Chapter 37

Monitoring Redundant Routing Engines

You monitor redundant Routing Engines to ensure that system processes function normally, such as routing protocols, packet forwarding tables, router interfaces, system management, JUNOS software and file system storage, and monitoring functions. (See Table 108.)

This chapter describes how to monitor redundant Routing Engines. For more information about monitoring Routing Engines, see “Monitoring the Routing Engine” on page 125. See also the applicable router hardware installation guide.

Table 108: Checklist for Monitoring Redundant Routing Engines

Monitor Redundant Routing Engine Tasks	Command or Action
Understanding Redundant Routing Engines on page 493 Redundant Routing Engine Characteristics on page 493 M10i Router Routing Engine Redundancy on page 494 M20 Router Routing Engine Redundancy on page 495 M40e and M160 Router Routing Engine Redundancy on page 496 M320 Router Routing Engine Redundancy on page 497 T320 Router and T640 Routing Node Routing Engine Redundancy on page 498	
Understanding the Redundant Routing Engine Configuration on page 500	[edit] [edit chassis redundancy] show or show chassis redundancy
Understanding Redundant Routing Engine Automatic Failover on page 501	
Understanding the Default Routing Engine Redundancy Behavior on page 501	
Displaying the Redundant Routing Engines Installed in the Router on page 502	show chassis hardware show chassis routing-engine
Checking the Redundant Routing Engine Status on page 503	See “Monitoring the Routing Engine Status” on page 136.
Displaying Redundant Routing Engine Mastership and Backup on page 503	show chassis routing-engine
Displaying Redundant Routing Engine Errors on page 504	show log mastership

Monitor Redundant Routing Engine Tasks	Command or Action
Manually Switching from Master to Backup Routing Engine on page 504	request chassis routing-engine master release request chassis routing-engine master switch
Replacing a Redundant Routing Engine on page 506	See “Removing a Routing Engine” on page 161.

See Also

Monitoring the Host Module on page 341

Monitoring the Routing Engine on page 125

Monitoring the MCS on page 359

Host Redundancy Overview on page 463

Monitoring Redundant MCSs on page 567

Monitoring Redundant Control Boards on page 559

Understanding Redundant Routing Engines

Purpose Inspect redundant Routing Engines to minimize system process failures.

What Are Redundant Routing Engines Redundant Routing Engines are two Routing Engines that are installed in the same router. One functions as the master, while the other stands by as a backup should the master Routing Engine fail. By default, the Routing Engine in slot 0 is the master (RE0) and the one in slot 1 is the backup (RE1).

Redundant Routing Engine Characteristics

Table 109 describes redundant Routing Engine characteristics for routing platforms.

Table 109: M-series Platform Redundant Routing Engine Characteristics

Component	M10i	M20	M40	M40e	M160	M320	T320 / T640
Redundant Routing Engine	X	X					
Redundant host modules with Routing Engine and MCS				X	X		
Redundant host subsystems with Routing Engine and Control Board						X	
Redundant host modules with Routing Engine and Control Board							X

The following sections describe the various routing platform Routing Engines:

M10i Router Routing Engine Redundancy on page 494

M20 Router Routing Engine Redundancy on page 495

M40e and M160 Router Routing Engine Redundancy on page 496

M320 Router Routing Engine Redundancy on page 497

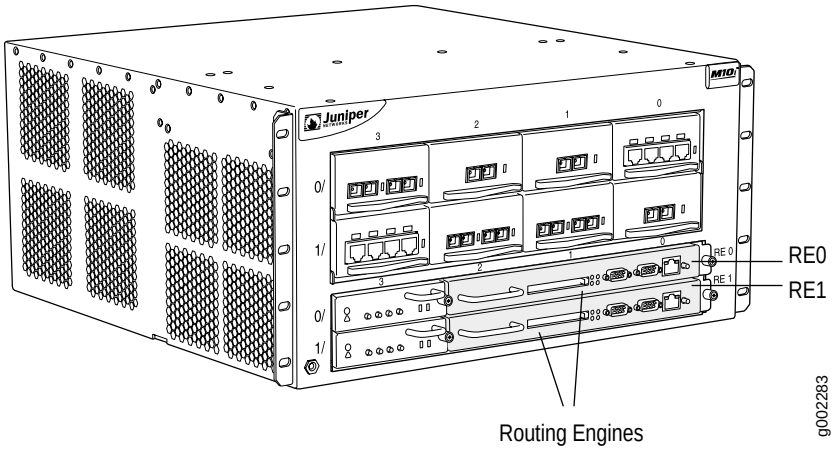
T320 Router and T640 Routing Node Routing Engine Redundancy on page 498

M10i Router Routing Engine Redundancy

The M10i router has redundant Routing Engines. The M10i router has one Routing Engine in slot RE0 and another in slot RE1 (see Figure 193). By default, the Routing Engine in slot RE0 is the master and the one in slot RE1 is the backup. If one Routing Engine fails, the other one assumes the routing functions.

The M10i router Routing Engine faceplate has LEDs that indicate redundant Routing Engine operating status and mastership. (See “Check the M10i Router Routing Engine LEDs” on page 139.)

Figure 193: M10i Router Redundant Routing Engine



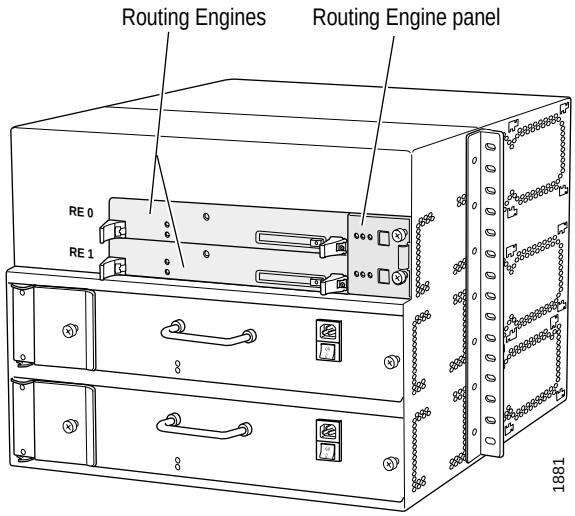
M20 Router Routing Engine Redundancy

The M20 router has one Routing Engine in slot RE0 and another in slot RE1 (see Figure 194). By default, the Routing Engine in slot RE0 is the master and the one in slot RE1 is the backup. If one Routing Engine fails, the other one assumes the routing functions.

The M20 router Routing Engine panel has LEDs that indicate redundant Routing Engine operating status and mastership. The craft interface also has LEDs that indicate redundant Routing Engine status and mastership. (See “Check the M20 Router Routing Engine LEDs” on page 140.)

Figure 194: M20 Router Redundant Routing Engine

Rear



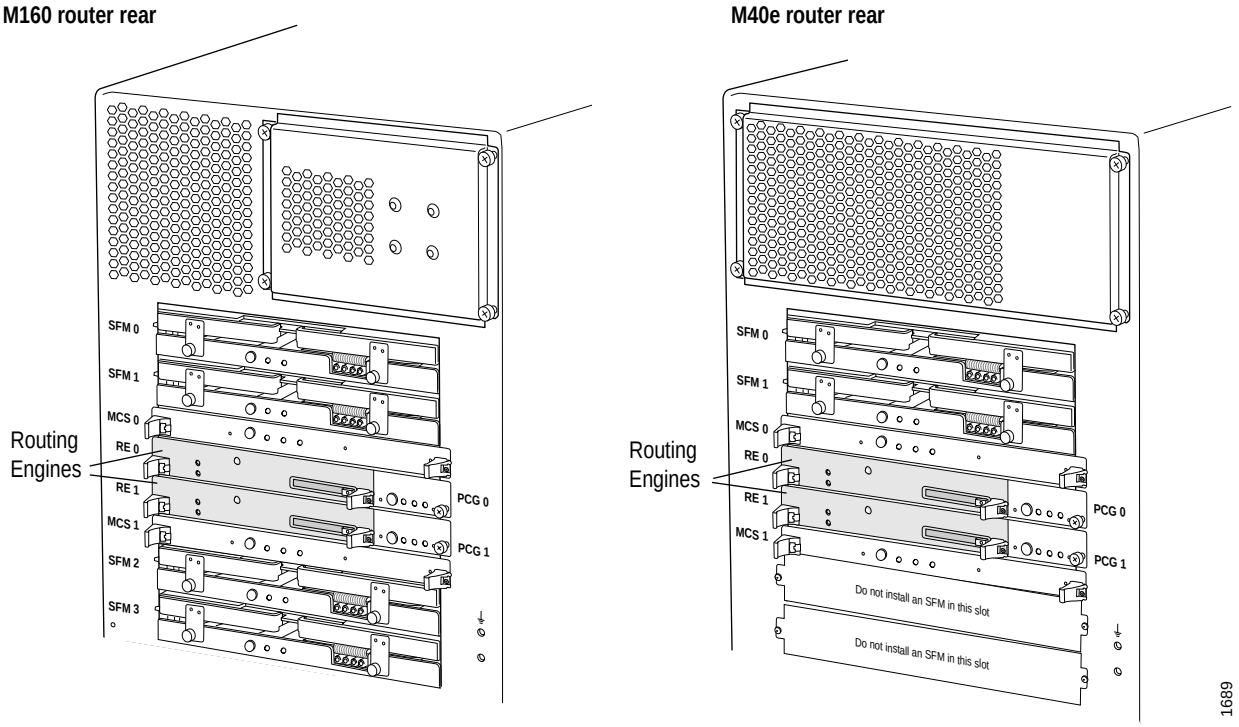
M40e and M160 Router Routing Engine Redundancy

The M40e and M160 routers have redundant Routing Engines that are components of the host module (see Figure 195). The host module consists of a Routing Engine and a Miscellaneous Control Subsystem (MCS). You can install two host modules in the M40e and M160 routers. For more information about monitoring redundant MCSs, see “Monitoring Redundant MCSs” on page 567.

Both the Routing Engine and the MCS must be installed for the host module to function. When two host modules are installed in the router, both are powered on, but only one is the master; the second host module is the backup and performs no functions. By default, the master host module has components installed in slots RE0 and MCS0; the backup host module has components installed in slots RE1 and MCS1.

The M40e and M160 router craft interface LEDs indicate the Routing Engine operating status and mastership. (See “Check the M40e and M160 Router Routing Engine LEDs” on page 143.)

Figure 195: M40e and M160 Router Redundant Routing Engines



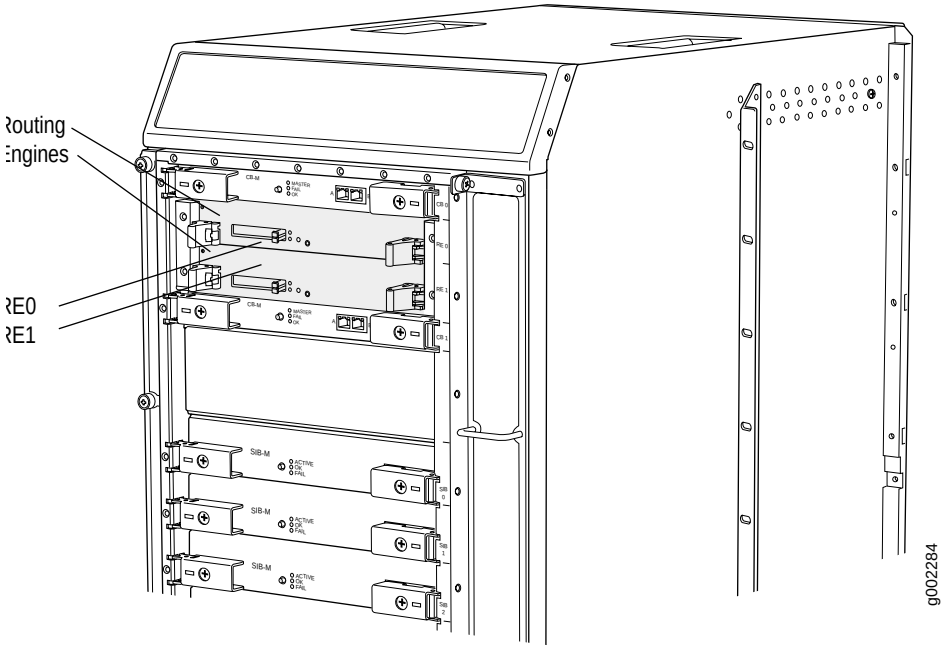
M320 Router Routing Engine Redundancy

The M320 router has a redundant Routing Engine that is a component of the host subsystem (see Figure 196). The host subsystem consists of a Routing Engine and a Control Board. Two host subsystems can be installed in the M320 router. For more information about monitoring redundant Control Boards, see “Monitoring Redundant Control Boards” on page 559.

Both the Routing Engine and the Control Board must be installed for the host subsystem to function. When two host subsystems are installed in the router, both are powered on, but only one is the master; the second host subsystem is the backup and performs no functions. By default, the master host module has components installed in slots RE0 and CB0; the backup host module has components installed in slots RE1 and CB1. The Routing Engines are hot-pluggable.

The M320 router craft interface LEDs indicate the Routing Engine operating status and mastership. (See “Check the M320 Router Routing Engine LEDs” on page 144.)

Figure 196: M320 Router Redundant Routing Engines



T320 Router and T640 Routing Node Routing Engine Redundancy

Figure 197 shows the T320 router redundant Routing Engines that are components of the host subsystem.

Figure 197: T320 Router Routing Engines

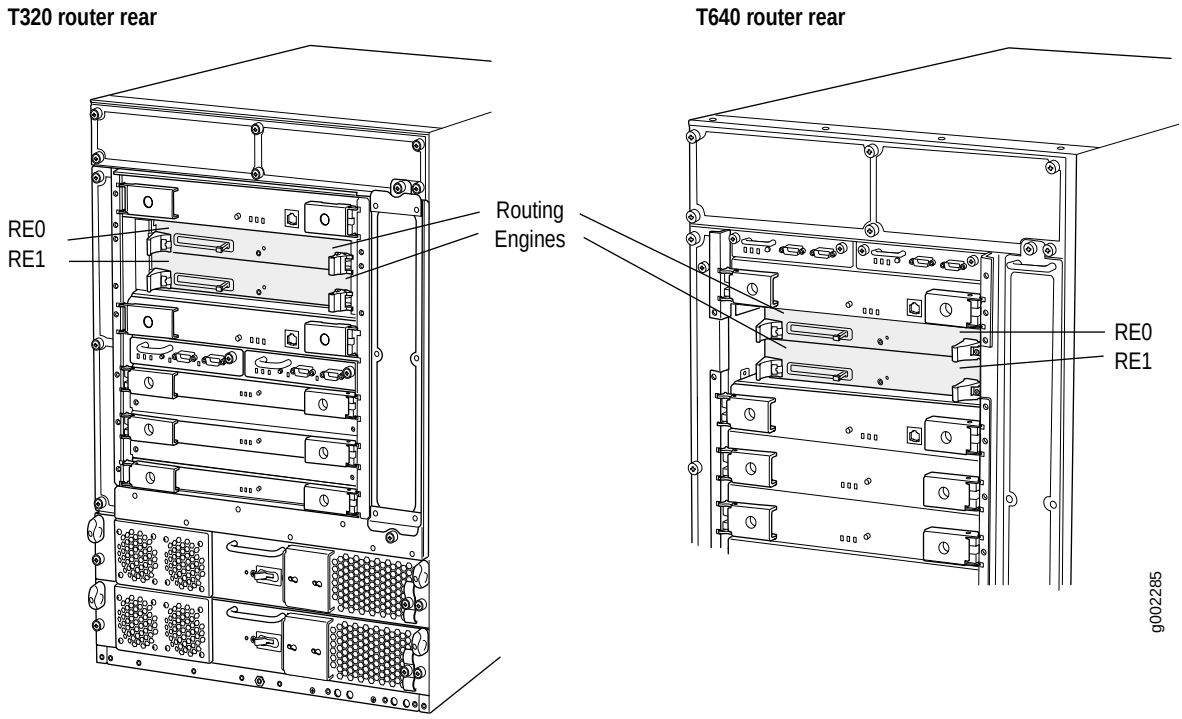
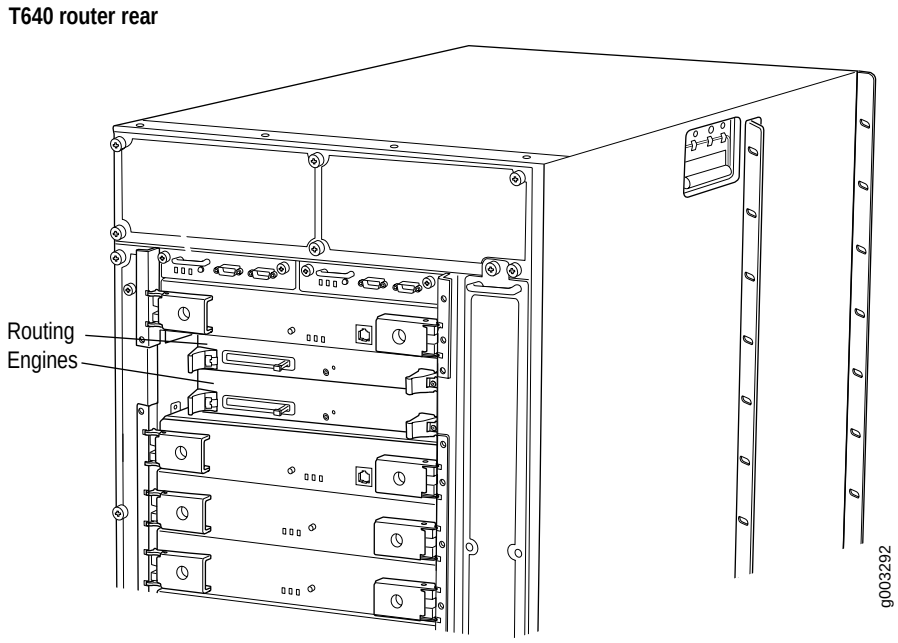


Figure 198 shows the T640 routing node redundant Routing Engines that are components of the host subsystem.

Figure 198: T640 Routing Node Routing Engines



The host subsystem consists of a Routing Engine and a Control Board. You can install two host subsystems in the T320 router and T640 routing node. For more information about monitoring redundant Control Boards, see “Monitoring Redundant Control Boards” on page 559.

Both the Routing Engine and the Control Board must be installed for the host subsystem to function. When two host subsystems are installed in the router, both are powered on, but only one is the master; the second host subsystem is the backup and performs no functions. By default, the master host subsystem has components installed in slots RE0 and CB0; the backup host module has components installed in slots RE1 and CB1. If one Routing Engine physically fails, the other one assumes the routing functions. If a software failure occurs, the other backup Routing Engine assumes routing functions if some preliminary configuration has been done. For more information, see“Host Redundancy Overview” on page 463.

The T320 router and T640 routing node craft interface LEDs indicate the Routing Engine operating status and mastership. (See “Check the T320 Router Routing Engine LEDs” on page 144 and “Check the T640 Routing Node Routing Engine LEDs” on page 145.)

Understanding the Redundant Routing Engine Configuration

For routers with redundant Routing Engines, you can configure a master and backup Routing Engine. By default, the Routing Engine in slot RE0 is the master, and the Routing Engine in slot RE1 is the backup. Once configured, you can specify the Routing Engine to assume mastership automatically if it detects loss of the keepalive signal from the master. You can configure Routing Engine redundancy is in the JUNOS software command-line interface (CLI) configuration mode at the [edit chassis redundancy] hierarchy level.

NOTE: We recommend that both Routing Engines have the same configuration. When changing the configuration on a Routing Engine, commit it to both Routing Engines using the commit synchronize statement at the [edit] hierarchy level. For more information about synchronizing configurations, see "Host Redundancy Overview" on page 463.

You can configure redundant Routing Engine automatic failover for the backup Routing Engine with a specified failover time. By default, automatic failover is disabled. To enable it, include the failover on-loss-of-keepalives statement at the [edit chassis redundancy] hierarchy level. By default, failover will occur after 300 seconds (5 minutes) unless a different time is specified. The failover time is indicated by the *keepalive-timeseconds* statement at the [edit chassis redundancy] hierarchy level. The range for the keepalive time is from 2 to 10,000 seconds.

To display the current Routing Engine redundancy configuration, follow these steps:

1. Enter the CLI configuration mode using the following command:

   user@host# **configure**

2. From the [edit chassis redundancy] hierarchy level, show the configuration using the following command:

   user@host# **show**

Alternative Action To display the current Routing Engine configuration, you can also use the following CLI command:

user@host> **show chassis redundancy**

Sample Output

```
user@host> show chassis redundancy
routing-engine 0 master;
routing-engine 1 backup;
failover on-loss-of-keepalives;
keepalive-time 300;
```

Understanding Redundant Routing Engine Automatic Failover

If the keepalive time is configured for 2 seconds, the sequence of events is as follows:

1. After 2 seconds of keepalive loss, a message is logged.

2. After 2 seconds of keepalive loss, the backup Routing Engine attempts to assume mastership. An alarm is generated whenever the backup Routing Engine is active, and the display is updated with the current status.

3. Once the backup Routing Engine assumes mastership, it continues to function as master even after the originally configured master Routing Engine has successfully resumed operation. You must manually restore it to its previous backup status. However, if at any time one of the Routing Engines is not present, the other Routing Engine becomes master automatically, regardless of how redundancy is configured.

Understanding the Default Routing Engine Redundancy Behavior

By default, the JUNOS software uses RE0 as the master Routing Engine and RE1 as the backup Routing Engine. Unless otherwise specified in the configuration, RE0 will always assume mastership if the acting master Routing Engine is rebooted.

To see how the default Routing Engine redundancy setting works, follow these steps:

WARNING: Do not try this procedure on a production network.

1. Make sure the router is running on RE0 as the master Routing Engine (see “Displaying Redundant Routing Engine Mastership and Backup” on page 503).

2. To manually switch the state of the Routing Engine mastership, use the request chassis routing-engine master command. RE0 is now the backup Routing Engine and RE1 is the master Routing Engine. If you use this command to change the master Routing Engine, and then restart the chassis software for any reason, the master reverts to the default setting. For information about switching Routing Engine mastership, see the request chassis routing-engine master command in the *JUNOS Protocols, Class of Service , and System Basics Command Reference*.

NOTE: On the next reboot of the master Routing Engine, the JUNOS software returns the router to the default state because you have not configured the Routing Engines to maintain this state after a reboot.

3. Reboot the master Routing Engine RE1. When you do this, the Routing Engine boots up and reads the configuration. If you have not specified in the configuration which Routing Engine is the master, RE1 uses the default configuration as the backup. Now both RE0 and RE1 are in a backup state. The JUNOS software detects this conflict and, to prevent a no-master state, reverts to the default configuration with RE0 assuming mastership.

Displaying the Redundant Routing Engines Installed in the Router

Action To determine whether a router has redundant Routing Engines, use the following CLI command:

user@host> **show chassis hardware**

NOTE: If the show chassis hardware CLI command displays no hardware information, check to see which Routing Engine you are logged in to. If you are logged in to the backup Routing Engine, no hardware information is displayed or there are errors.

Sample Output

```
user@host> show chassis hardware
Hardware inventory:
Item            Version  Part number  Serial number     Description
Chassis                                22196             M20
Backplane       REV 07   710-001517   AL2873
Power Supply A  REV 04   740-001466   001043            DC
Power Supply B  REV 04   740-001466   000671            DC
Display         REV 04   710-001519   AJ7282
Host 0                                 c800000749a9db01  Present
Host 1                                 9a00000749b14301  Present
[...Output truncated...]
```

What It Means The command output displays the Routing Engine slot number, revision level, part number, serial number, and type.

Alternative Action To display more detailed information about the Routing Engines installed in a router, use the following CLI command:

user@host> **show chassis routing-engine**

```
user@host> show chassis routing-engine
Routing Engine status:
  Slot 0:
    Current state                  Master
    Election priority              Master (default)
    Temperature                    29 degrees C / 84 degrees F
    DRAM                           768 Mbytes
    CPU utilization:
      User                         0 percent
      Background                   0 percent
      Kernel                       1 percent
      Interrupt                    0 percent
      Idle                         98 percent
    Serial ID                      c800000749a9db01
    Start time                     2002-06-18 13:53:12 UTC
    Uptime                         70 days, 52 minutes, 40 seconds
    Load averages:                 1 minute   5 minute  15 minute
                                   0.08       0.02      0.01
Routing Engine status:
  Slot 1:
    Current state                  Backup
    Election priority              Backup (default)
    Temperature                    30 degrees C / 86 degrees F
    DRAM                           805306368 Mbytes
```

```
CPU utilization:
  User                  0 percent
  Background            0 percent
  Kernel                0 percent
  Interrupt             0 percent
  Idle                 99 percent
Serial ID               9a00000749b14301
Start time              2002-06-18 13:54:05 UTC
Uptime                  70 days, 51 minutes, 50 seconds
```

Checking the Redundant Routing Engine Status

Action For more information about monitoring Routing Engine status, see “Monitoring the Routing Engine Status” on page 136.

Displaying Redundant Routing Engine Mastership and Backup

Action To display which Routing Engine is master and backup, use the following CLI command:

```
user@host> show chassis routing-engine
```

Sample Output

```
user@host> show chassis routing-engine
Routing Engine status
  Slot 0
    Current state: Master
    Election priority: Master
  Temperature                 41 C / 105 degrees F
  DRAM                          765 Mbytes
  CPU utilization
    User                        0 percent
    Background                  0 percent
    Kernel                      0 percent
    Interrupt                   0 percent
    Idle                      100 percent
  Serial ID                     39000004f8bdec01
  Start time                    2000-01-04 22:02:58 UTC
  Uptime                          14 hours, 45 minutes, 40 seconds
    Load averages                 1 minute   5 minute  15 minute
                          0.05          0.04          0.01
  Slot 1
    Current state     Backup
    Election priority     Backup (default)
  Temperature                 41 C / 105 degrees F
[...Output truncated...]
```

What It Means The command output shows the status of the Routing Engines: RE0 is Master and RE1 is Backup.

Alternative Actions You can also use the show chassis environment routing-engine command; for more information see “Monitoring the Routing Engine Status” on page 136. The Current State field indicates which Routing Engine is master and which is backup.

For M40e and M160 routers, you can also use the show chassis craft-interface command. The command output shows the master and backup Routing Engine LED status; for more information, see “Monitoring the Routing Engine Status” on page 136.

Displaying Redundant Routing Engine Errors

Action To view redundancy log messages, use the following CLI command:

```
user@host> show log mastership
```

Sample Output

```
user@host> show log mastership
[...Output truncated...]
May 13 11:18:31 RE mastership msg error: subtype 52
May 13 11:18:32 failed to receive loss of keepalives from other RE for the last 20 sec
[...Output truncated...]
```

What It Means The /var/log/mastership file records error messages from redundancy logging. The file records the time of the message and a description of the message. A message is logged after 20 seconds of keepalive loss.

Manually Switching from Master to Backup Routing Engine

Action To manually switch from master to backup Routing Engine, or to force the backup Routing Engine to become master, use the following CLI command:

```
user@host> request chassis routing-engine master release
```

You can also use the following CLI command:

```
user@host> request chassis routing-engine master switch
```

For routers with multiple Routing Engines only, you can control which Routing Engine is the master.

WARNING: For routers that have two Routing Engines, both Routing Engines must be running JUNOS Release 4.0 or later. Do not run JUNOS Release 3.4 on one of the Routing Engines and Release 4.0 on the other. JUNOS software Release 3.4 does not support Routing Engine redundancy. If you are using this release of the software, only one Routing Engine can be installed in either slot in the router.

By default, the Routing Engine in slot 0 (RE0) is the master and the Routing Engine in slot 1 (RE1) is the backup. To change the default master Routing Engine, include the routing-engine statement at the [edit chassis redundancy] hierarchy level in the configuration. For more information, see the *JUNOS System Basics Configuration Guide*.

When you force the backup Routing Engine to become the master Routing Engine with the request chassis routing-engine master command and then restart the chassis software for any reason, the master reverts to the default setting.

NOTE: The configurations on the two Routing Engines do not have to be the same, and they are not automatically synchronized. If you configure both Routing Engines as masters, when the chassis software restarts for any reason, the Routing Engine in slot 0 becomes the master and the Routing Engine in slot 1 becomes the backup.

We recommend making both configurations the same.

When both Routing Engines have the same configuration and come up at the same time, the Routing Engine in slot 0 takes precedence over the Routing Engine in slot 1. Table 110 indicates which Routing Engine becomes master based on the configuration of both Routing Engines.

Table 110: Routing Engine Mastership Election

		Slot 0 Configuration		
		Master	**Backup**	**Disabled**
Slot 1 Configuration	**Master**	Slot 0: master Slot 1: backup	Slot 0: backup Slot 1: master	Slot 0: disabled Slot 1: master
	Backup	Slot 0: master Slot 1: backup	Slot 0: master Slot 1: backup	Slot 0: disabled Slot 1: master
	Disabled	Slot 0: master Slot 1: disabled	Slot 0: master Slot 1: disabled	Slot 0: disabled Slot 1: disabled

Sample Output

The following command output displays when you attempt to have the backup Routing Engine become master:

```
user@M20-host> request chassis routing-engine master acquire

warning: Traffic will be interrupted while the PFE is re-initialized

warning: The other routing engine's file system could be corrupted
Reset other routing engine and become master ? [yes,no] (no)
```

The following command output displays when you switch the mastership from the master Routing Engine to the backup:

```
user@m20-host-0> request chassis routing-engine master switch

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

Resolving mastership...
Complete. The other Routing Engine becomes the master.
root@m20-host-0>
```

The following command output displays when you switch the mastership from the backup to the master Routing Engine:

```
root@m20-host-0> request chassis routing-engine master switch

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

Resolving mastership...
Complete. The local routing engine becomes the master.
root@m20-host-0>
```

What It Means The command output indicates that traffic will be interrupted during the Routing Engine mastership switch process. The command output confirms whether you really want to continue with the mastership switch process, and indicates when the mastership switch process is complete.

Syntax request chassis routing-engine master <acquire <no-confirm>| release | switch>

acquire—(Optional) Attempt to become the master Routing Engine.

no-confirm—(Optional) Do not request confirmation.

release—(Optional) Request the other Routing Engine to become the master.

switch—(Optional) Toggle mastership between Routing Engines.

Replacing a Redundant Routing Engine

If you have a router with two Routing Engines and you want to shut the power off to the router or remove a Routing Engine, you must first halt the backup Routing Engine (if it has been upgraded), then halt the master Routing Engine. To halt a Routing Engine, issue the request system halt command. You can also halt both Routing Engines at the same time by issuing the request system halt both-routing-engines command.

NOTE: When you halt both Routing Engines, a message displays to press Enter to restart or to halt. If you press Enter on the master Routing Engine to restart, it will restart. However the backup Routing Engine will not restart. It will wait at the message to restart or to halt. You then have to press Enter on the console of the backup Routing Engine for it to restart.

Action To replace a redundant Routing Engine, see “Removing a Routing Engine” on page 161.