Configuring Supervisor Engine Redundancy on the Catalyst 4507R and 4510R Switches

This chapter describes how to configure supervisor engine redundancy on the Catalyst 4507R and Catalyst 4510R switches.

This chapter consists of the following major sections:

Note For complete syntax and usage information for the switch commands used in this chapter, first look at the *Cisco Catalyst 4500 Series Switch Command Reference* and related publications at this location:

http://www.cisco.com/en/US/products//hw/switches/ps4324/index.html

If the command is not found in the *Catalyst 4500 Command Reference*, it will be found in the larger Cisco IOS library. Refer to the *Catalyst 4500 Series Switch Cisco IOS Command Reference* and related publications at this location:

http://www.cisco.com/en/US/products/ps6350/index.html

Overview of Supervisor Engine Redundancy

Catalyst 4500 series switches allow a standby supervisor engine to take over if the primary supervisor engine fails, thereby allowing the switch to resume operation quickly in the event of a supervisor engine failure. This capability is called supervisor engine redundancy. In software, this capability is enabled by route processor redundancy (RPR) operating mode.

The standby supervisor engine runs in RPR mode. When RPR mode is used, the standby supervisor engine partially boots and keeps synchronized copies of the active configuration, which shortens the time needed to bring up the standby supervisor engine and have it start handling traffic from 1.5 minutes (for a cold boot on the standby) to 30 seconds (to finish the boot and re establish links).

In addition to the reduced switchover time, supervisor engine redundancy supports the following:

- Online insertion and removal (OIR) of the standby supervisor engine.
- Software upgrade. (See the "Performing a Software Upgrade" section on page 36-5.)
- Auto-startup and bootvar synchronization.
- Hardware signals that detect and decide the active or standby status of supervisor engine.
- Automatic switchover to the standby supervisor engine if the active supervisor engine ever fails.

When the switch is powered on, the two supervisor engines determine which will serve as the primary and which will be the standby. Usually, the supervisor engine that boots first, either in slot 1 or 2, becomes the active supervisor engine.

A switchover will occur when one or more of the following events take place:

- The active supervisor engine fails or is removed.
- A user forces a switchover.
- A user reloads the active supervisor engine.
- A core dump occurs.

Note In a switchover, there is a disruption of traffic because some address states are lost and then restored after they are dynamically redetermined.

Understanding Supervisor Engine Redundancy

These sections describe supervisor engine redundancy:

Operation

With supervisor engine redundancy enabled, the standby supervisor engine automatically takes over for the primary supervisor engine if the active supervisor engine fails or if a manual switchover is performed. The standby supervisor engine has already been automatically initialized and configured, shortening the switchover time. Supervisor engine redundancy provides the following additional benefits:

- Online insertion and removal (OIR) of the standby supervisor engine

  Supervisor engine redundancy allows OIR of the standby supervisor engine for maintenance. When the standby supervisor engine is inserted, the active supervisor engine detects its presence and begins to transition the standby supervisor engine to the fully initialized state.
- Software upgrade

To minimize software upgrade and downgrade times, you can preload the standby supervisor engine with the software version you want to upgrade or downgrade to and then configure the system to switch over to the standby supervisor engine.

Supervisor engine redundancy also supports manual user-initiated switchover. You can initiate a switchover with the **redundancy force-switchover** command.

Supervisor Engine Synchronization

Because the standby supervisor engine is not fully initialized, it interacts with the active supervisor engine only to receive configuration changes as they occur, keeping the configuration information on both supervisor engines identical. This synchronization of the startup configuration file is enabled by default in RPR mode. You cannot enter CLI commands on the standby supervisor engine.

When a standby supervisor engine is running in RPR mode, the following operations trigger synchronization of the configuration information:

- When a standby supervisor engine first comes online, the configuration information is synchronized from the active supervisor engine to the standby supervisor engine. This synchronization overwrites any existing startup configuration file on the standby supervisor engine.
- If the **auto-synch** command is enabled, changes to the startup configuration on the active supervisor engine are automatically synchronized on the standby supervisor.

Supervisor Engine Redundancy Guidelines and Restrictions

The following guidelines and restrictions apply to supervisor engine redundancy:

- Supervisor engine redundancy does not provide supervisor engine load balancing or any other feature requiring two active supervisor engines. Only one supervisor engine is active. Network services are disrupted until the standby supervisor engine takes over and the switch recovers.
- When usingRPR mode with WS-4513+ and WS-X4515 supervisor engines, only the Gig 1/1 and Gig 2/1 Gigabit Ethernet interfaces on each supervisor engine are available. The Gig 1/2 and Gig 2/2 interfaces are not available.

Note This restriction applies only to the WS-4513+ and WS-X4515 supervisor engines. The WS-X4516 supervisor engines support all four Gigabit Ethernet interfaces in RPR mode.

- With supervisor engine redundancy enabled, the supervisor engines may run different releases of Cisco IOS software if both releases are Cisco IOS Release 12.1(12c)EW or later.
- The Forwarding Information Base (FIB) tables are cleared on a switchover. As a result, routed traffic is interrupted until route tables reconverge.
- Static IP routes are maintained across a switchover because they are configured from entries in the configuration file.
- Information about dynamic states maintained on the active supervisor engine is not synchronized to the standby supervisor engine and is lost on switchover. Dynamic state information (such as border gateway protocol [BGP] session information) is lost at switchover.
- The Catalyst 4507R and the 4510R switches are the only Catalyst 4500 series switches that support supervisor engine redundancy.

- The Catalyst 4510R switch supports the WS-X4516 supervisor engine only. The Catalyst 4507R switch supports the other redundant supervisor engines (Supervisor Engine II-Plus and Supervisor Engine IV and WS-X4516). Do not mix and match different supervisor models in a redundancy configuration.
- The active and standby supervisor engines must be in slots 1 and 2.
- Both the active and standby supervisor engines must support redundancy (Supervisor Engine II-Plus and Supervisor Engine IV). Earlier versions are not supported.
- Each supervisor engine must have the resources to run the switch on its own, which means that each supervisor engine has its own Flash device and console port connections.
- Make separate console connections to each supervisor engine. Do not connect a Y cable to the console ports.
- You must set the configuration register in the startup-config to autoboot. (See the "Modifying the Boot Field" section on page 3-15.)

Note There is no support for booting from the network.

If these requirements are met, the switch functions in RPR mode by default.

Configuring Supervisor Engine Redundancy

Supervisor engine redundancy is configured by default when a second supervisor engine is detected.

This example shows how to display the redundancy state:

```
Switch#show redundancy states
       my state = 13 -ACTIVE
     peer state = 4  -STANDBY COLD
           Mode = Duplex
           Unit = Primary
        Unit ID = 1

Redundancy Mode (Operational) = RPR
Redundancy Mode (Configured)  = RPR
     Split Mode = Disabled
   Manual Swact = Enabled
 Communications = Up

   client count = 4
 client_notification_TMR = 30000 milliseconds
          keep_alive TMR = 4000 milliseconds
        keep_alive count = 1
    keep_alive threshold = 7
           RF debug mask = 0x0
Switch#
```

Synchronizing the Supervisor Engine Configurations

During normal operation, the startup-config, boot variables, config-registers, and VLAN database configuration are synchronized by default between the two supervisor engines. In a switchover, the new active supervisor engine uses the current configuration.

To manually synchronize the configurations used by the two supervisor engines, perform this task on the active supervisor engine:

	Command	Purpose
Step 1	`Switch(config)# redundancy`	Enters redundancy configuration mode.
Step 2	`Switch(config-red)# main-cpu`	Enters main-cpu configuration submode.
Step 3	`Switch(config-r-mc)# auto-sync {startup-config | config-register | bootvar | standard}`	Synchronizes the configuration elements.
Step 4	`Switch(config-r-mc)# end`	Returns to privileged EXEC mode.
Step 5	`Switch# copy running-config startup-config`	Forces a manual synchronization of the configuration files in NVRAM. **Note** This step is not required to synchronize the running configuration file in dynamic random-access memory (DRAM).

Note The **auto-sync** command controls the synchronization of the CONFIG-REG, BOOTVAR and STARTUP/PRIVATE configuration files only. The calendar and **vlan** database files are always synchronized when they change.

This example shows how to reenable the default automatic synchronization feature using the **auto-sync standard** command to synchronize the **startup-config** and **config-register** configuration of the active supervisor engine with the standby supervisor engine: updates for the boot variables are automatic and cannot be disabled.

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)# auto-sync standard
Switch(config-r-mc)# end
Switch# copy running-config startup-config
```

Note To manually synchronize individual elements of the standard auto-sync configuration, disable the default automatic synchronization feature.

This example shows how to disable default automatic synchronization and allow only automatic synchronization of the config-registers of the active supervisor engine to the standby supervisor engine, while disallowing synchronization of the startup configuration:

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)# no auto-sync standard
Switch(config-r-mc)# auto-sync config-register
Switch(config-r-mc)# end
```

Performing a Software Upgrade

The software upgrade procedure supported by supervisor engine redundancy allows you to upgrade the Cisco IOS software image on the supervisor engines without reloading the system.

To perform a software upgrade, perform this task:

	Command	Purpose

Step 1	`Switch# copy source_device:source_filename slot0:target_filename`
	
	Or:
	
	`Switch# copy source_device:source_filename bootflash:target_filename`
	
	Or:
	
	`Switch# copy source_device:source_filename slaveslot0:target_filename`
	
	Or:
	
	`Switch# copy source_device:source_filename slavebootflash:target_filename`
		Copies the new Cisco IOS software image to bootflash on both supervisor engines.

Step 2	`Switch# config terminal`
	`Switch(config)# config-register 0x2`
	`Switch(config)# boot system flash device:file_name`
		Configures the supervisor engines to boot the new image.

Step 3	`Switch# copy running-config start-config`	Saves the configuration.
Step 4	`Switch# redundancy reload peer`	Reloads the standby supervisor engine and bring it back online (running the new version of the Cisco IOS software). **Note** Before reloading the standby supervisor engine, make sure you wait long enough to ensure that all configuration synchronization changes have completed.
Step 5	`Switch# redundancy force-switchover`	Conducts a manual switchover to the standby supervisor engine. The standby supervisor engine becomes the new active supervisor engine running the new Cisco IOS software image. The modules reload and the module software downloads from the new active supervisor engine. The old active supervisor engine reboots with the new image and becomes the standby supervisor engine.

This example shows how to perform a software upgrade:

```
Switch# config terminal
Switch(config)# config-register 0x2
Switch(config)# boot system flash slot0: cat4000-is-mz.121-11b.EW
Switch# copy running-config start-config
Switch# redundancy reload peer
Switch# redundancy force-switchover
Switch#
```

Copying Files to the Standby Supervisor Engine

If you want to manually copy a file from the active supervisor engine to the **slot0:** device on the standby supervisor engine, use this command:

```
Switch# copy source_device:source_filename slaveslot0:target_filename
```

To copy a file to the **bootflash:** device on a standby supervisor engine, use this command:

```
Switch# copy source_device:source_filename slavebootflash:target_filename
```