High Availability and Redundancy Configuration Guide, Cisco DCNM for SAN, Release 5.x

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C O N T E N T S

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New and Changed Information

As of Cisco DCNM Release 5.2, Cisco Fabric Manager and Cisco Data Center Network Manager for LAN are merged into one unified product called Cisco Data Center Network Manager (DCNM) that can manage both LAN and SAN environments. As a part of this product merger, the name Cisco DCNM for SAN replaces the name Cisco Fabric Manager.

The following documentation changes support the merged Cisco DCNM product:

- Cisco DCNM product documentation for Cisco DCNM Release 5.2 is retitled with the name Cisco DCNM for LAN.

- Cisco Fabric Manager product documentation for Cisco DCNM Release 5.2 is retitled with the name Cisco DCNM for SAN.

- Cisco DCNM for SAN product documentation is now published to the Data Center Network Manager listing page on Cisco.com:
  http://www.cisco.com/en/US/products/ps9369/tsd_products_support_configure.html

  This URL is also the listing page for Cisco DCNM for LAN product documentation.

- Cisco Fabric Manager documentation for software releases earlier than Cisco DCNM Release 5.2, retains the name Cisco Fabric Manager and remains available at its current Cisco.com listing page:
  http://www.cisco.com/en/US/products/ps10495/tsd_products_support_configure.html

  You should continue to use the Cisco Fabric Manager documentation if you are using a release of Cisco Fabric Manager software that is earlier than Cisco DCNM Release 5.2.

- The name DCNM-SAN is used in place of Cisco DCNM for SAN in the user interface of Cisco Data Center Network Manager; likewise, the name DCNM-LAN is used in place of Cisco DCNM for LAN in the user interface. To match the user interface, the product documentation also uses the names DCNM-SAN and DCNM-LAN.

- The following new publications support both Cisco DCNM for LAN and DCNM for SAN, and address the new licensing model, the new installation process, and the new features of Cisco DCNM:

  - *Cisco DCNM Installation and Licensing Guide*

  - *Cisco DCNM Release Notes*

For a complete list of Cisco DCNM documentation, see the "Related Documentation" section in the Preface.

As of Cisco MDS NX-OS Release 4.2(1), software configuration information is available in new feature-specific configuration guides for the following information:

- System management

- Interfaces

- Fabric

- Quality of service
- Security
- IP services
- High availability and redundancy

The information in these new guides previously existed in the *Cisco MDS 9000 Family CLI Configuration Guide* and in the *Cisco MDS 9000 Family Fabric Manager Configuration Guide*. Those configuration guides remain available on Cisco.com and should be used for all software releases prior to MDS NX-OS Release 4.2(1). Each guide addresses the features introduced in or available in a particular release. Select and view the configuration guide that pertains to the software installed in your switch.

Some information from the *Cisco MDS 9000 Family CLI Configuration Guide* and the *Cisco MDS 9000 Family Fabric Manager Configuration Guide* now appears in the following guides that are common among products that run the Nexus operating system:

- *Cisco NX-OS Family Licensing Guide* – Explains the licensing model and describes the feature licenses.
- *Cisco NX-OS Fundamentals Configuration Guide* – Describes the switch setup utility and includes general CLI, file system, and configuration information.

For a complete list of document titles, see the list of Related Documentation in the "Preface."

To find additional information about Cisco MDS NX-OS Release 4.2(x), see the *Cisco MDS 9000 Family Release Notes* available at the following Cisco Systems website:

http://www.cisco.com/en/US/products/ps5989/prod_release_notes_list.htm

About this Guide

The information in the new *High Availability and Redundancy Configuration Guide, Cisco DCNM for SAN* previously existed in Part 2: Installation and Switch Management of the *Cisco MDS 9000 Family Fabric Manager Configuration Guide.*

There are no new or changed DCNM for SAN features for high availability and redundancy in MDS NX-OS Release 5.2(1).

Preface

This preface describes the audience, organization, and conventions of the *High Availability and Redundancy Configuration Guide, Cisco DCNM for SAN*. It also provides information on how to obtain related documentation.

Audience

This guide is for experienced network administrators who are responsible for configuring and maintaining the Cisco MDS 9000 Family of multilayer directors and fabric switches.

Organization

This guide is organized as follows:

Chapter 1	High Availability Overview	Provides an overview of high availability and redundancy features.
Chapter 2	Configuring High Availability	Describes how to configure the high availability feature, including switchover processes.

Document Conventions

Command descriptions use these conventions:

boldface font	Commands and keywords are in boldface.
italic font	Arguments for which you supply values are in italics.
[ ]	Elements in square brackets are optional.
[x	y	z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.

Screen examples use these conventions:

screen font	Terminal sessions and information the switch displays are in screen font.
boldface screen font	Information you must enter is in boldface screen font.
italic screen font	Arguments for which you supply values are in italic screen font.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

This document uses the following conventions:

Note   Means reader *take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Caution   Means *reader be careful.* In this situation, you might do something that could result in equipment damage or loss of data.

Related Documentation

The documentation set for the Cisco MDS 9000 Family includes the following documents. To find a document online, use the Cisco MDS NX-OS Documentation Locator at:

http://www.cisco.com/en/US/docs/storage/san_switches/mds9000/roadmaps/doclocater.htm

Release Notes

- *Cisco MDS 9000 Family Release Notes for Cisco MDS NX-OS Releases*
- *Cisco MDS 9000 Family Release Notes for MDS SAN-OS Releases*
- *Cisco MDS 9000 Family Release Notes for Cisco MDS 9000 EPLD Images*
- *Cisco DCNM Release Notes*

Regulatory Compliance and Safety Information

- *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*

Compatibility Information

- *Cisco Data Center Interoperability Support Matrix*
- *Cisco MDS 9000 NX-OS Hardware and Software Compatibility Information and Feature Lists*
- *Cisco MDS 9000 Family Switch-to-Switch Interoperability Configuration Guide*

Hardware Installation

- *Cisco MDS 9500 Series Hardware Installation Guide*
- *Cisco MDS 9200 Series Hardware Installation Guide*
- *Cisco MDS 9100 Series Hardware Installation Guide*
- *Cisco MDS 9124 and Cisco MDS 9134 Multilayer Fabric Switch Quick Start Guide*

Software Installation and Upgrade

- *Cisco MDS 9000 NX-OS Software Upgrade and Downgrade Guide*

Cisco NX-OS

- *Cisco MDS 9000 Family NX-OS Licensing Guide*
- *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*
- *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Quality of Service Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Security Configuration Guide*
- *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Intelligent Storage Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS High Availability and Redundancy Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Inter-VSAN Routing Configuration Guide*
- *Cisco MDS 9000 Family Cookbook for Cisco MDS SAN-OS*

Cisco DCNM-SAN

- *Cisco DCNM Fundamentals Guide, Release 5.x*
- *System Management Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Interfaces Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Fabric Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Quality of Service Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Security Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *IP Services Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Intelligent Storage Services Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *High Availability and Redundancy Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *Inter-VSAN Routing Configuration Guide, Cisco DCNM for SAN, Release 5.x*
- *SMI-S and Web Services Programming Guide, Cisco DCNM for SAN, Release 5.x*

Command-Line Interface

- *Cisco MDS 9000 Family Command Reference*

Intelligent Storage Networking Services Configuration Guides

- *Cisco MDS 9000 Family I/O Acceleration Configuration Guide*
- *Cisco MDS 9000 Family SANTap Deployment Guide*
- *Cisco MDS 9000 Family Data Mobility Manager Configuration Guide*
- *Cisco MDS 9000 Family Storage Media Encryption Configuration Guide*

Troubleshooting and Reference

- *Cisco MDS 9000 Family and Nexus 7000 Series System Messages Reference*
- *Cisco MDS 9000 Family SAN-OS Troubleshooting Guide*
- *Cisco MDS 9000 Family NX-OS MIB Quick Reference*
- *Cisco DCNM for SAN Database Schema Reference*

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

- Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

High Availability Overview

You can configure the high availability (HA) software framework and redundancy features using Cisco DCNM for SAN. These features include application restartability and nondisruptive supervisor switchability. Cisco high availability is a technology delivered in Cisco NX-OS software that enables network-wide resilience to increase IP network availability.

The Cisco MDS 9500 Series of multilayer directors and switches 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 enables the following features:

- Ensures nondisruptive software upgrade capability.

- 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.

- 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.

- Provides switchovers if the active supervisor fails. The standby supervisor, if present, takes over without disrupting storage or host traffic.

Directors in the Cisco MDS 9500 Series have two supervisor modules (Supervisor-1 and Supervisor-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, Supervisor-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.

For information on configuring high availability, see Chapter 2, "Configuring High Availability."

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C H A P T E R 2

Configuring High Availability

This chapter describes how to configure high availability, and describes the switchover processes.

This chapter includes the following sections:

About High Availability

Process restartability provides the high availability functionality in Cisco MDS 9000 Family switches. This process ensures that process-level failures do not cause system-level failures. It also restarts the failed processes automatically. This process is able to restore its state prior to the failure and continues executing from the failure point going forward.

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.

Switchover Processes

Switchovers occur by one of the following two processes:

- 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.

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

This section includes the following topics:

- Manually Initiating a Switchover, page 2-2

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.

Note The image a supervisor module is booted up from cannot be deleted from bootflash. This is to ensure that the new standby supervisor module ia able to synchronize during the process.

Manual Switchover Guidelines

Be aware of the following guidelines when performing a manual 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.

Manually Initiating a Switchover

To manually initiate a switchover from an active supervisor module to a standby supervisor module, use the active supervisor module using Device Manager. After you enter this command, another switchover process cannot be started on the same switch until a stable standby supervisor module is available.

To perform a switchover using Device Manager, follow these steps:

Step 1   Ensure that an HA switchover is possible by selecting **Physical > Modules** to verify the presence of multiple modules.

You see the screen shown in Figure 2-1.

Figure 2-1   Modules Screen Shows Current Supervisor

Step 2   In the main Device Manager screen, select **Admin > Reset Switch**.

Figure 2-2 *Reset Switch Dialog Box*
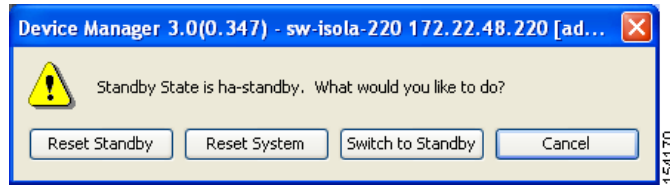
Step 3 Click **Switch to Standby**.

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 2-1 lists the possible values for the redundancy states.

Table 2-1 *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. **Note** You should try to initialize the supervisor module until it comes up as HA-standby. This state is a temporary 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 2-2 lists the possible values for the supervisor module states.

Table 2-2 *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 2-3 lists the possible values for the internal redundancy states.

Table 2-3   *Internal States*

State	Description
HA standby	The HA switchover mechanism in the standby supervisor module is enabled (see the "Synchronizing Supervisor Modules" section on page 2-2).
Active with no standby	A switchover is not possible.
Active with HA standby	The active supervisor module in the switch is ready to be configured. The standby 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.
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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