system processes in a routing matrix run on the TX Matrix platform and some run on the T640 routing nodes. For example, the routing protocol process (rpd) runs exclusively on the TX Matrix platform. To restart the routing protocol process for the entire routing matrix, issue the restart routing command on the TX Matrix platform.

```
user@router> 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 platform and the T640 routing nodes. To restart the chassis process that manages PICs, FPCs, and other hardware components, issue the restart chassis-control command on the TX Matrix platform and select the all, all-lcc, or lcc *lcc-number* option.

```
user@router> restart chassis-control ?
```

```
Possible completions:
  <[Enter]>            Execute this command
   all                  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 chassis (0..3)
  soft                 Soft reset (SIGHUP) the process
  |                    Pipe through a command
```

To restart the Simple Network Management Protocol (SNMP) process, issue the restart snmp command on the TX Matrix platform and select the all, all-lcc, or lcc *lcc-number* option.

```
user@router> restart snmp ?
Possible completions:
  <[Enter]>            Execute this command
   all                  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 chassis (0..3)
  soft                 Soft reset (SIGHUP) the process
  |                    Pipe through a command
```

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Rebooting and Halting Routing Matrix Components

You can control which component in a routing matrix is rebooted or halted. If you reboot or halt the TX Matrix platform, by default you also reboot or halt the master Routing Engines on all T640 routing nodes. To reboot a specific component, issue the request system reboot command with the all-lcc, lcc, or scc option.

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

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

```
user@router> request system halt ?
Possible completions:
  <[Enter]>            Execute this command
   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 LCC (0..3)
  media                Boot media for next boot
  message              Message to display to all users
   scc                  Halt SCC
  |                    Pipe through a command
```

Issuing the request system halt both-routing-engines command on a TX Matrix platform halts both Routing Engines in the TX Matrix platform and both Routing Engines in all T640 routing nodes 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 System Basics and Services Command Reference*.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Enabling and Disabling Specific Routing Matrix Hardware Components

You can temporarily disable certain hardware components (such as FPCs, PICs, and SIBs) that belong to the TX Matrix platform and T640 routing nodes in the routing matrix. To do so, issue the appropriate request chassis command and include the lcc or scc 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 T640 routing node and specify its corresponding LCC number.

```
user@router> request chassis ?
Possible completions:
  cb                   Change Control Board 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@router> request chassis fpc ?
Possible completions:
  lcc                  Slot number of LCC that houses FPC (0..3)
  offline              Take FPC offline
  online               Bring FPC online
  restart              Restart FPC
  slot                 FPC slot number (0..31)

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

user@router> request chassis sib ?
Possible completions:
  lcc                  Change Switch Interface Board status (0..3)
  offline              Take SIB offline
  online               Bring SIB online
  scc                  Change Switch Interface Board status
  slot                 SIB slot number (0..4)
  start-receiver       Start SIB optical receiver (0..3)
  stop-receiver        Stop SIB optical receiver (0..3)
```

The routing matrix extends the concept of taking specific hardware components offline or online to include an entire T640 routing node in a routing matrix. To enable or disable a T640 routing node in a routing matrix, issue the request chassis lcc slot *lcc-number* (offline | online) command.

```
user@router> 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 T640 routing node 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@router> 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 T640 routing node LCC2 (the equivalent of routing matrix slot 19).

```
user@router> 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@router> 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@router> 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 T640 routing node to routing matrix FPC slot numbers, see “Routing Matrix FPC Numbering” on page 13.

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Managing Files on Routing Engines in a Routing Matrix

You can manage files on all Routing Engines in a routing matrix. For example, you can copy a file from the master Routing Engine in the TX Matrix platform to the master Routing Engine on a T640 routing node.

```
user@router> file list lcc0-re0:
/var/home/user/lcc0-re0: No such file or directory

user@router> file list
/var/home/user/:
.ssh/
fred.txt

user@host> file copy fred.txt lcc0-re0:fred.txt

user@host> file list lcc0-re0:
lcc0-re0:
--------------------------------------------------------------------------
/var/home/user/:
.ssh/
fred.txt
```

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Miscellaneous Commands for a Routing Matrix

There are a variety of other useful commands you can use when maintaining a routing matrix.

- To display the location of routing matrix components and convert FPCs from T640 routing node local numbering to routing matrix global numbering, issue the show chassis location fpc command on the TX Matrix platform:

```
user@router> show chassis location fpc

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

- To check the status of the SIB connection between the TX Matrix platform and T640 routing nodes, issue the show chassis fabric topology command on the TX Matrix platform. All values for each available T640 routing node (LCC) should be in the UP state. In the following excerpt of output for this command, a routing matrix that contains only LCCs 0 and 2 shows only these two T640 routing nodes as being UP:

```
LCC0_SIB-L0_F0,03->SIB-S0_F0,00 UP
LCC1_SIB-L0_F0,03->SIB-S0_F0,01 RESET
LCC2_SIB-L0_F0,03->SIB-S0_F0,02 UP
LCC3_SIB-L0_F0,03->SIB-S0_F0,03 RESET
```

- To verify that the Ethernet links between the TX Matrix platform and the T640 routing node control boards are operational, issue the show chassis ethernet-switch command on the TX Matrix platform:

```
user@router> show chassis ethernet-switch

scc-re0:
--------------------------------------------------------------------------
Link is good on FE port 4 connected to device: LCC0
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 6 connected to device: LCC2
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 8 connected to device: SPMB
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on GE port 13 connected to device: Other RE
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Enabled
lcc0-re0:
```

```
------------------------------------------------------------------------------
Link is good on FE port 1 connected to device: FPC1
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 2 connected to device: FPC2
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 3 connected to device: FPC3
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 8 connected to device: SPMB
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 10 connected to device: SCC
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on GE port 13 connected to device: Other RE
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
lcc2-re0:
------------------------------------------------------------------------------
Link is good on FE port 0 connected to device: FPC0
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 1 connected to device: FPC1
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 3 connected to device: FPC3
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 8 connected to device: SPMB
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on FE port 10 connected to device: SCC
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
Link is good on GE port 13 connected to device: Other RE
  Speed is 100Mb
  Duplex is full
  Autonegotiate is Enabled
```

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- Example: Routing Matrix Configuration on page 28

Chapter 3

Routing Matrix Configuration Examples

Merging Examples

To merge a full example, follow these steps:

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

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

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

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

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

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

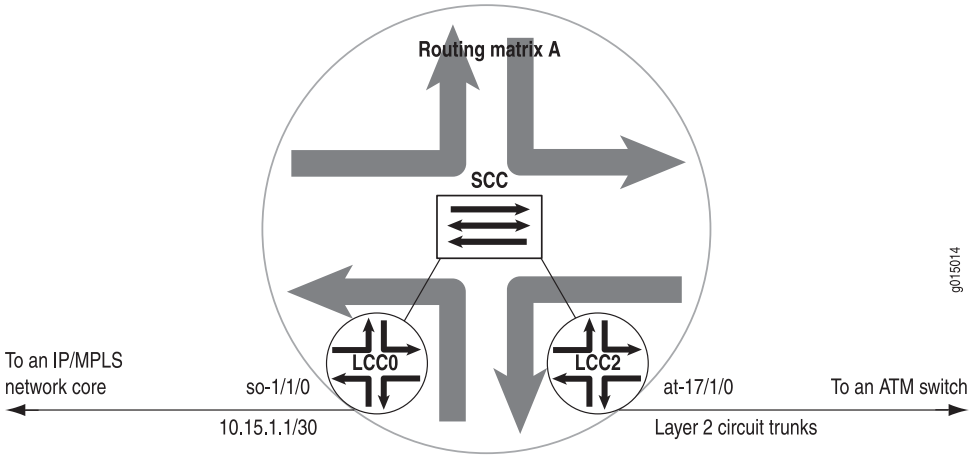
Related Topics For more information about the load command, see the *JUNOS CLI User Guide*.

Example: Routing Matrix Configuration

Routing Matrix Topology

Figure 2 on page 29 shows Routing Matrix A, a basic routing matrix consisting of a TX Matrix platform and two T640 routing nodes. The TX Matrix platform is named SCC and the nodes are named LCC0 and LCC2. The routing matrix is acting as a provider edge (PE) router in a Layer 2 circuit network. SONET interface so-1/1/0 in node LCC0 connects to an IP/MPLS core network, and Asynchronous Transfer Mode 2 (ATM2) intelligent queuing (IQ) interface at-17/1/0 in node LCC2 runs Layer 2 circuit trunk mode to connect to an ATM switch. (For more information about Layer 2 see the *JUNOS VPNs Configuration Guide*.)

Figure 2: Routing Matrix Topology Diagram



Some key considerations for this configuration are as follows:

- Treat the routing matrix like a single routing platform and execute all configuration and operational commands on the TX Matrix platform SCC.
- Create configuration groups for each Routing Engine in the routing matrix by using groups re0, re1, lcc0-re0, lcc2-re0, lcc0-re1, and lcc2-re1. In the groups, configure hostnames, default routes, and management 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.

TX Matrix Platform—SCC

```
[edit]
groups { # You can create special configuration groups in a routing matrix.
   re0 { # This group corresponds to the master Routing Engine
      system { # on the TX Matrix platform.
         host-name scc;
         backup-router 192.168.17.254;
      }
      interfaces {
         fxp0 {
            unit 0 {
               family inet {
                  address 192.168.77.158/21;
               }
            }
         }
      }
   }
```

```
re1 { # This group corresponds to the backup Routing Engine
    system { # on the TX Matrix platform.
        host-name scc1;
        backup-router 192.168.17.254;
    }
    interfaces {
        fxp0 {
            unit 0 {
                family inet {
                    address 192.168.77.168/21;
                }
            }
        }
    }
}
lcc0-re0 { # This group corresponds to the master Routing Engine
    system { # on the T640 routing node LCC0.
        host-name lcc0;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
    }
    interfaces {
        fxp0 {
            unit 0 {
                family inet {
                    address 192.168.77.157/21;
                }
            }
        }
    }
}
lcc2-re0 { # This group corresponds to the master Routing Engine
    system { # on the T640 routing node LCC2.
        host-name lcc2;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
    }
    interfaces {
        fxp0 {
            unit 0 {
                family inet {
                    address 192.168.77.159/21;
                }
            }
        }
    }
}
lcc0-re1 { # This group corresponds to the backup Routing Engine
    system { # on the T640 routing node LCC0.
        host-name lcc0-1;
        backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
    }
    interfaces {
        fxp0 {
            unit 0 {
                family inet {
                    address 192.168.77.169/21;
                }
```

```
            }
          }
        }
    }
    lcc2-re1 { # This group corresponds to the backup Routing Engine
        system { # on the T640 routing node LCC2.
            host-name lcc2-1;
            backup-router 192.168.17.254 destination [10.0.0.0/8 192.168.0.0/16];
        }
        interfaces {
            fxp0 {
                unit 0 {
                    family inet {
                        address 192.168.77.192/21;
                    }
                }
            }
        }
    }
}
apply-groups [ re0 re1 lcc0-re1 lcc2-re1 lcc0-re0 lcc2-re0 ];
system {
    syslog {
        file messages {
            any any;
        }
    }
}
chassis { # You must apply chassis commands to a specific T640 routing node.
    lcc 2 { # Specify the T640 routing node 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 T640 routing node 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 T640 routing node 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 T640 routing node.
                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 Your Work

To verify proper operation of the routing matrix, use the following commands on the TX Matrix platform:

- show chassis alarms < lcc *lcc-number* | scc >
- show chassis craft-interface < lcc *lcc-number* | scc >
- show chassis ethernet-switch < lcc *lcc-number* | scc >
- show chassis hardware < lcc *lcc-number* | scc >
- show chassis fpc < lcc *lcc-number* >
- show chassis lccs
- show chassis location < fpc | interface | lcc *lcc-number* | scc >
- show chassis routing-engine < lcc *lcc-number* | scc >
- show chassis sibs < lcc *lcc-number* | scc >
- show interfaces terse
- show route summary
- show system uptime < all-lcc | lcc *lcc-number* | scc >
- show version < all-lcc | lcc *lcc-number* | scc >

In general, when you issue standard operational commands on a TX Matrix platform, you receive output from the primary Routing Engines of all components in the routing matrix. To limit the output of information for a specific T640 routing node within the routing matrix, include the lcc *lcc-number* option. To display information for the TX Matrix platform only, include the scc option. To display information for all T640 routing nodes 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 show the output of select operational commands used with the configuration example:

- Displaying the Software Version on page 35
- Displaying Interfaces on page 38
- Displaying Routes on page 39
- Displaying Alarms and System Uptime on page 39
- Displaying Chassis Hardware and Status on page 42

Displaying the Software Version

The show version command provides an excellent example of how you can select output for various components of the routing matrix. If the TX Matrix platform (SCC) or a T640 routing node (LCC) is not specified in the command, then the command displays output for all components.

```
user@router> show version ?
Possible completions:
  <[Enter]>            Execute this command
  all-lcc              Show software version on all LCC chassis
  brief                Display brief output
  detail               Display detailed output
  lcc                  Show software version on specific LCC (0..3)
  scc                  Show software version on the SCC
  |                    Pipe through a command
```

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

```
user@router> show version
scc-re0:
--------------------------------------------------------------------------
Hostname: scc
Model: TX Matrix
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
lcc0-re0:
--------------------------------------------------------------------------
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
lcc2-re0:
--------------------------------------------------------------------------
Hostname: lcc2
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

To display the software version for the TX Matrix platform only, include the scc option:

```
user@router> show version scc
Hostname: scc
Model: TX Matrix
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
```

To display the software version for a specific T640 routing node, include the lcc option:

```
user@router> show version lcc 0
lcc0-re0:
--------------------------------------------------------------------------
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

To display the output for all T640 routing nodes, include the all-lcc option:

```
user@router> show version all-lcc
lcc0-re0:
--------------------------------------------------------------------------
Hostname: lcc0
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
lcc2-re0:
--------------------------------------------------------------------------
Hostname: lcc2
Model: t640
JUNOS Base OS boot [7.0-20040630.0]
JUNOS Base OS Software Suite [7.0-20040629.0]
JUNOS Kernel Software Suite [7.0-20040630.0]
JUNOS Packet Forwarding Engine Support (T-Series) [7.0-20040630.0]
JUNOS Routing Software Suite [7.0-20040630.0]
JUNOS Online Documentation [7.0-20040630.0]
JUNOS Crypto Software Suite [7.0-20040630.0]
JUNOS Support Tools Package [7.0-20040630.0]
```

Displaying Interfaces

Although individual FPCs are installed in each of the T640 routing nodes, the routing matrix is designed to collect interface information centrally at the TX Matrix platform. To display available interfaces in the routing matrix, issue a show interfaces command on the TX Matrix platform:

```
user@router> 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 Routes

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

```
user@router> 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:

```
user@router> show chassis alarms
scc-re0:
--------------------------------------------------------------------------
2 alarms currently active
Alarm time               Class  Description
2004-09-27 08:50:57 PDT  Major  LCC 2 Major Errors
2004-09-27 08:50:42 PDT  Minor  LCC 0 Minor Errors
lcc0-re0:
--------------------------------------------------------------------------
1 alarms currently active
Alarm time               Class  Description
2004-09-27 08:50:42 PDT  Minor  PEM 1 Absent
lcc2-re0:
--------------------------------------------------------------------------
1 alarms currently active
Alarm time               Class  Description
2004-09-27 08:50:57 PDT  Major  PEM 1 Not OK
```

To display the craft interface display for all routing matrix components, issue the show chassis craft-interface command:

```
user@router> show chassis craft-interface
scc-re0:
--------------------------------------------------------------------------------
FPM Display contents:
    +--------------------+
    |scc           |
    |2 Alarms active     |
    |R: LCC 2 Major Error|
    |Y: LCC 0 Minor Error|
    +--------------------|
Front Panel System LEDs:
Routing Engine    0    1
-------------------------
OK                *    *
Fail              .    .
Master            *    .
Front Panel Alarm Indicators:
-----------------------------
Red LED      *
Yellow LED   *
Major relay  *
Minor relay  *
CB LEDs:
  CB   0   1
--------------
Amber  .   .
Green  *   *
Blue   *   .
SIB LEDs:
  SIB  0   1   2   3   4
-------------------------
Fail   .   .   .   .   .
OK     *   *   *   *   *
Active .   *   *   *   *
lcc0-re0:
--------------------------------------------------------------------------------
FPM Display contents:
    +--------------------+
    |lcc0            |
    |1 Alarm active      |
    |Y: 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:
    +--------------------+
    |lcc2          |
    |1 Alarm 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  *   *   *   *   *
```

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

```
user@router> show system uptime
scc-re0:
--------------------------------------------------------------------------
Current time: 2004-09-27 09:44:55 PDT
System booted: 2004-09-27 08:49:31 PDT (00:55:24 ago)
Protocols started: 2004-09-27 08:50:27 PDT (00:54:28 ago)
Last configured: 2004-09-27 09:16:08 PDT (00:28:47 ago) by regress
9:44AM PDT up 55 mins, 1 user, load averages: 0.00, 0.05, 0.06
lcc0-re0:
--------------------------------------------------------------------------
Current time: 2004-09-27 09:44:55 PDT
System booted: 2004-09-27 08:49:24 PDT (00:55:31 ago)
Last configured: 2004-09-27 09:16:06 PDT (00:28:49 ago) by regress
9:44AM PDT up 56 mins, 0 users, load averages: 0.00, 0.02, 0.00
lcc2-re0:
--------------------------------------------------------------------------
Current time: 2004-09-27 09:44:55 PDT
System booted: 2004-09-27 08:49:26 PDT (00:55:29 ago)
Last configured: 2004-09-27 09:16:06 PDT (00:28:49 ago) by regress
9:44AM PDT up 55 mins, 0 users, load averages: 0.02, 0.01, 0.00
```

Displaying Chassis Hardware and Status

To display the hardware inventory for a routing matrix, you can select output for the TX Matrix platform only, a specific T640 routing node, or all components. If a specific component (lcc or scc) is not specified as an option in the command, the default output displays information for the entire routing matrix.

```
user@router> show chassis hardware ?
Possible completions:
  <[Enter]>            Execute this command
  detail               Include RAM and disk information in output
  extensive            Display ID EEPROM information
  frus                 Display assembly IDs and extra PIC information
   lcc                  Display chassis-specific information (0..3)
  scc                  Display chassis-specific information
  |                    Pipe through a command
```

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

```
user@router> show chassis hardware
scc-re0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                                  TX Matrix
Midplane         REV 04   710-004396   RB0013            SCC Midplane
FPM GBUS
```

```
FPM Display      REV 04   710-004619   HS5953           SCC FPM
CIP 0            REV 01   710-010218   HS5726           SCC CIP
CIP 1            REV 01   710-010218   HV9163           SCC CIP
PEM 0            Rev 11   740-002595   pm18529          Power Entry Module
Routing Engine 0 REV 02   740-008883   212058900121     RE-4.0
Routing Engine 1 REV 03   740-008883   211123900258     RE-4.0
CB 0             REV 01   710-011709   HS5911           Control Board (CB-TX)
CB 1             REV 01   710-011709   HZ2163           Control Board (CB-TX)
SPMB 0           REV 09   710-003229   HT4129           T-series Switch CPU
SPMB 1           REV 09   710-003229   HT4174           T-series Switch CPU
SIB 0            REV 01   710-011223   HS0663           SIB-S8-F16 1/2
  B Board        REV 05   710-011225   HW1210           SIB-S8-F16 1/2 (B)
SIB 1            REV 01   710-005839   HW1160           SIB-S8-F16
  B Board        REV 01   710-005840   HW1213           SIB-S8-F16 (B)
SIB 2            REV 05   710-011223   HW1146           SIB-S8-F16 1/2
  B Board        REV 05   710-011225   JB8148           SIB-S8-F16 1/2 (B)
SIB 3            REV 05   710-011223   HW1218           SIB-S8-F16 1/2
  B Board        REV 05   710-011225   HW1214           SIB-S8-F16 1/2 (B)
SIB 4            REV 05   710-011223   HW1162           SIB-S8-F16 1/2
  B Board        REV 05   710-011225   HW1182           SIB-S8-F16 1/2 (B)
lcc0-re0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                65409            T640
Midplane         REV 03   710-005608   RA1395           T640 Backplane
FPM GBUS         REV 09   710-002901   RA2649           T640 FPM Board
FPM Display      REV 05   710-002897   RA2608           FPM Display
CIP              REV 06   710-002895   HS0753           T-series CIP
PEM 0            Rev 01   740-002595   MF16629          Power Entry Module
SCG 0            REV 11   710-003423   HS4313           T640 Sonet Clock Gen.
SCG 1            REV 11   710-003423   HR9161           T640 Sonet Clock Gen.
Routing Engine 0 REV 03   740-008883   211123900199     RE-4.0
Routing Engine 1 REV 03   740-008883   211123900248     RE-4.0
CB 0             REV 02   710-007655   HS5909           Control Board (CB-T)
CB 1             REV 02   710-007655   HS5910           Control Board (CB-T)
FPC 1            REV 07   710-007527   HR0716           FPC Type 2
  CPU            REV 15   710-001726   HS6048           FPC CPU
  PIC 0          REV 07   750-001900   AR3722           1x OC-48 SONET, SMSR
  PIC 1          REV 05   750-001900   AD3644           1x OC-48 SONET, SMSR
  PIC 3          REV 06   750-001900   HD7603           1x OC-48 SONET, SMSR
  MMB 1          REV 03   710-005555   HT5273           MMB-288mbit
  PPB 0          REV 04   710-003758   HR4249           PPB Type 2
  PPB 1          REV 04   710-003758   HR4257           PPB Type 2
FPC 2            REV 01   710-010233   HM4189           E-FPC Type 1
  CPU            REV 01   710-010169   HS9936           FPC CPU-Enhanced
  PIC 1          REV 03   750-005719   HL8326           1x OC-12 ATM-II IQ, MM
  PIC 2          REV 01   750-003141   AD9051           1x G/E, 1000 BASE-SX
  MMB 1          REV 01   710-008923   HR0848           MMB 3M 288-bit
FPC 3            REV 01   710-010154   HR0863           E-FPC Type 3
  CPU            REV 01   710-010169   HN3422           FPC CPU-Enhanced
  PIC 3          REV 01   750-009553   HP3576           4x OC-48 SONET
    SFP 0        REV 01   740-009030   P11H5N1          SFP-LR
    SFP 1        REV 01   740-009029   35D464P00060     SFP-IR
    SFP 3        REV 01   740-009030   P11H5LM          SFP-LR
  MMB 0          REV 01   710-010171   HR0821           MMB-288mbit
  MMB 1          REV 01   710-010171   HR0818           MMB-288mbit
SPMB 0           REV 09   710-003229   HT4177           T-series Switch CPU
SPMB 1           REV 09   710-003229   HT4176           T-series Switch CPU
SIB 0            REV 07   710-005781   HR5939           SIB-L8-F16
  B Board        REV 06   710-005782   HR5944           SIB-L8-F16 (B)
```

```
SIB 1            REV 02   710-005781   HZ2146           SIB-L8-F16
  B Board        REV 03   710-005782   HY4160           SIB-L8-F16 (B)
SIB 2            REV 07   710-005781   HR5925           SIB-L8-F16
  B Board        REV 03   710-005782   HY4161           SIB-L8-F16 (B)
SIB 3            REV 07   710-005781   HR5918           SIB-L8-F16
  B Board        REV 06   710-005782   HR5972           SIB-L8-F16 (B)
SIB 4            REV 07   710-005781   HR5935           SIB-L8-F16
  B Board        REV 06   710-005782   HR5969           SIB-L8-F16 (B)
lcc2-re0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                55609            T640
Midplane         REV 03   710-005608   RA1444           T640 Backplane
FPM GBUS         REV 09   710-002901   RA3309           T640 FPM Board
FPM Display      REV 05   710-002897   RA3273           FPM Display
CIP              REV 06   710-002895   HS0735           T-series CIP
PEM 0            Rev 11   740-002595   PM18568          Power Entry Module
PEM 1            Rev 11   740-002595   PM18572          Power Entry Module
SCG 0            REV 11   710-003423   HS9991           T640 Sonet Clock Gen.
Routing Engine 0 REV 03   740-008883   211123900183     RE-4.0
Routing Engine 1 REV 02   740-008883   212058900178     RE-4.0
CB 0             REV 02   710-007655   HS5913           Control Board (CB-T)
CB 1             REV 02   710-007655   HS5944           Control Board (CB-T)
FPC 0            REV 05   710-001721   HD5965           FPC Type 3
  CPU            REV 09   710-001726   AY4909           FPC CPU
  PIC 0          REV 04   750-009553   HV3648           4x OC-48 SONET
    SFP 0        REV 01   740-009029   P11JXWP          SFP-IR
    SFP 1        REV 01   740-008169   36D525P00154     UNKNOWN
    SFP 2        REV 01   740-009028   2353110          SFP-SR
    SFP 3        REV 01   740-008169   36D525P00159     UNKNOWN
  PIC 1          REV 02   750-009567   HX2875           1x 10GE(LAN),XENPAK
    SFP 0        REV 01   740-009898   USC202YW25       XENPAK-LR
  MMB 0          REV 03   710-004047   HE3427           MMB-288mbit
  MMB 1          REV 03   710-004047   HD5812           MMB-288mbit
  ICBM           REV 04   710-003384   HB1884           FPC ICBM
  PPB 0          REV 02   710-002845   HC0964           PPB Type 3
  PPB 1          REV 02   710-002845   HC0987           PPB Type 3
FPC 1            REV 02   710-002385   HC0618           FPC Type 2
  CPU            REV 06   710-001726   HA4724           FPC CPU
  PIC 0          REV 02   750-009066   HL9900           1x OC-48 SONET SFP
    SFP 0                 NON-JNPR     P11QS8W          SFP-LR
  PIC 1          REV 02   750-007219   AZ1339           2x OC-12 ATM-II IQ, MM
  PIC 2          REV 02   750-002510   AP7476           2x G/E, 1000 BASE-SX
  PIC 3          REV 05   750-001900   AD5738           1x OC-48 SONET, SMSR
  MMB 1          REV 03   710-004047   HD5829           MMB-288mbit
  ICBM           REV 04   710-003384   HC0386           FPC ICBM
  PPB 0          REV 02   710-003758   HC0904           PPB Type 2
  PPB 1          REV 02   710-003758   HC0898           PPB Type 2
FPC 3            REV 07   710-007529   HR3311           FPC Type 3
  CPU            REV 15   710-001726   HR2788           FPC CPU
  PIC 0          REV 10   750-004535   HT0545           1x OC-192 SM SR2
  PIC 1          REV 12   750-004535   HX2065           1x OC-192 SM SR2
  PIC 2          REV 01   750-004535   HC0241           1x OC-192 SM SR1
  PIC 3          REV 01   750-004535   HF6583           1x OC-192 SM SR1
  MMB 0          REV 03   710-005555   HR5642           MMB-288mbit
  MMB 1          REV 03   710-005555   HR5586           MMB-288mbit
  PPB 0          REV 04   710-002845   HT6719           PPB Type 3
  PPB 1          REV 04   710-002845   HM0206           PPB Type 3
SPMB 0           REV 09   710-003229   HR8685           T-series Switch CPU
SPMB 1           REV 09   710-003229   HR3730           T-series Switch CPU
```

```
SIB 0           REV 07   710-005781   HR5937           SIB-L8-F16
  B Board       REV 06   710-005782   HZ5288           SIB-L8-F16 (B)
SIB 1           REV 07   710-005781   HZ5279           SIB-L8-F16
  B Board       REV 06   710-005782   HR5951           SIB-L8-F16 (B)
SIB 2           REV 07   710-005781   HZ5276           SIB-L8-F16
  B Board       REV 06   710-005782   HR5950           SIB-L8-F16 (B)
SIB 3           REV 07   710-005781   HR5915           SIB-L8-F16
  B Board       REV 06   710-005782   HZ5285           SIB-L8-F16 (B)
SIB 4           REV 07   710-005781   HR5934           SIB-L8-F16
  B Board       REV 06   710-005782   HR5952           SIB-L8-F16 (B)
```

You can also display individual hardware components in the TX Matrix platform, a specific T640 routing node, or the entire routing matrix. To display all the SIBs in the entire routing matrix, issue the show chassis sibs command on the TX Matrix platform.

```
user@router> show chassis sibs
scc-re0:
--------------------------------------------------------------------------
Slot  State               Uptime
 0    Spare
 1    Online              53 minutes, 38 seconds
 2    Online              53 minutes, 36 seconds
 3    Online              53 minutes, 33 seconds
 4    Online              53 minutes, 30 seconds
lcc0-re0:
--------------------------------------------------------------------------
Slot  State               Uptime
 0    Spare
 1    Online              53 minutes, 18 seconds
 2    Online              53 minutes, 17 seconds
 3    Online              53 minutes, 16 seconds
 4    Online              53 minutes, 15 seconds
lcc2-re0:
--------------------------------------------------------------------------
Slot  State               Uptime
 0    Spare
 1    Online              53 minutes, 18 seconds
 2    Online              53 minutes, 17 seconds
 3    Online              53 minutes, 16 seconds
 4    Online              53 minutes, 15 seconds
```

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

```
user@router> show chassis routing-engine
scc-re0:
--------------------------------------------------------------------------
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                 34 degrees C / 93 degrees F
    CPU temperature             35 degrees C / 95 degrees F
    DRAM                      2048 MB
    Memory utilization          12 percent
```

```
    CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    5 percent
      Interrupt                 0 percent
      Idle                     95 percent
    Model                       RE-4.0
    Serial ID                   212058900121
    Start time                  2004-09-27 08:49:31 PDT
    Uptime                     1 hour, 4 seconds
    Load averages:              1 minute   5 minute  15 minute
                                    0.06       0.04       0.05
Routing Engine status:
  Slot 1:
    Current state               Backup
    Election priority           Backup (default)
    Temperature                33 degrees C / 91 degrees F
    CPU temperature            34 degrees C / 93 degrees F
    DRAM                     2048 MB
    Memory utilization         10 percent
    CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    0 percent
      Interrupt                 1 percent
      Idle                     99 percent
    Model                       RE-4.0
    Serial ID                   211123900258
    Start time                  2004-09-26 13:09:13 PDT
    Uptime                     20 hours, 40 minutes, 4 seconds
lcc0-re0:
--------------------------------------------------------------------------
Routing Engine status:
  Slot 0:
    Current state               Master
    Election priority           Master (default)
    Temperature                37 degrees C / 98 degrees F
    CPU temperature            38 degrees C / 100 degrees F
    DRAM                     2048 MB
    Memory utilization         11 percent
    CPU utilization:
      User                      0 percent
      Background                0 percent
      Kernel                    3 percent
      Interrupt                 1 percent
      Idle                     97 percent
    Model                       RE-4.0
    Serial ID                   211123900199
    Start time                  2004-09-27 08:49:24 PDT
    Uptime                     1 hour, 11 seconds
    Load averages:              1 minute   5 minute  15 minute
                                    0.02       0.02       0.00
Routing Engine status:
  Slot 1:
    Current state               Backup
    Election priority           Backup (default)
    Temperature                35 degrees C / 95 degrees F
    CPU temperature            35 degrees C / 95 degrees F
    DRAM                     2048 MB
    Memory utilization         10 percent
    CPU utilization:
```

```
      User                     0 percent
      Background               0 percent
      Kernel                   0 percent
      Interrupt                0 percent
      Idle                    99 percent
    Model                      RE-4.0
    Serial ID                  211123900248
    Start time                 2004-09-26 13:09:07 PDT
    Uptime                    20 hours, 40 minutes, 12 seconds
lcc2-re0:
--------------------------------------------------------------------------
Routing Engine status:
  Slot 0:
    Current state              Master
    Election priority          Master (default)
    Temperature               33 degrees C / 91 degrees F
    CPU temperature           35 degrees C / 95 degrees F
    DRAM                    2048 MB
    Memory utilization        11 percent
    CPU utilization:
      User                     0 percent
      Background               0 percent
      Kernel                   4 percent
      Interrupt                0 percent
      Idle                    96 percent
    Model                      RE-4.0
    Serial ID                  211123900183
    Start time                 2004-09-27 08:49:26 PDT
    Uptime                    1 hour, 9 seconds
    Load averages:             1 minute   5 minute  15 minute
                                   0.15       0.05       0.01
Routing Engine status:
  Slot 1:
    Current state              Backup
    Election priority          Backup (default)
    Temperature               32 degrees C / 89 degrees F
    CPU temperature           34 degrees C / 93 degrees F
    DRAM                    2048 MB
    Memory utilization        10 percent
    CPU utilization:
      User                     0 percent
      Background               0 percent
      Kernel                   0 percent
      Interrupt                1 percent
      Idle                    99 percent
    Model                      RE-4.0
    Serial ID                  212058900178
    Start time                 2004-09-26 13:09:10 PDT
    Uptime                    20 hours, 40 minutes, 8 seconds
```

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

```
user@router> 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      2          0       256         7         44
  2  Empty
  3  Online            31      3          0       256        14         44
  4  Empty
  5  Empty
  6  Empty
  7  Empty
```

You can also check to see if the TX Matrix platform and T640 routing nodes are communicating correctly within the routing matrix. To verify that the T640 routing nodes have proper connectivity to the routing matrix, issue the show chassis lccs command. In this example, there are two T640 routing nodes in the routing matrix.

```
user@router> show chassis lccs
Slot  State               Uptime
 0    Online             52 minutes, 5 seconds
 1    Empty
 2    Online             52 minutes, 6 seconds
 3    Empty
```

Related Topics

- Routing Matrix Feature Guide, JUNOS 9.4
- Overview of the Routing Matrix on page 3
- Roadmap to Configuring a Routing Matrix on page 9
- System Requirements for the Routing Matrix on page 6

Part 2
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