



## CHAPTER 8

# Configuring High Availability

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The Cisco MDS 9500 Series of multilayer directors support application restartability and nondisruptive supervisor switchability. The switches are protected from system failure by redundant hardware components and a high availability software framework.

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## About High Availability

The high availability (HA) software framework provides the following:

- Ensures nondisruptive software upgrade capability. See [Chapter 6, “Software Images.”](#)
- Provides redundancy for supervisor module failure by using dual supervisor modules.
- Performs nondisruptive restarts of a failed process on the same supervisor module. A service running on the supervisor modules and on the switching module tracks the HA policy defined in the configuration and takes action based on this policy. This feature is also available in switches in the Cisco MDS 9200 Series and the Cisco MDS 9100 Series.
- Protects against link failure using the PortChannel (port aggregation) feature. This feature is also available in switches in the Cisco MDS 9200 Series and in the Cisco MDS 9100 Series. See [Chapter 15, “Configuring PortChannels.”](#)
- Provides management redundancy using the Virtual Router Redundancy Protocol (VRRP). This feature is also available in switches in the Cisco MDS 9200 Series and in the Cisco MDS 9100 Series.  
See the [“Virtual Router Redundancy Protocol” section on page 43-16.](#)
- Provides switchovers if the active supervisor fails. The standby supervisor, if present, takes over without disrupting storage or host traffic.

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Directors in the Cisco MDS 9500 Series have two supervisor modules (sup-1 and sup-2) in slots 5 and 6 (Cisco MDS 9509 and 9506 Switches) or slots 7 and 8 (Cisco MDS 9513 Switch). When the switch powers up and both supervisor modules are present, the supervisor module that comes up first enters the active mode and the supervisor module that comes up second enters the standby mode. If both supervisor modules come up at the same time, sup-1 becomes active. The standby supervisor module constantly monitors the active supervisor module. If the active supervisor module fails, the standby supervisor module takes over without any impact to user traffic.


**Note**

For high availability, you need to connect the ethernet port for both active and standby supervisors to the same network or virtual LAN. The active supervisor owns the one IP address used by these ethernet connections. On a switchover, the newly activated supervisor takes over this IP address.

## Switchover Mechanisms

Switchovers occur by one of the following two mechanisms:

- The active supervisor module fails and the standby supervisor module automatically takes over.
- You manually initiate a switchover from an active supervisor module to a standby supervisor module.

Once a switchover process has started another switchover process cannot be started on the same switch until a stable standby supervisor module is available.


**Caution**

If the standby supervisor module is not in a stable state (ha-standby), a switchover is not performed.

## HA Switchover Characteristics

An HA switchover has the following characteristics:

- It is stateful (nondisruptive) because control traffic is not impacted.
- It does not disrupt data traffic because the switching modules are not impacted.
- Switching modules are not reset.

## Initiating a Switchover

To manually initiate a switchover from an active supervisor module to a standby supervisor module, issue the **system switchover** command. Once issued, another switchover process cannot be started on the same switch until a stable standby supervisor module is available.

To ensure that an HA switchover is possible, issue the **show system redundancy status** command or the **show module** command. If the command output displays the `HA-standby` state for the standby supervisor module, then the switchover is possible.

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## Switchover Guidelines

Be aware of the following guidelines when performing a switchover:

- When you manually initiate a switchover, system messages indicate the presence of two supervisor modules.
- A switchover can only be performed when two supervisor modules are functioning in the switch.
- The modules in the chassis are functioning as designed.

## Verifying Switchover Possibilities

This section describes how to verify the status of the switch and the modules before a switchover.

- Use the **show system redundancy status** command to ensure that the system is ready to accept a switchover.
- Use the **show module** command to verify the status (and presence) of a module at any time. A sample output of the **show module** command follows:

```
switch# show module
Mod  Ports  Module-Type                Model                Status
---  -
2    8      IP Storage Services Module DS-X9308-SMIP       ok
5    0      Supervisor/Fabric-1       DS-X9530-SF1-K9     active *
6    0      Supervisor/Fabric-1       DS-X9530-SF1-K9     ha-standby
8    0      Caching Services Module  DS-X9560-SMAP       ok
9    32     1/2 Gbps FC Module       DS-X9032             ok

Mod  Sw          Hw          World-Wide-Name(s) (WWN)
---  -
2    1.3(0.106a) 0.206      20:41:00:05:30:00:00:00 to 20:48:00:05:30:00:00:00
5    1.3(0.106a) 0.602      --
6    1.3(0.106a) 0.602      --
8    1.3(0.106a) 0.702      --
9    1.3(0.106a) 0.3        22:01:00:05:30:00:00:00 to 22:20:00:05:30:00:00:00

Mod  MAC-Address(es)                Serial-Num
---  -
2    00-05-30-00-9d-d2 to 00-05-30-00-9d-de JAB064605a2
5    00-05-30-00-64-be to 00-05-30-00-64-c2 JAB06350B1R
6    00-d0-97-38-b3-f9 to 00-d0-97-38-b3-fd JAB06350B1R
8    00-05-30-01-37-7a to 00-05-30-01-37-fe JAB072705ja
9    00-05-30-00-2d-e2 to 00-05-30-00-2d-e6 JAB06280ae9
```

\* this terminal session

The `Status` column in the output should display an `OK` status for switching modules and an `active` or `HA-standby` status for supervisor modules. If the status is either `OK` or `active`, you can continue with your configuration.

- Use the **show boot auto-copy** command to verify the configuration of the auto-copy feature and if an auto-copy to the standby supervisor module is in progress. Sample outputs of the **show boot auto-copy** command follow:

```
switch# show boot auto-copy
Auto-copy feature is enabled
switch# show boot auto-copy list
No file currently being auto-copied
```

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## Process Restartability

Process restartability provides the high availability functionality in Cisco MDS 9000 Family switches. It ensures that process-level failures do not cause system-level failures. It also restarts the failed processes automatically. This vital process functions on infrastructure that is internal to the switch.

See the “[Displaying System Processes](#)” section on page 1-1.

## Synchronizing Supervisor Modules

The running image is automatically synchronized in the standby supervisor module by the active supervisor module. The boot variables are synchronized during this process.

The standby supervisor module automatically synchronizes its image with the running image on the active supervisor module.

See the “[Replacing Modules](#)” section on page 6-40.

## Copying Boot Variable Images to the Standby Supervisor Module

You can copy the boot variable images that are in the active supervisor module (but not in the standby supervisor module) to the standby supervisor module. Only those KICKSTART and SYSTEM boot variables that are set for the standby supervisor module can be copied. For module (line card) images, all boot variables are copied to the corresponding standby locations (bootflash: or slot0:) if not already present.

## Automatic Copying of Boot Variables

To enable or disable automatic copying of boot variables, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>boot auto-copy</b> Auto-copy administratively enabled	Enables (default) automatic copying of boot variables from the active supervisor module to the standby supervisor module.
	switch(config)# <b>no boot auto-copy</b> Auto-copy administratively disabled	Disables the automatic copy feature.

## Verifying the Copied Boot Variables

Use the **show boot auto-copy** command to verify the current state of the copied boot variables. This example output shows that automatic copying is enabled.

```
switch# show boot auto-copy
Auto-copy feature enabled
```

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This example output shows that automatic copying is disabled.

```
switch# show boot auto-copy
Auto-copy feature disabled
```

Use the **show boot auto-copy list** command to verify what files are being copied. This example output displays the image being copied to the standby supervisor module's bootflash. Once this is successful, the next file will be image2.bin.



**Note**

This command only displays files on the active supervisor module.

```
switch# show boot auto-copy list
File: /bootflash:/image1.bin
Bootvar: kickstart
```

```
File:/bootflash:/image2.bin
Bootvar: system
```

This example output displays a typical message when the **auto-copy** option is disabled or if no files are copied.

```
switch# show boot auto-copy list
No file currently being auto-copied
```

## Displaying HA Status Information

Use the **show system redundancy status** command to view the HA status of the system. Tables 8-1 to 8-3 explain the possible output values for the redundancy, supervisor, and internal states.

```
switch# show system redundancy status
Redundancy mode
-----
      administrative:  HA
      operational:    HA
This supervisor (sup-1)
-----
      Redundancy state:  Active
      Supervisor state:  Active
      Internal state:    Active with HA standby
Other supervisor (sup-2)
-----
      Redundancy state:  Standby
      Supervisor state:  HA standby
      Internal state:    HA standby
```

The following conditions identify when automatic synchronization is possible:

- If the internal state of one supervisor module is *Active with HA standby* and the other supervisor module is *HA-standby*, the switch is operationally HA and can do automatic synchronization.
- If the internal state of one of the supervisor modules is *none*, the switch cannot do automatic synchronization.

Table 8-1 lists the possible values for the redundancy states.

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**Table 8-1 Redundancy States**

State	Description
Not present	The supervisor module is not present or is not plugged into the chassis.
Initializing	The diagnostics have passed and the configuration is being downloaded.
Active	The active supervisor module and the switch is ready to be configured.
Standby	A switchover is possible.
Failed	The switch detects a supervisor module failure on initialization and automatically attempts to power-cycle the module three (3) times. After the third attempt it continues to display a failed state.
Offline	The supervisor module is intentionally shut down for debugging purposes.
At BIOS	The switch has established connection with the supervisor and the supervisor module is performing diagnostics.
Unknown	The switch is in an invalid state. If it persists, call TAC.

Table 8-2 lists the possible values for the supervisor module states.

**Table 8-2 Supervisor States**

State	Description
Active	The active supervisor module in the switch is ready to be configured.
HA standby	A switchover is possible.
Offline	The switch is intentionally shut down for debugging purposes.
Unknown	The switch is in an invalid state and requires a support call to TAC.

Table 8-3 lists the possible values for the internal redundancy states.

**Table 8-3 Internal States**

State	Description
HA standby	The HA switchover mechanism in the standby supervisor module is enabled (see the <a href="#">“HA Switchover Characteristics”</a> section on page 8-2).
Active with no standby	A switchover is possible.
Active with HA standby	The active supervisor module in the switch is ready to be configured. The standby supervisor module is in the HA-standby state.
Shutting down	The switch is being shut down.
HA switchover in progress	The switch is in the process of changing over to the HA switchover mechanism.
Offline	The switch is intentionally shut down for debugging purposes.
HA synchronization in progress	The standby supervisor module is in the process of synchronizing its state with the active supervisor modules.
Standby (failed)	The standby supervisor module is not functioning.

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**Table 8-3**      ***Internal States (continued)***

<b>State</b>	<b>Description</b>
Active with failed standby	The active supervisor module and the second supervisor module is present but is not functioning.
Other	The switch is in a transient state. If it persists, call TAC.

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