1:1 Supervisor Card Redundancy

This document describes high availability and redundancy features of the Supervisor card on the Cisco RF Gateway 10 (RFGW-10) Universal Edge Quadrature Amplitude Modulation (UEQAM).

High availability is a critical requirement in networks to provide continuous access to applications and data. It is required to minimize downtime and ensure maximum productivity in a network.

Supervisor high availability is achieved through:
- Route Processor Redundancy (RPR)
- Stateful Switchover (SSO)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module and to see a list of the releases in which each feature is supported, see the “Feature Information for 1:1 Supervisor Card Redundancy” section on page 87.

Use Cisco Feature Navigator to find information about platform support and Cisco IOS, Catalyst OS, and Cisco IOS XE software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.
Prerequisites for 1:1 Supervisor Card Redundancy

- The Supervisor cards should be installed in the Cisco RFGW-10 chassis in slots 1 and 2.
- Both Supervisor cards in the chassis should be SUP-V/10-Gigabit Ethernet cards and use the same Cisco IOS software image.

Restrictions for 1:1 Supervisor Card Redundancy

- If SSO mode of Supervisor redundancy is configured and the Cisco IOS images on both the Supervisor cards is not the same, then the Supervisor switches to RPR redundancy mode.

Information About 1:1 Supervisor Card Redundancy

This section describes the types of high availability, supervisor redundancy, and the need and cause for a Supervisor switchover on the Cisco RFGW-10:

- Supervisor Redundancy, page 66
- Route Processor Redundancy, page 68
- Stateful Switchover, page 68
- Accessing the Standby Supervisor Card, page 69
- Supervisor Redundancy SSO Support on Cisco RFGW-10, page 71
- Supervisor Uplink Configuration, page 72
- Forcing a Switchover Between Active and Standby Supervisor, page 74

Supervisor Redundancy

The Cisco RFGW-10 supports two redundant Supervisor cards—one Active card and one Standby card. In a switchover, the standby Supervisor card takes over the active Supervisor card. Running the Supervisor card in RPR or SSO operating mode enables Supervisor redundancy.

The Cisco RF Gateway 10 Supervisor Engine 7-E uplink ports are not recommended for data or management traffic in Supervisor Redundancy Mode.
The Supervisor 7-E card has four uplink ports on its front panel. Only the top two ports are active in redundancy mode. However, in redundancy mode, packet loss occurs in the traffic paths between the uplink ports on the standby Supervisor card and the switch fabric on the active Supervisor card. There is no packet loss for uplink ports on active supervisors.

The uplink ports on the Cisco RFGW-10 DS-384 and the Cisco RFGW-10 DS-48 line cards are recommended for data and management traffic.

### Need for Supervisor Redundancy

In a switchover scenario, if the active Supervisor card fails and the Standby card takes over or a manual switchover is performed, the standby Supervisor card becomes the active Supervisor. The standby Supervisor card is automatically initialized with the startup configuration of the active Supervisor card, thus shortening the switchover time.

The switchover time for a Supervisor card in RPR mode could vary from 30 seconds or longer depending on the configuration. The switchover time for a Supervisor card in SSO mode is less than 1 second.

In addition to the minimal switchover time, Supervisor redundancy supports:

- Online Insertion and Removal (OIR) of the standby Supervisor card—OIR is usually performed for maintenance. When the standby Supervisor card is inserted, the active Supervisor card detects it. The standby Supervisor boots partially initialized in an RPR mode and fully initialized in the SSO mode

**Note**

Before removing a Supervisor card from the chassis at runtime, ensure that the card is in the standby mode. If the card is in active mode, execute the `redundancy force-switchover` command to change the card to the standby mode, and then remove the card from the chassis.

**Tip**

While performing a software upgrade, load the new image on the standby Supervisor card. This minimizes the switchover downtime on the Supervisor card.

### Causes for Supervisor Switchover

Some of the possible causes that can trigger a switchover from the active Supervisor card to the standby Supervisor card are:

- A software crash or hardware failure or fault on the active Supervisor card
- Standby Supervisor card detects failed active Supervisor card
- Reloading the active Supervisor card by executing the `reload` command—forcing manual switchover
- Lack of response of the active Supervisor card to the polls or the heartbeat maintained between the active and standby Supervisor card
- A hardware diagnostic failure is detected
Route Processor Redundancy

In Route Processor Redundancy (RPR) mode, the standby Supervisor card completes its initialization but suspends just before parsing the startup-config. The standby Supervisor card monitors the active Supervisor card, and switches over when it detects a failure on the active Supervisor card. When the standby Supervisor card becomes active, the TCC cards and all the line cards in the chassis are reset, and the startup-config is parsed. There is a traffic outage in this mode because the line cards are reset.

The switchover time of the active Supervisor card can be 30 seconds or more depending on the configuration.

The following are synchronized between the active and the standby Supervisor cards:

- Startup system configuration
- Boot variable
- Configuration register
- Calendar
- VLAN database

The following are not synchronized between the active and standby Supervisor cards:

- State configuration
- Running configuration
- Routing tables and forwarding shortcuts
- MAC address table
- Dynamic protocols such as DHCP

Switchover

The standby Supervisor card loads a Cisco IOS software image at startup and initializes itself in standby mode. In the event of a switchover, the standby Supervisor card reinitializes itself as the active Supervisor card, reloads all the line cards, and restarts the system. Because all line cards are reloaded, adjacent routers detect the physical link failure for most types of point-to-point connections. The standby Supervisor card parses the complete configuration, completes the booting sequence, resets the modules to perform self diagnostics, waits for the modules to come online and builds routing tables, MAC address tables, and dynamic protocols.

Stateful Switchover

In Stateful Switchover (SSO) mode, the standby Supervisor card is fully initialized and configured. This allows SSO to shorten the switchover time if the active Supervisor card fails, or if a manual switchover is performed. Both the startup and running configurations are continually synchronized from the active to the standby Supervisor cards, and the line cards are not reset during a switchover. The interfaces remain up during this transfer, so neighboring routers do not detect a physical link flap (the link does not go down and come back up).

The line cards, Layer 2 protocols, and application state information are synchronized and the standby Supervisor card is in a “hot” standby ready state to take over immediately. As the standby Supervisor card recognizes the hardware link status of every link, ports that were previously active remain active after a switchover has taken place.
The following are synchronized between the active and the standby Supervisor cards:

- Startup and running configuration
- Platform state information such as interface state, heartbeat state, and line card redundancy state
- Application state information
- Layer 2 feature configurations

The following are not synchronized between the active and the standby Supervisor cards:

- All Layer 3 protocols including OSPF
- Boot image
- Multicast PIM and IGMP precools
- L2VPNv3

## Switchover

In the event of a switchover, the standby Supervisor card becomes the active Supervisor card. As the standby Supervisor card is continuously synchronized with the startup and running configuration, switchover downtime is minimal. The state information synchronization (often called “checkpointing”) from the active Supervisor card to the standby Supervisor card occurs at normal run time. At the switchover, the newly active Supervisor card immediately uses the state information previously synchronized (checkpointed).

The line cards are not reset as part of the switchover. The Supervisor card reconciles the line card state information with its own state information on switchover. SSO-aware features or protocols such as DHCP protocols are checkpointed during switchover. Non-SSO aware features or protocols such as OSPF, BGP, Multicast PIM and IGMP, and L2VPNv3 protocols are quickly available on the standby as the standby Supervisor card is completely initialized.

## Benefits of SSO

SSO provides a faster switchover compared to Route Processor Redundancy (RPR) by fully initializing and configuring the standby Supervisor card. By using checkpointed state information, the time required for routing protocols to converge is minimized. As protocol information, application information, and user session information are maintained during the switchover, improved network availability is provided and line cards continuously forward network traffic with no loss of sessions.

## Accessing the Standby Supervisor Card

The following activities can be performed on the standby Supervisor card.

<table>
<thead>
<tr>
<th>Commands</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dir slavebootflash:</code> or <code>dir slaveslot0:</code></td>
<td>Lists the contents of the standby bootflash: device or slot0.</td>
</tr>
<tr>
<td><code>delete slavebootflash:&lt;filename&gt;</code> or <code>delete slaveslot0:&lt;filename&gt;</code></td>
<td>Deletes a specific filename from the standby devices.</td>
</tr>
<tr>
<td><code>squeeze slavebootflash:</code> or <code>squeeze slaveslot0:</code></td>
<td>Performs the squeeze function.</td>
</tr>
</tbody>
</table>
### Information About 1:1 Supervisor Card Redundancy

#### Commands Description

<table>
<thead>
<tr>
<th>Commands</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>format slavebootflash</code>: or <code>format slaveslot0:</code></td>
<td>Formats the standby devices.</td>
</tr>
<tr>
<td><code>copy &lt;source&gt; slavebootflash</code>: or <code>copy &lt;source&gt; slaveslot0:</code></td>
<td>Copies files to standby devices.</td>
</tr>
</tbody>
</table>
Supervisor Redundancy SSO Support on Cisco RFGW-10

The following features are supported for Supervisor Redundancy in SSO mode.

Platform

Configuration Synchronization

The running configuration and the startup configuration are synchronized from the active Supervisor card to the standby Supervisor card. The running configuration is synchronized line by line. The commands are executed on the active Supervisor card and then on the standby Supervisor card. Parser Return Code (PRC) is used to verify the active and standby Supervisor card have the same path of execution for the command.

All interfaces and ports are synchronized as part of the configuration.

Alarm management

Syslog alarms are synchronized to the standby Supervisor card at run time. Active alarms reside on each line card. On a Supervisor switchover, the newly active Supervisor card receives the alarms from the line cards.

Line card management

The state of line cards progresses through events such as line card insertion, line card removal, line card partial reset, and line card full reset. These events and the corresponding line card states are checkpointed from the active Supervisor card to the standby Supervisor card. At the Supervisor switchover, the newly active Supervisor card continues to manage the line cards with the check pointed state information.

RF Switch

The RF switch management maintains state information on all the RF switch cards, whether or not the card is present in the system. The state information is synchronized from the active Supervisor to the standby Supervisor card whenever the RF switch is inserted or removed.

DEPI

In the Cisco IOS Release 12.2(50)SQ, DEPI is configured in one of the two modes—manual mode via static DEPI path configuration or protocol mode via dynamic DEPI protocol. In DEPI manual mode, the Supervisor switchover does not affect the statically configured DEPI connections. Hence, the switchover interruption to DEPI data traffic is in subseconds.

In DEPI protocol mode, the DEPI control plane is SSO-unaware as the underlying IOS L2TPv3 protocol is SSO-unaware. Neither the L2TPv3 protocol state nor the DEPI state is checkpointed from the active Supervisor card to the standby Supervisor card. During Supervisor switchover, the DEPI control plane and data plane are recovered as follows with minimal service outage time:

- DEPI control plane and data plane reestablishment—At Supervisor switchover, the newly active Supervisor card reestablishes the DEPI control connections and data sessions with its CMTS peer. The IDs of reestablished sessions fall into the same DEPI session ID range as before.
Information About 1:1 Supervisor Card Redundancy

- DEPI data plane nonstop forwarding (NSF)—While the newly active Supervisor card is re-establishing the DEPI connections and data sessions, the Cisco RFGW-10 receives and processes DEPI data traffic that the CMTS continues to forward through the existing data sessions. This nonstop forwarding function minimizes the service outage time for a couple of seconds. The existing data sessions are removed after the new sessions are established.

Video

The Video SSO feature is available in Cisco IOS Release 12.2(50)SQ1 and later.

Video sessions on the Cisco RFGW-10 are either unicast or multicast sessions created manually or remotely using Generic QAM Interface (GQI). At run time, the video session state information is check pointed from the active Supervisor card to the standby Supervisor card.

Unicast video sessions continue to forward traffic during Supervisor card switchover with about one second outage time.

Multicast video sessions may experience a longer outage time during Supervisor card switchover. For a small number of SDV sessions (for example, 1,000), the outage time is typically less than 4 seconds. For a large number of SDV sessions (for example, 10,000), the outage time is around 10 seconds. This is because, in Cisco IOS Release 12.2(50)SQ1, the underlying multicast function is not SSO-aware although the video session state is synchronized to the standby Supervisor card. The SSO performance of multicast video sessions will be improved in a future release.

**Supervisor Uplink Configuration**

To configure Supervisor uplink, use the following command in configuration mode:

```plaintext
Router(config)# hw-module uplink select {all | gigabitethernet | tengigabitethernet}
```

When Supervisor uplink is configured, only specific uplink ports are active and available for uplink connectivity. If you try to configure other uplink ports, an error message similar to the following is displayed:

% WARNING: Interface GigabitEthernet1/5 is usable/operational only in 'all' or 'gigabit' uplink configuration when only one supervisor is present in the % chassis in slot 1.

Table 1, Table 2, and Table 3 show the valid port configurations for uplink.

<table>
<thead>
<tr>
<th>Uplink Interface</th>
<th>Slot 1: Supervisor V 10GE</th>
<th>Slot 2: Empty</th>
<th>Slot 1: Empty</th>
<th>Slot 2: Supervisor V 10GE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GE 1/1</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>10GE 1/2</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>Active</td>
</tr>
<tr>
<td>10GE 2/1</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>10GE 2/2</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>Active</td>
</tr>
</tbody>
</table>

Table 1: Only 10-Gigabit Ethernet Ports for Uplink
### Table 2 Only Gigabit Ethernet Ports for Uplink

<table>
<thead>
<tr>
<th>Uplink Interface</th>
<th>Slot 1: Supervisor V 10GE</th>
<th>Slot 1: Empty</th>
<th>Slot 1: Supervisor V 10GE</th>
<th>Slot 1: Empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE 1/3</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/4</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/5</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/6</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/3</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>GE 2/4</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
</tr>
<tr>
<td>GE 2/5</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/6</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 3 Both 10-Gigabit Ethernet and Gigabit Ethernet Ports for Uplink

<table>
<thead>
<tr>
<th>Uplink Interface</th>
<th>Slot 1: Supervisor V 10GE</th>
<th>Slot 1: Empty</th>
<th>Slot 1: Supervisor V 10GE</th>
<th>Slot 1: Empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GE 1/1</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>10GE 1/2</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>10GE 2/1</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>10GE 2/2</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/3</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/4</td>
<td>Active</td>
<td>N/A</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/5</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 1/6</td>
<td>Active</td>
<td>N/A</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/3</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/4</td>
<td>N/A</td>
<td>Active</td>
<td>Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/5</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
<tr>
<td>GE 2/6</td>
<td>N/A</td>
<td>Active</td>
<td>Not Active</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Forcing a Switchover Between Active and Standby Supervisor

This section describes how to do a manual switchover between the active and standby Supervisor cards on the Cisco RFGW-10:

- Forcing RPR Switchover, page 74
- Reloading the Supervisor Cards, page 74
- Forcing Stateful Switchover, page 75

Forcing RPR Switchover

To force the active Supervisor card to standby mode and the standby to active, use the `redundancy force-switchover` command in privileged EXEC mode:

Before the `redundancy` command is used, ensure that the active and standby Supervisor cards have a high availability Cisco IOS image installed and configured for Route Processor Redundancy (RPR) mode. Before the system switches over, it verifies that the standby Supervisor card is ready to take over.

If the current running configuration is different from the startup configuration, the system prompts to save the running configuration before the switchover is performed.

A manual switchover is performed for one of the following reasons:

- When an active Supervisor card is upgraded or replaced.
- When the Cisco IOS software is upgraded on the standby Supervisor card and is required to start using the new software image. This allows the upgrade of the software on the former active Supervisor card without interrupting system operations.
- When testing switchover operations on the system.

The following example shows a switchover being initiated manually:

```
Router# redundancy force-switchover
Proceed with switchover to standby Supervisor? [confirm] y
```

Press `enter` or `y` to confirm the action to begin the switchover. If you press any other key, the switchover is aborted.

The following example shows a switchover failure because the standby Supervisor card is either not ready, not available, or not installed:

```
Router# redundancy force-switchover
There is no STANDBY present. Failed to force switchover
```

Reloading the Supervisor Cards

To reset the standby Supervisor card or to reset both the active and standby Supervisor cards, use the `redundancy reload` command in privileged EXEC mode:

```
Router# redundancy reload {peer | shelf}
```

Use `peer` to reload only the standby Supervisor card and use `shelf` to reload both the active and standby Supervisor cards.

The following example shows how to reset the standby Supervisor card:

```
Router# redundancy reload peer
```
Chapter 1:1 Supervisor Card Redundancy

How to Configure 1:1 Supervisor Card Redundancy

This section describes how to configure 1:1 Supervisor card redundancy in Cisco RFGW-10:

- Configuring Route Processor Redundancy, page 76
- Configuring Stateful Switchover, page 79
Configuring Route Processor Redundancy

This section describes how to configure Route Processor Redundancy (RPR).

SUMMARY STEPS

1. enable
2. configure terminal
3. redundancy
4. mode rpr
5. main-cpu
6. auto-sync {startup-config | config_register | bootvar | standard}
7. exit
8. write memory
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>enable</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router&gt; enable</td>
</tr>
<tr>
<td></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>configure terminal</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# configure terminal</td>
</tr>
<tr>
<td></td>
<td>Enters the global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>redundancy</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config)# redundancy</td>
</tr>
<tr>
<td></td>
<td>Enters redundancy configuration mode.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>mode rpr</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-red)# mode rpr</td>
</tr>
<tr>
<td></td>
<td>Sets the mode as Route Processor Redundancy (RPR).</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>main-cpu</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-red)# main-cpu</td>
</tr>
<tr>
<td></td>
<td>Enters main-cpu mode to configure redundancy of the Supervisor card.</td>
</tr>
</tbody>
</table>
Chapter 1: Supervisor Card Redundancy

How to Configure 1:1 Supervisor Card Redundancy

Example:
The following example shows how to enter RPR and main-CPU redundancy mode:

```
Router# configure terminal
Router(config)# redundancy
Router(config-red)# mode rpr
Router(config-red)# main-cpu
Router(config-red-mc)# auto-sync standard
Router(config-red-mc)# exit
Router# write memory
```

Command or Action | Purpose
--- | ---
Step 6 auto-sync (startup-config | config_register | bootvar | standard) | Enables automatic synchronization of the active Supervisor card configuration to standby.
- **startup-config**—Specifies that the Supervisor cards should synchronize the startup configuration files.
- **config_register**—Specifies that the Supervisor cards should synchronize the configuration register values.
- **bootvar**—Specifies that the Supervisor cards should synchronize the following boot variables:
  - **BOOT**—Set by the `boot system device:filename` command
  - **CONFIG_FILE**—Set by the `boot config device:filename` command
  - **BOOTLDR**—Set by the `boot bootldr device:filename` command
- **standard**—(Default) Specifies that the Supervisor cards should synchronize all of the system files.

The no form of the command specifies that one or more files should not be synchronized.

Note: We strongly recommend that you use the `auto-sync standard` command to ensure that all system files are synchronized between the two Supervisor modules. The no `auto-sync` command is not typically used in production plants.

Step 7 exit | Exits global, redundancy configuration, and main-cpu modes, and returns to privileged EXEC mode.

Example:
```
Router(config-red-mc)# exit
```

Step 8 write memory | Saves your settings to the nonvolatile random access memory (NVRAM) to ensure that the system retains the settings after a power cycle.

Example:
```
Router# write memory
```
Configuring Stateful Switchover

This section describes how to configure Stateful Switchover (SSO).

SUMMARY STEPS

1. enable
2. configure terminal
3. redundancy
4. mode sso
5. exit
6. write memory

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| Step 1 | enable | Enables privileged EXEC mode.  
- Enter your password if prompted. |
| Example: | Router> enable | |
| Step 2 | configure terminal | Enters the global configuration mode. |
| Example: | Router# configure terminal | |
| Step 3 | redundancy | Enters redundancy configuration mode. |
| Example: | Router(config)# redundancy | |
| Step 4 | mode sso | Sets the mode as Stateful Switchover (SSO). |
| Example: | Router(config-red)# mode sso | |
| Step 5 | exit | Exits global, redundancy configuration, and main-cpu modes, and returns to privileged EXEC mode. |
| Example: | Router(config-red-mc)# exit | |
| Step 6 | write memory | Saves your settings to the nonvolatile random access memory (NVRAM) to ensure that the system retains the settings after a power cycle. |
| Example: | Router# write memory | |
Example:

The following example shows how to enter SSO redundancy mode:

```
Router# configure terminal
Router(config)# redundancy
Router(config-red)# mode sso
Router(config-red)# exit
Router# write memory
```

How to Verify 1:1 Supervisor Card Redundancy

This section describes how to verify 1:1 Supervisor Card Redundancy in Cisco RFGW-10:

- Verifying Route Processor Redundancy, page 80
- Verifying Stateful Switchover, page 82

Verifying Route Processor Redundancy

The following is a sample output of the `show redundancy` command showing Supervisor Redundancy RPR mode configured the on the Cisco RFGW-10:

```
Router# show redundancy
Load for five secs: 8%/0%; one minute: 9%; five minutes: 10%
Time source is hardware calendar, *15:26:51.687 PDT Wed Sep 16 2009

Redundant System Information :
-----------------------------
Available system uptime = 2 days, 4 hours, 5 minutes
Switchovers system experienced = 0
   Standby failures = 1
   Last switchover reason = none
   Hardware Mode = Simplex
   Configured Redundancy Mode = RPR
   Operating Redundancy Mode = RPR
   Maintenance Mode = Disabled
   Communications = Down      Reason: Simplex mode

Current Processor Information :
-----------------------------
   Active Location = slot 1
   Current Software state = ACTIVE
   Uptime in current state = 2 days, 4 hours, 5 minutes
   Image Version = Cisco IOS Software, Catalyst 4500 L3 Switch Software (rfgw-ENTSERVICESK9-M), Version 12.2(122SQ_20090905)SQ EARLY DEPLOYMENT DA TECODE BUILD, synced to 122_50_SG_THROTTLE_BASE_LABEL
   Copyright (c) 1986-2009 by Cisco Systems, Inc.
   Compiled Sat 05-Sep-09 04:24 by jdkerr
   BOOT = bootflash:rfgw-entservicesk9-mz.122SQ_20090905,12;
   Configuration register = 0x2

Peer (slot: 2) information is not available because it is in 'DISABLED' state
```
To verify the current Supervisor redundancy status, use the following command in user EXEC or privileged EXEC mode:

```
Router# show redundancy [clients | counters | history | states]
```

The following is sample output of the `show redundancy clients` command:

```
Router# show redundancy clients

clientID = 0 clientSeq = 0 RF_INTERNAL_MSG
clientID = 25 clientSeq = 130 CHKPT RF
clientID = 5 clientSeq = 170 RFS client
clientID = 50 clientSeq = 530 Slot RF
clientID = 65000 clientSeq = 65000 RF_LAST_CLIENT
```

The following is sample output of the `show redundancy counters` command:

```
Router# show redundancy counters

Redundancy Facility OMs
  comm link up = 1
  comm link down down = 0
  invalid client tx = 0
  null tx by client = 0
  tx failures = 0
  tx msg length invalid = 0
  client not rxing msgs = 0
  rx peer msg routing errors = 0
  null peer msg rx = 0
  errored peer msg rx = 0

  buffers tx = 1009
  tx buffers unavailable = 0
  buffers rx = 1006
  buffer release errors = 0

  duplicate client registers = 0
  failed to register client = 0
  Invalid client syncs = 0
```

The following is sample output of the `show redundancy history` command:

```
Router# show redundancy history

00:00:00 client added: RF_INTERNAL_MSG(0) seq=0
00:00:00 client added: RF_LAST_CLIENT(65000) seq=65000
00:00:00 client added: CHKPT RF(25) seq=130
00:00:01 client added: Slot RF(50) seq=530
00:00:15 client added: RFS client(5) seq=170
00:00:16 *my state = INITIALIZATION(2) *peer state = DISABLED(1)
00:00:16 RF_PROG_INITIALIZATION(100) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:16 RF_PROG_INITIALIZATION(100) CHKPT RF(25) op=0 rc=11
00:00:16 RF_PROG_INITIALIZATION(100) RFS client(5) op=0 rc=11
00:00:16 RF_PROG_INITIALIZATION(100) Slot RF(50) op=0 rc=11
00:00:16 RF_PROG_INITIALIZATION(100) RF_LAST_CLIENT(65000) op=0 rc=11
00:00:16 *my state = NEGOTIATION(3) peer state = DISABLED(1)
00:00:16 RF_EVENT_GO_ACTIVE(512) op=0 rc=0
00:00:16 *my state = ACTIVE-FAST(9) peer state = DISABLED(1)
00:00:16 RF_STATUS_MAINTENANCE_ENABLE(403) CHKPT RF(25) op=0 rc=0
00:00:16 RF_STATUS_MAINTENANCE_ENABLE(403) RFS client(5) op=0 rc=0
00:00:16 RF_STATUS_MAINTENANCE_ENABLE(403) Slot RF(50) op=0 rc=0
00:00:16 RF_PROG_ACTIVE_FAST(200) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:16 RF_PROG_ACTIVE_FAST(200) CHKPT RF(25) op=0 rc=11
```
The following is sample output of the `show redundancy states` command:

Router# show redundancy states

my state = 13 -ACTIVE
peer state = 8  -STANDBY HOT
  Mode = Duplex
  Unit = Primary
  Unit ID = 0

Redundancy Mode = Hot Standby Redundancy
Maintenance Mode = Disabled
Manual Swact = Enabled
Communications = Up

  client count = 5
  client_notification_TMR = 30000 milliseconds
  RF debug mask = 0x0

Verifying Stateful Switchover

The following is a sample output of the `show redundancy` command showing Supervisor redundancy SSO mode configured using the on the Cisco RFGW-10:

Router# show redundancy
Load for five secs: 8%/0%; one minute: 10%; five minutes: 10%
Time source is hardware calendar, *15:18:51.999 PDT Wed Sep 16 2009

Redundant System Information :
----------------------------------
Available system uptime = 2 days, 3 hours, 57 minutes
Switchovers system experienced = 0
  Standby failures = 0
  Last switchover reason = none

  Hardware Mode = Duplex
  Configured Redundancy Mode = Stateful Switchover
  Operating Redundancy Mode = Stateful Switchover
  Maintenance Mode = Disabled
  Communications = Up

Current Processor Information :
-----------------------------
  Active Location = slot 1
  Current Software state = ACTIVE
  Uptime in current state = 2 days, 3 hours, 57 minutes
  Image Version = Cisco IOS Software, Catalyst 4500 L3 Switch Software (rfgw-ENTSERVICESK9-M), Version 12.2(122SQ_20090905)SQ EARLY DEPLOYMENT DATECODE BUILD, synced to 122_50_SG_THROTTLE_BASE_LABEL
  Copyright (c) 1986-2009 by Cisco Systems, Inc.
  Compiled Sat 05-Sep-09 04:24 by jdkerr
  BOOT = bootflash:rfgw-entservicesk9-mz.122SQ_20090905,12;
Configuration register = 0x2

Peer Processor Information:
----------------------------
Standby Location = slot 2
Current Software state = STANDBY HOT
Uptime in current state = 2 days, 3 hours, 56 minutes
Image Version = Cisco IOS Software, Catalyst 4500 L3 Switch Software (rfgw-ENTSERVICESK9-M), Version 12.2(122SQ_20090905)SQ EARLY DEPLOYMENT DATACODE BUILD, synced to 122_50_SG_THROTTLE_BASE_LABEL
Copyright (c) 1986-2009 by Cisco Systems, Inc.
Compiled Sat 05-Sep-09 04:2
BOOT = bootflash:rfgw-entservicesk9-mz.122SQ_20090905,
12;
Configuration register = 0x2

To verify the current Supervisor redundancy status, use the following command in user EXEC or privileged EXEC mode:

Router# show redundancy [clients | counters | history | states]

The following is sample output of the show redundancy clients command:

Router# show redundancy clients
Load for five secs: 11%/0%; one minute: 10%; five minutes: 11%
Time source is hardware calendar, *15:20:08.899 PDT Wed Sep 16 2009
clientID = 0 clientSeq = 0 RF_INTERNAL_MSG
clientID = 29 clientSeq = 60 Redundancy Mode RF
clientID = 139 clientSeq = 61 IfIndex
clientID = 3300 clientSeq = 62 Persistent Variable
clientID = 25 clientSeq = 68 CHKPT RF
clientID = 77 clientSeq = 75 Event Manager
clientID = 22 clientSeq = 98 Network RF Client
clientID = 88 clientSeq = 99 HSRP
clientID = 71 clientSeq = 114 XDR RRP RF Client
clientID = 75 clientSeq = 132 TableId HA
clientID = 520 clientSeq = 135 RFS RF
clientID = 210 clientSeq = 136 Auth Mgr
clientID = 5 clientSeq = 137 Config Sync RF clien
clientID = 501 clientSeq = 145 LAN-Switch VTP VLAN
clientID = 502 clientSeq = 147 LAN-Switch Port Mana
clientID = 200 clientSeq = 165 ETHERNET OAM RF
clientID = 201 clientSeq = 166 ETHERNET CFM RF
clientID = 20 clientSeq = 177 IPROUTING NSF RF cli
clientID = 55 clientSeq = 187 GALIOS_CONFIG_SYNC
clientID = 34 clientSeq = 192 SNMP RF Client
clientID = 35 clientSeq = 202 History RF Client
clientID = 91 clientSeq = 223 REDSSOC
clientID = 250 clientSeq = 226 EEM Server RF CLIENT
clientID = 252 clientSeq = 228 EEM POLICY-DIR RF CL
clientID = 54 clientSeq = 230 SNMP HA RF Client
clientID = 57 clientSeq = 233 ARP
clientID = 50 clientSeq = 240 PH_RF_Event_Detector
clientID = 2001 clientSeq = 241 CAT4K CHASSIS
clientID = 2002 clientSeq = 242 Link State
clientID = 2003 clientSeq = 244 K2Man
clientID = 2005 clientSeq = 248 Rkios
The following is sample output of the `show redundancy counters` command:

```
Router# show redundancy counters
Load for five secs: 12%/0%; one minute: 11%; five minutes: 11%
Time source is hardware calendar, *15:18:05.943 PDT Wed Sep 16 2009

Redundancy Facility OM:
  comm link up = 1
  comm link down = 0
  invalid client tx = 0
  null tx by client = 0
  tx failures = 0
  tx msg length invalid = 0
  client not rxing msgs = 0
  rx peer msg routing errors = 0
  null peer msg rx = 0
  errored peer msg rx = 0
  buffers tx = 23994
  tx buffers unavailable = 0
  buffers rx = 20810
  buffer release errors = 0
  duplicate client registers = 0
  failed to register client = 0
  Invalid client syncs = 0
```

The following is sample output of the `show redundancy history` command:

```
Router# show redundancy history
Load for five secs: 8%/0%; one minute: 10%; five minutes: 10%
Time source is hardware calendar, *15:16:40.079 PDT Wed Sep 16 2009
00:00:00 client added: RF_INTERNAL_MSG(0) seq=0
00:00:00 client added: RF_LAST_CLIENT(65000) seq=361
00:00:00 RF_STATUS_SEND_RF_STATE(408) RF_LAST_CLIENT(65000) op=1 rc=0
00:00:01 client added: IfIndex(139) seq=61
00:00:01 RF_STATUS_SEND_RF_STATE(408) IfIndex(139) op=1 rc=0
00:00:01 client added: ISSU Test Client(4005) seq=319
00:00:01 RF_STATUS_SEND_RF_STATE(408) ISSU Test Client(4005) op=1 rc=0
00:00:01 client added: RFS RF(520) seq=135
00:00:01 client added: DATA DESCRIPTOR RF CLIENT(141) seq=323
00:00:01 client added: ISSU process(3099) seq=316
00:00:01 RF_STATUS_SEND_RF_STATE(408) ISSU process(3099) op=1 rc=0
00:00:01 client added: Persistent Variable(3300) seq=62
00:00:01 RF_STATUS_SEND_RF_STATE(408) Persistent Variable(3300) op=1 rc=0
00:00:01 client added: REP Protocol(212) seq=278
00:00:01 RF_STATUS_SEND_RF_STATE(408) REP Protocol(212) op=1 rc=0
00:00:01 client added: History RF Client(35) seq=202
00:00:01 RF_STATUS_SEND_RF_STATE(408) History RF Client(35) op=1 rc=0
00:00:01 client added: CHKPT RF(25) seq=68
00:00:01 RF_STATUS_SEND_RF_STATE(408) CHKPT RF(25) op=1 rc=0
00:00:01 client added: XDR RRP RF Client(71) seq=114
00:00:01 RF_STATUS_SEND_RF_STATE(408) XDR RRP RF Client(71) op=1 rc=0
00:00:01 client added: Config Sync RF client(5) seq=137
00:00:01 RF_STATUS_SEND_RF_STATE(408) Config Sync RF client(5) op=1 rc=0
00:00:01 client added: Config Verify RF client(94) seq=292
00:00:01 RF_STATUS_SEND_RF_STATE(408) Config Verify RF client(94) op=1 rc=0
00:00:01 client added: Inline Power rf client(505) seq=294
00:00:01 RF_STATUS_SEND_RF_STATE(408) Inline Power rf client(505) op=1 rc=0
00:00:01 client added: Port Security(508) seq=297
00:00:01 RF_STATUS_SEND_RF_STATE(408) Port Security(508) op=1 rc=0
00:00:01 client added: LAN-Switch Port Manager(502) seq=147
```
The following is sample output of the `show redundancy states` command:

```
Router# show redundancy states
Load for five secs: 8%/0%; one minute: 10%; five minutes: 11%
Time source is hardware calendar, *15:14:31.131 PDT Wed Sep 16 2009
  my state = 13  -ACTIVE
  peer state = 8   -STANDBY HOT
  Mode = Duplex
  Unit = Primary
  Unit ID = 1

Redundancy Mode (Operational) = Stateful Switchover
Redundancy Mode (Configured) = Stateful Switchover
Redundancy State = Stateful Switchover
  Maintenance Mode = Disabled
  Manual Swact = enabled
  Communications = Up
  client count = 59
  client_notification_TMR = 240000 milliseconds
  keep_alive TMR = 9000 milliseconds
  keep_alive count = 0
  keep_alive threshold = 18
  RF debug mask = 0x0
```
Additional References

The following sections provide references related to 1:1 Supervisor Card Redundancy feature.

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>rf_gateway/command/reference/RFGW-10_Book.html</td>
</tr>
<tr>
<td>New Software Features in Cisco IOS</td>
<td>Cisco RF Gateway 10 Software Feature and Configuration Guide</td>
</tr>
</tbody>
</table>

Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
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<tbody>
<tr>
<td>No new or modified standards are supported by this feature, and support</td>
<td>—</td>
</tr>
<tr>
<td>for existing standards has not been modified by this feature.</td>
<td></td>
</tr>
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</table>

MIBs

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<tr>
<th>MIB</th>
<th>MIBs Link</th>
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</thead>
<tbody>
<tr>
<td>No new or modified MIBs are supported by this feature, and support</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases,</td>
</tr>
<tr>
<td>for existing MIBs has not been modified by this feature.</td>
<td>and feature sets, use Cisco MIB Locator found at the following URL:</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
</tbody>
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RFCs

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<th>RFC</th>
<th>Title</th>
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<tr>
<td>No new or modified RFCs are supported by this feature, and support</td>
<td>—</td>
</tr>
<tr>
<td>for existing RFCs has not been modified by this feature.</td>
<td></td>
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</tbody>
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Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Support website provides extensive online resources, including</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
<tr>
<td>documentation and tools for troubleshooting and resolving technical issues</td>
<td></td>
</tr>
<tr>
<td>with Cisco products and technologies.</td>
<td></td>
</tr>
<tr>
<td>To receive security and technical information about your products, you can</td>
<td></td>
</tr>
<tr>
<td>subscribe to various services, such as the Product Alert Tool (accessed from</td>
<td></td>
</tr>
<tr>
<td>Field Notices), the Cisco Technical Services Newsletter, and Really Simple</td>
<td></td>
</tr>
<tr>
<td>Syndication (RSS) Feeds.</td>
<td></td>
</tr>
<tr>
<td>Access to most tools on the Cisco Support website requires a Cisco.com user</td>
<td></td>
</tr>
<tr>
<td>ID and password.</td>
<td></td>
</tr>
</tbody>
</table>

Feature Information for 1:1 Supervisor Card Redundancy

Table 4 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS, Catalyst OS, and Cisco IOS XE software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note: Table 4 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.
### Table 4 Feature Information for 1:1 Supervisor Card Redundancy

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
</table>
| 1:1 Supervisor Card Redundancy        | 12.2(44)SQ  | This feature was introduced in the Cisco IOS Release 12.2(44)SQ to support the Cisco RF Gateway 10. The following commands were introduced or modified:  
  - mode rpr  
  - main-cpu  
  - auto-sync {startup-config | config_register | bootvar | standard}  
  - redundancy force-switchover  
  - redundancy reload {peer | shelf}  
  - hw-module uplink select [all | gigabitethernet | tengigabitethernet]  
  - show redundancy [clients | counters | history | states] |
|                                       | 12.2(50)SQ  | Stateful Switchover (SSO) is supported in addition to RPR mode. The following commands were introduced or modified:  
  - mode {rpr | sso} |
|                                       | 12.2(50)SQ1 | Support for Video SSO is added. |

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