



## Configuring High Availability

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This chapter provides details on the high availability feature that is available on switches with two supervisor modules. It includes the following sections:

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# About High Availability

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

- Ensures nondisruptive software upgrade capability. See [Chapter 5, “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 Cisco MDS 9216 switches.
- Protects against link failure using the PortChannel (port aggregation) feature. See [Chapter 11, “Configuring PortChannels.”](#)
- Provides management redundancy using Virtual Routing Redundancy Protocol (VRRP). See the [“Configuring VRRP” section on page 16-12.](#)
- Switchability—When the active supervisor fails, the standby supervisor, if present, takes over without disrupting traffic.

Directors in the Cisco MDS 9500 Series have two supervisor modules in the two center slots (sup-1 and sup-2). 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. The standby module constantly monitors the active module. If the active module fails, the standby module takes over without any impact to user traffic.

**Note**

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With the exception of nondisruptive restarts of failed processes on the same supervisor module, all other features pertain specifically to the MDS 9500 Series of multilayer directors.

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# Switchover Mechanisms

When the active supervisor module fails, the standby module automatically takes over. You can also issue a **system switchover** command to specifically initiate a switchover from an active supervisor module to a standby supervisor module.

Any switchover function is nonreversible. Once a switchover has occurred and the failed processor has been replaced or successfully restarted, you cannot switch back to the original, active supervisor module (unless there is a subsequent failure or you issue the **system switchover** command).

Two switchover modes are available in the Cisco MDS 9000 Family: HA (default) or warm.



Note

To determine version compatibility between switch images, use the **show version compatibility** command (see the [“Upgrading Software Images on Modules”](#) section on page 5-10). If the images are not compatible, an HA switchover is not possible.

## HA Switchover

When a **show system redundancy status** or a **show module** command displays the HA-standby state for the standby supervisor module, an HA switchover (default) is possible. An HA switchover has the following characteristics:

- Is stateful (nondisruptive) since control traffic is not impacted
- Does not impact data traffic since the switching modules are not impacted
- Switching modules are not reset

This is the best possible scenario because there is no system downtime.

## Warm Switchover

When a **show system redundancy status** or a **show module** command displays the standby state for the standby supervisor module, a warm switchover is possible. A warm switchover has the following characteristics:

- Is stateless (disruptive) since control traffic will be impacted.
- Impacts data traffic since switching modules will be impacted.
- Switching modules are reset with a significantly reduced bring up time

This kind of switchover is faster than powering down the switching module and starting over because the switching modules use an optimal bring up time.

# Configuring System Switchover

By default, the system uses a HA switchover. When two supervisor modules are available on the system, you can switch over from the active to the standby supervisor module using a **HA** (nondisruptive) or **warm** (disruptive) switchover. In the HA switchover mode, a switchover is performed where possible. If HA switchover is not possible, the warm switchover mode is attempted. If warm switchover mode is configured, then HA switchover is disabled.



## Caution

Switching from HA to warm or warm to HA modes cause the standby supervisor module to reset.

To define the switchover mechanism in a switch, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>system switchover warm</b> switch(config)#	Configures the switch to perform a stateless (disruptive) switchover the next time a switchover occurs (EXEC mode command or in response to a failure).
	switch(config)# <b>system switchover HA</b> switch(config)#	Reverts the switch settings to perform the default stateful (nondisruptive) switchover the next time a switchover occurs (EXEC mode command or in response to a failure).
	or issue the following command:  switch(config)# <b>no system switchover</b> switch(config)#	Restores the default settings (HA switchover).

## Switchover Guidelines

Be aware of the following guidelines when performing a switchover:

- Use the **system switchover** command when you need to upgrade the software (see the “[Upgrading Software Images on Modules](#)” section on page 5-10).
- The **system switchover** command returns the following message when the standby supervisor is not present in the switch:

```
switch# system switchover
Failed to switchover: (supervisor has no standby)
```

- You can only perform a switchover when the switch has two supervisor modules functioning in the switch. Use the **show system redundancy status** command to ensure that the system is ready to accept a switchover.
- Verify that the modules in the chassis are functioning as designed. To verify the status of a module at any time, issue the **show module** command in EXEC mode. A sample output of the **show module** command follows:

```
switch# show module
Mod  Ports  Module-Type                Model                Status
---  -
2    16     1/2 Gbps FC Module        DS-X9016             ok
5     0     Supervisor/Fabric-1       DS-X9530-SF1-K9     active *
6     0     Supervisor/Fabric-1       DS-X9530-SF1-K9     HA-standby
8    32     1/2 Gbps FC Module        DS-X9032             ok
```

```

Mod  Sw          Hw          World-Wide-Name(s) (WWN)
---  -
2    1.0(0.253)   1.0         20:41:00:05:30:00:38:de to 20:50:00:05:30:00:38:de
5    1.0(0.253)   1.0         --
6    1.0(0.253)   1.0         --
8    1.0(0.253)   1.0         20:41:00:05:30:00:38:de to 20:50:00:05:30:00:38:de

```

```

Mod  MAC-Address(es)          Serial-Num
---  -
2    00-05-30-00-0f-e4 to 00-05-30-00-0f-e8   jab0636063v
5    00-05-30-00-19-66 to 00-05-30-00-19-6a   jab06370593
6    00-05-30-02-20-02 to 00-05-30-02-20-06   jab06371593
8    00-05-30-00-1a-12 to 00-05-30-00-1a-16   jab06370574

```

\* this terminal session

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



**Note** A standby supervisor module reflects the HA-standby status if the HA switchover mechanism is enabled. If the warm switchover mechanism is enabled, the standby supervisor module reflects the standby status.

## Process Restartability

Process restartability provides the high availability functionality in Cisco MDS 9000 Family switches. It ensures that the application-level failures do not cause system-level failures. It also restarts the failed applications automatically.

This vital process functions on infrastructure that is internal to the switch.

See “[Displaying System Processes](#)” section on page 25-2.

## Synchronizing Supervisor Modules

The **system auto-sync image** option is disabled by default on switches in the Cisco MDS 9000 Series. This command can only be operational if the following cases apply:

- the **system switchover HA** command is configured.
- two supervisor modules are up and running

You can synchronize the standby supervisor module software image with the bootflash image using the **system auto-sync image** command in configuration mode. The current image is synchronized in both supervisor modules (see the “[Specifying Kickstart and System Images](#)” section on page 5-11).

To enable or disable automatic synchronization, follow these steps:

	Command	Purpose
Step 1	switch# <b>config t</b> switch(config)#	Enters configuration mode.
Step 2	switch(config)# <b>system system auto-sync image</b> switch(config)#	Enables automatic synchronization.
	switch(config)# <b>no system auto-sync image</b> Automatic synchronization of BOOT and KICKSTART is now disabled.	Disables automatic synchronization (default).



#### Note

Be sure to point the SYSTEM variable to the system image for the installation procedure.

When you log in to the switch after the basic upgrade, the standby supervisor module synchronizes its image automatically with the running image on the active supervisor module. To upgrade the image, you must disable this option. By disabling this option, you are ensuring that the synchronization does not take place with undesired images. Enabling this option synchronizes the running image on both supervisor modules. During a synchronization, the boot variables are not synchronized. The boot variables are independent of the two supervisor modules (see “[Upgrading Switches with Dual Supervisor Modules](#)” section on page 5-8).

Use the **show auto-sync** command to view the status of the auto-sync configuration. See [Example 4-1](#).

#### Example 4-1 Displays Auto Synchronization Status

```
switch# show system auto-sync
auto-sync is disabled
auto-sync not started
```

You can view the output of the **show system redundancy** command to verify if HA switchover and automatic synchronization are enabled and operational.

## Displaying HA Information

Use the **show system redundancy status** command to view the high availability status of the system. See [Example 4-2](#).

#### Example 4-2 Displays Redundancy Status

```
switch# show system redundancy status
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 of the other supervisor module is `HA standby` or vice-versa, the switch is operationally HA and can do automatic synchronization.
- If the internal state of one supervisor module is `Active with warm standby` and of the other supervisor module is `Warm standby` or vice-versa, the switch is operationally warm and cannot do automatic synchronization.
- If the internal of one of the supervisor modules is `none` the switch cannot do automatic synchronization.

Table 4-1 lists the possible values for the redundancy states.

**Table 4-1 Switch Redundancy States**

State	Description
Not present	The supervisor module is not present or is not plugged in to the switch.
Initializing	The diagnostics have passed and the configuration is being downloaded.
Active	This module is the active supervisor module and the switch is ready to be configured.
Standby	This module is the standby supervisor module and the warm switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
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 switch is intentionally shut down for debugging purposes.
At BIOS	The module 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 4-2 lists the possible values for the Supervisor state.

**Table 4-2 Supervisor States**

State	Description
Active	This module is the active supervisor module and the switch is ready to be configured.
HA standby	This module is the standby supervisor module and the HA switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
Warm standby	This module is the standby supervisor module and the warm switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
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 4-3 lists the possible values for the internal state.

**Table 4-3 Internal Switch States**

State	Description
Warm standby	This module is the standby supervisor module and the warm switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
HA standby	This module is the standby supervisor module and the HA switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
Active with no standby	This module is the active supervisor module, and the second supervisor module is not present in the switch.
Active with HA standby	This module is the active supervisor module and the switch is ready to be configured. The standby module is in the HA-standby state.
Active with warm standby	This module is the standby supervisor module and the warm switchover mechanism is enabled (see the “ <a href="#">HA Switchover</a> ” section on page 4-3).
Shutting down	The switch is being shut down.
Warm switchover in progress	The switch is in the process of changing over to the warm switchover mechanism.
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 supervisor modules.
Standby (failed)	The standby supervisor module is not functioning.
Active with failed standby	This module is 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.

## Default Settings

[Table 4-4](#) lists the default settings for high availability features.

**Table 4-4 Default High Availability Setting**

Parameters	Default
Switchover mode	HA