Managing System Hardware

This chapter provides details on how to manage system hardware other than services and switching modules and how to monitor the health of the switch.

Displaying Switch Hardware Inventory

Use the **show inventory** command to view information on the field replaceable units (FRUs) in the switch, including product IDs, serial numbers, and version IDs. The following example shows the **show inventory** command output:

```
switch# show inventory
NAME: "Chassis",  DESCR: "MDS 9710 (10 Slot) Chassis "
PID: DS-C9710            ,  VID: V00 ,  SN: JAF1647AQTL

NAME: "Slot 2",  DESCR: "2/4/8/10/16 Gbps Advanced FC Module"
PID: DS-X9448-768K9      ,  VID: V02 ,  SN: JAE192008U7

NAME: "Slot 3",  DESCR: "4/8/16/32 Gbps Advanced FC Module"
PID: DS-X9648-1536K9     ,  VID: V01 ,  SN: JAE203901Z0

NAME: "Slot 5",  DESCR: "Supervisor Module-3"
PID: DS-X97-SF1-K9       ,  VID: V02 ,  SN: JAE17360E6B

NAME: "Slot 6",  DESCR: "Supervisor Module-3"
PID: DS-X97-SF1-K9       ,  VID:     ,  SN: JAE164300E8
```

```
NAME: "Slot 7",  DESCR: "1/10/40G IPS,2/4/8/10/16G FC Module"
PID: DS-X9334-K9         ,  VID: V00 ,  SN: JAE195001TJ

NAME: "Slot 8",  DESCR: "4/8/16/32 Gbps Advanced FC Module"
PID: DS-X9648-1536K9     ,  VID: V01 ,  SN: JAE203901ZJ

NAME: "Slot 10",  DESCR: "1/10 Gbps Ethernet Module"
PID: DS-X9848-480K9      ,  VID: V01 ,  SN: JAE172603Q9

NAME: "Slot 11",  DESCR: "Fabric card module"
PID: DS-X9710-FAB1       ,  VID: V01 ,  SN: JAE18040A1N

NAME: "Slot 12",  DESCR: "Fabric card module"
PID: DS-X9710-FAB        ,  VID: V01 ,  SN: JAE164705RF

NAME: "Slot 13",  DESCR: "Fabric card module"
PID: DS-X9710-FAB1       ,  VID: V01 ,  SN: JAE18040A22

NAME: "Slot 14",  DESCR: "Fabric card module"
PID: DS-X9710-FAB1       ,  VID: V01 ,  SN: JAE1640085T

NAME: "Slot 15",  DESCR: "Fabric card module"
PID: DS-X9710-FAB        ,  VID: V01 ,  SN: JAE16410AR4

NAME: "Slot 16",  DESCR: "Fabric card module"
PID: DS-X9710-FAB1       ,  VID: V00 ,  SN: JAE19500864

NAME: "Slot 33",  DESCR: "MDS 9710 (10 Slot) Chassis Power Supply"
PID: DS-CAC97-3KW        ,  VID: V01 ,  SN: DTM1649022W

NAME: "Slot 34",  DESCR: "MDS 9710 (10 Slot) Chassis Power Supply"
PID: DS-CAC97-3KW        ,  VID: V01 ,  SN: DTM16490239

NAME: "Slot 35",  DESCR: "MDS 9710 (10 Slot) Chassis Power Supply"
PID: DS-CAC97-3KW        ,  VID: V01 ,  SN: DTM164602ZP

NAME: "Slot 40",  DESCR: "MDS 9710 (10 Slot) Chassis Power Supply"
PID: DS-CAC97-3KW        ,  VID: V01 ,  SN: DTM164602XH

NAME: "Slot 41",  DESCR: "MDS 9710 (10 Slot) Chassis Fan Module"
PID: DS-C9710-FAN        ,  VID: V00 ,  SN: JAF1647ADCN

NAME: "Slot 42",  DESCR: "MDS 9710 (10 Slot) Chassis Fan Module"
PID: DS-C9710-FAN        ,  VID: V00 ,  SN: JAF1647ACHH

NAME: "Slot 43",  DESCR: "MDS 9710 (10 Slot) Chassis Fan Module"
PID: DS-C9710-FAN        ,  VID: V00 ,  SN: JAF1647ADCE
```

Use the **show hardware** command to display switch hardware inventory details. The following example shows the **show hardware** command output:

```
switch# show hardware
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Documents: http://www.cisco.com/en/US/products/ps9372/tsd_products_support_series_home.html
Copyright (c) 2002-2017, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
license. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
```

```
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php

Software
  BIOS:      version 3.1.0
  kickstart: version 8.2(1)
  system:    version 8.2(1)
  BIOS compile time:       02/27/2013
  kickstart image file is: bootflash:///m9700-sf3ek9-kickstart-mz.8.2.1.bin.S46
  kickstart compile time:  8/30/2017 23:00:00 [09/27/2017 12:00:46]
  system image file is:    bootflash:///m9700-sf3ek9-mz.8.2.1.bin.S46
  system compile time:     8/30/2017 23:00:00 [09/27/2017 14:57:51]


Hardware
  cisco MDS 9710 (10 Slot) Chassis ("Supervisor Module-3")
  Intel(R) Xeon(R) CPU         with 8167860 kB of memory.
  Processor Board ID JAE17360E6B

  Device name: sw-9710-101
  bootflash:    3915776 kB
  slot0:              0 kB (expansion flash)

Kernel uptime is 0 day(s), 2 hour(s), 25 minute(s), 2 second(s)

Last reset at 969755 usecs after  Wed Nov  8 06:28:35 2017

  Reason: Reset Requested by CLI command reload
  System version: 8.2(1)
  Service:

plugin
  Core Plugin, Ethernet Plugin
--------------------------------
Switch hardware ID information
--------------------------------

Switch is booted up
  Switch type is : MDS 9710 (10 Slot) Chassis
  Model number is DS-C9710
  H/W version is 0.2
  Part Number is 73-14586-02
  Part Revision is 02
  Manufacture Date is Year 16 Week 47
  Serial number is JAF1647AQTL
  CLEI code is 0

--------------------------------
Chassis has 10 Module slots and 6 Fabric slots
--------------------------------

Module1  empty

Module2  powered-dn
  Module type is : 2/4/8/10/16 Gbps Advanced FC Module
  0 submodules are present
  Model number is DS-X9448-768K9
  H/W version is 1.3
  Part Number is 73-15110-04
  Part Revision is A0
  Manufacture Date is Year 19 Week 20
  Serial number is JAE192008U7
  CLEI code is CMUIAHUCAC
```

```
.
.
.
Module10  ok
  Module type is : 1/10 Gbps Ethernet Module
  0 submodules are present
  Model number is DS-X9848-480K9
  H/W version is 1.0
  Part Number is 73-15258-05
  Part Revision is A0
  Manufacture Date is Year 17 Week 26
  Serial number is JAE172603Q9
  CLEI code is CMUCAD5BAA

Xbar1  ok
  Module type is : Fabric card module
  0 submodules are present
  Model number is DS-X9710-FAB1
  H/W version is 1.2
  Part Number is 73-15234-02
  Part Revision is C0
  Manufacture Date is Year 18 Week 4
  Serial number is JAE18040A1N
  CLEI code is CMUCAD1BA
.
.
.
Xbar6  powered-dn
  Module type is : Fabric card module
  0 submodules are present
  Model number is DS-X9710-FAB1
  H/W version is 1.0
  Part Number is 73-100994-01
  Part Revision is 03
  Manufacture Date is Year 19 Week 50
  Serial number is JAE19500864
  CLEI code is CLEI987656

---------------------------------------
Chassis has 8 PowerSupply Slots
---------------------------------------

PS1 ok
  Power supply type is: 3000.00W 220v AC
  Model number is DS-CAC97-3KW
  H/W version is 1.0
  Part Number is 341-0428-01
  Part Revision is A0
  Manufacture Date is Year 16 Week 49
  Serial number is DTM1649022W
  CLEI code is CMUPABRCAA
.
.
.
PS8 ok
  Power supply type is: 3000.00W 220v AC
  Model number is DS-CAC97-3KW
  H/W version is 1.0
  Part Number is 341-0428-01
  Part Revision is A0
  Manufacture Date is Year 16 Week 46
  Serial number is DTM164602XH
  CLEI code is CMUPABRCAA
```

```
---------------------------------
Chassis has 3 Fan slots
---------------------------------

Fan1(sys_fan1) ok
  Model number is DS-C9710-FAN
  H/W version is 0.2
  Part Number is 73-15236-02
  Part Revision is 02
  Manufacture Date is Year 16 Week 47
  Serial number is JAF1647ADCN
  CLEI code is

Fan2(sys_fan2) ok
  Model number is DS-C9710-FAN
  H/W version is 0.2
  Part Number is 73-15236-02
  Part Revision is 02
  Manufacture Date is Year 16 Week 47
  Serial number is JAF1647ACHH
  CLEI code is

Fan3(sys_fan3) ok
  Model number is DS-C9710-FAN
  H/W version is 0.2
  Part Number is 73-15236-02
  Part Revision is 02
  Manufacture Date is Year 16 Week 47
  Serial number is JAF1647ADCE
  CLEI code is
```

Running CompactFlash Tests

You can run the CompactFlash CRC checksum test to identify if the CompactFlash firmware is corrupted and needs to be updated. By default, the CompactFlash CRC checksum test is enabled to automatically run in the background every seven days (you can change the automatic test interval by using the **system health module cf-crc-check frequency** command in configuration mode). You can run the test on demand by using the **system health cf-crc-check module** CLI command in EXEC mode. To turn the automatic testing off, use the **no system health module cf-crc-check** command in configuration mode.

The CompactFlash CRC checksum test can check if CompactFlash is corrupted on the following modules:

- DS-X9016
- DS-X9032
- DS-X9302-14K9
- DS-X9308-SMIP
- DS-X9304-SMIP
- DS-X9530-SF1-K9

Running the CompactFlash CRC Checksum Test On Demand

To run the CompactFlash CRC checksum test, use the **system health cf-crc-check module** command:

system health cf-crc-check module *number*

number indicates the slot in which the identified module resides.

```
switch# system health cf-crc-check module 4
```

Enabling and Disabling Automatic CompactFlash Firmware Update

By default, the Cisco NX-OS software update the CompactFlash firmware automatically every 30 days. You can disable the automatic update and then reenable the automatic update at a later time.

SUMMARY STEPS

1. **configure terminal**
2. [**no**]**system health module** *slot-number* **cf-re-flash**
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	[**no**]**system health module** *slot-number* **cf-re-flash** **Example:** `switch(config)# system health module 2 cf-re-flash`	Enables the automatic CompactFlash firmware update. Use the **no** form of the command to disable automatic firmware updates. The default is enabled.
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash firmware update status for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Setting the CompactFlash CRC Checksum Test Interval

You can set the automatic CRC checksum test interval.

SUMMARY STEPS

1. **configure terminal**

2. **system health module** *slot-number* **cf-crc-check frequency** *seconds*
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**system health module** *slot-number* **cf-crc-check frequency** *seconds* **Example:** `switch(config)# system health module 2 cf-crc-check frequency 15`	Sets the automatic CompactFlash CRC checksum test interval in seconds. The range is from 15 to 255.
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash CRC checksum testing status for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling and Disabling Failure Action for a CompactFlash Checksum Test

You can prevent the Cisco NX-OS software from taking any action if a CompactFlash failure is determined while running the CRC checksum test and the failed CompactFlash is isolated from further testing. By default, this feature is enabled. The failure action is controlled at the module level.

SUMMARY STEPS

1. **configure terminal**
2. [**no**]**system health module** *slot-number* **cf-crc-check faliure-action**
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

	Command or Action	Purpose
Step 2	[**no**]**system health module** *slot-number* **cf-crc-check faliure-action** **Example:** `switch(config)# system health module 2 cf-crc-check`	Enables the automatic CompactFlash CRC checksum testing. Use the **no** form of the command to disable the failure action. The default is enabled.
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash CRC checksum testing status for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Running the CompactFlash CRC Checksum Test On Demand

To run the CompactFlash CRC checksum test, use the **system health cf-crc-check module** command:

system health cf-crc-check module *number*

number indicates the slot in which the identified module resides.

```
switch# system health cf-crc-check module 4
```

Updating the CompactFlash Firmware On Demand

You can update the CompactFlash firmware on demand using the following command:

system health cf-re-flash module *slot-number*

slot-number indicates the slot in which the identified module resides.

```
switch# system health cf-re-flash module 2
```

Enabling and Disabling the Automatic CompactFlash CRC Checksum Test

By default, the CompactFlash CRC checksum test is enabled to automatically run in the background. You can disable the automatic testing and then enable the testing at a later time.

SUMMARY STEPS

1. **configure terminal**
2. **system health module** *slot-number* **cf-crc-check**
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**system health module** *slot-number* **cf-crc-check** **Example:** `switch(config)# system health module 2 cf-crc-check`	Enables the automatic CompactFlash CRC checksum testing. Use the **no** form of the command to disable CompactFlash CRC checksum testing. The defauilt is enabled.
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash CRC checksum testing status for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Setting the CompactFlash Firmware Update Interval

You can set the firmware update interval. The default interval is every 30 days.

SUMMARY STEPS

1. **configure terminal**
2. **system health module** *slot-number* **cf-re-flash frequency** *days*
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**system health module** *slot-number* **cf-re-flash frequency** *days* **Example:** `switch(config)# system health module 2 cf-re-flash frequency 45`	Sets the automatic CompactFlash firware update interval. The range is from 30 to 255. The default is every 30 days.

	Command or Action	Purpose
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash firmware update interface configuration for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling and Disabling Failure Action for CompactFlash Firmware Updates

You can prevent the Cisco NX-OS software from taking any action if a CompactFlash failure occurs during the CompactFlash firmware update. By default, when a failure occurs, the Cisco NX-OS software isolates the failed CompactFlash from further testing. A failure action is controlled at the module level.

SUMMARY STEPS

1. **configure terminal**
2. [**no**]**system health module** *slot-number* **cf-re-flash failure-action**
3. (Optional) **show system health module** *slot-number*
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	[**no**]**system health module** *slot-number* **cf-re-flash failure-action** **Example:** `switch(config)# system health module 2 cf-re-flash`	Enables the automatic CompactFlash firware update failure action. Use the **no** form of the command to disable the failure action. The default is enabled.
Step 3	(Optional) **show system health module** *slot-number* **Example:** `switch(config)# show system health module 2`	Displays the automatic CompactFlash firmware update failure action status for a module.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Displaying CompactFlash Firmware Update Configuration

To display CompactFlash firmware update configuration for a specific module, use the following command:

show system health module *slot-number*

Displaying CompactFlash CRC Test and Firmware Update Statistics

To display the CompactFlash CRC checksum test and the flash update statistics, use the **show system health statistics** command.

```
switch# show system health statistics

Test statistics for module 2
--------------------------------------------------------------------------------
Test Name           State            Freqency   Run    Pass    Fail CFail Errs
--------------------------------------------------------------------------------
Bootflash           Running            10s    28316   28316       0     0    0
EOBC                Running             5s    56632   56632       0     0    0
Loopback            Running             5s    56618   56618       0     0    0
CF checksum         Running             2d        2       2       0     0    0
CF re-flash         Running            30d        1       1       0     0    0
--------------------------------------------------------------------------------

Test statistics for module 5
--------------------------------------------------------------------------------
Test Name           State            Freqency   Run    Pass    Fail CFail Errs
--------------------------------------------------------------------------------
Bootflash           Running            10s    28314   28314       0     0    0
EOBC                Running             5s    56629   56629       0     0    0
Loopback            Running             5s    56614   56614       0     0    0
CF checksum         Running             1d        4       4       0     0    0
CF re-flash         Running            30d        1       1       0     0    0
--------------------------------------------------------------------------------

Test statistics for module 7
--------------------------------------------------------------------------------
Test Name           State            Freqency   Run    Pass    Fail CFail Errs
--------------------------------------------------------------------------------
InBand              Running             5s    56643   56643       0     0    0
Bootflash           Running            10s    28323   28323       0     0    0
EOBC                Running             5s    56643   56643       0     0    0
Management Port     Running             5s    56643   56643       0     0    0
--------------------------------------------------------------------------------

Test statistics for module 8
--------------------------------------------------------------------------------
Test Name           State            Freqency   Run    Pass    Fail CFail Errs
--------------------------------------------------------------------------------
InBand              Running             5s    56624   56624       0     0    0
Bootflash           Running            10s    28317   28317       0     0    0
EOBC                Running             5s    56624   56624       0     0    0
--------------------------------------------------------------------------------

Test statistics for module 13
--------------------------------------------------------------------------------
Test Name           State            Freqency   Run    Pass    Fail CFail Errs
--------------------------------------------------------------------------------
```

```
Bootflash           Running            10s    28304   28304       0      0     0
EOBC                Running             5s    56608   56608       0      0     0
Loopback            Running             5s    56608   56608       0      0     0
--------------------------------------------------------------------------------
```

Displaying the Switch Serial Number

You can display the serial number of your Cisco MDS 9000 Series switch by looking at the serial number label on the back of the chassis (next to the power supply), or by using the **show sprom backplane 1** command.

```
switch# show sprom backplane 1
DISPLAY backplane sprom contents:
Common block :
 Block Signature : 0xabab
 Block Version   : 3
 Block Length    : 160
 Block Checksum  : 0x134f
 EEPROM Size     : 65535
 Block Count     : 5
 FRU Major Type  : 0x6001
 FRU Minor Type  : 0x0
 OEM String      : Cisco Systems, Inc.
 Product Number  : DS-C9710
 Serial Number   : JAF1647AQTL
 Part Number     : 73-14586-02
 Part Revision   : 02
 Mfg Deviation   : 0
 H/W Version     : 0.2
 Mfg Bits        : 0
 Engineer Use    : 0
 snmpOID         : 0.0.0.0.0.0.0.0
 Power Consump   : 0
 RMA Code        : 0-0-0-0
 CLEI Code       : 0
 VID             : V00
Chassis specific block:
.
.
.
```

Note If you are installing a new license, use the **show license host-id** command to obtain the switch serial number. For more information, see the *Cisco MDS 9000 Family NX-OS Software Licensing Guide*.

Displaying Power Usage Information

Use the **show environment power** command to display the actual power usage information for the entire switch. In response to this command, power supply capacity and consumption information is displayed for each module.

Note In a Cisco MDS 9700 Series switch, power usage is reserved for both supervisors regardless of whether one or both supervisor modules are present.

```
switch# show environment power

Power Supply:
Voltage: 50 Volts
Power                                Actual        Total
Supply    Model                      Output     Capacity    Status
-------  -------------------  -----------  -----------  --------------
1        DS-CAC97-3KW               549 W       3000 W     Ok
2        DS-CAC97-3KW               535 W       3000 W     Ok
3        DS-CAC97-3KW               539 W       3000 W     Ok
4        DS-CAC97-3KW               535 W       3000 W     Ok
5        ------------                 0 W          0 W     Absent
6        ------------                 0 W          0 W     Absent
7        ------------                 0 W          0 W     Absent
8        ------------                 0 W          0 W     Absent


                                   Actual        Power
Module    Model                     Draw    Allocated    Status
-------  -------------------  -----------  -----------  --------------
2        DS-X9448-768K9             N/A           0 W    Powered-Dn
3        DS-X9648-1536K9            265 W       750 W    Powered-Up
5        DS-X97-SF1-K9              113 W       190 W    Powered-Up
6        DS-X97-SF1-K9              106 W       190 W    Powered-Up
7        DS-X9334-K9                441 W       480 W    Powered-Up
8        DS-X9648-1536K9            252 W       750 W    Powered-Up
10       DS-X9848-480K9             363 W       500 W    Powered-Up
Xb1      DS-X9710-FAB1               95 W       150 W    Powered-Up
Xb2      DS-X9710-FAB                91 W       150 W    Powered-Up
Xb3      DS-X9710-FAB1               94 W       150 W    Powered-Up
Xb4      DS-X9710-FAB1               90 W       150 W    Powered-Up
Xb5      DS-X9710-FAB                98 W       150 W    Powered-Up
Xb6      DS-X9710-FAB1              N/A         150 W    Powered-Dn
fan1     DS-C9710-FAN                50 W       600 W    Powered-Up
fan2     DS-C9710-FAN                40 W       600 W    Powered-Up
fan3     DS-C9710-FAN                45 W       600 W    Powered-Up

N/A - Per module power not available


Power Usage Summary:
--------------------
Power Supply redundancy mode (configured)               Redundant
Power Supply redundancy mode (operational)              Redundant

Total Power Capacity (based on configured mode)              6000 W
Total Power of all Inputs (cumulative)                      12000 W
Total Power Output (actual draw)                             2158 W
Total Power Allocated (budget)                               5560 W
Total Power Available for additional modules                  440 W
```

Power Supply Modes

Cisco MDS 9000 Series Multilayer Switches support different number and capabilities of power supplies. This section describes the power modes that are available on Cisco MDS 9000 Series Multilayer Switches.

Not all power modes are available on all Cisco MDS 9000 Series Multilayer Switches.

You can configure one of the following power modes to use the combined power provided by the installed power supply units (no power redundancy) or to provide power redundancy when there is power loss. We recommend that you configure the full redundancy power mode on your switch for optimal performance.

- Combined mode—This mode uses the combined capacity of all the power supplies. In case of power supply failure, the entire switch can be shut down (depending on the power used) causing traffic disruption. This mode is seldom used, except in cases when the switch requires more power.
- Input Source (grid) redundancy mode—This mode allocates half of the power supplies to the available category and the other half to the reserve category. You must use different power supplies for the available and reserve categories so that if the power supplies used for the active power fails, the power supplies used for the reserve power can provide power to the switch. If the grid-redundancy mode is lost, the power mode reverts to combined mode.
- Power-supply (N+1) redundancy mode—This mode allocates one power supply as reserve to provide power to the switch in case an active power supply fails. The remaining power supplies are allocated for the available category. The reserve power supply must be at least as powerful as each of the power supplies used for the active power.
- Full-redundancy mode—This mode is a combination of input-source (grid) and power-supply (N+1) redundancy modes. Similar to the input-source redundancy mode, this mode allocates half of the power supplies to the available category and the remaining power supplies to reserve category. One of the reserve power supplies can alternatively be used to provide power if a power supply used for the active power fails.

For more information on the power supply modes supported on your switch, see the *Hardware Installation Guide* corresponding to your switch.

Configuration Guidelines for Power Supplies

For information that is specific to the power supplies supported on your switch, see the *Hardware Installation Guide* corresponding to your switch.

Note

- Some Cisco MDS switches support DC and high-voltage DC (HVDC) power supplies. HVDC power supplies support 440 V (higher voltage), whereas DC power supplies support up to 110 or 220 V. Also, HVDC power supplies are efficient in transmitting power over a long distance.
- The Cisco MDS 9250i switch has three power supplies whose power supply mode is configured to N+1 mode. Cisco MDS 9250i switch can also be operated with only two power supplies when 1+1 grid redundancy is required. All the other Cisco MDS 9000 switches (excluding Directors) have a nonconfigurable power supply mode set to 1+1 grid redundancy.

A Cisco MDS 9700 Series switch ships with enough power supplies to power a fully populated chassis in the grid-redundant (N+N) mode. For example, depending on your switch's configuration, Cisco MDS 9710 switch may ship with six power supplies, by default, and can power a fully populated chassis in the grid-redundant power-configuration (N+N) mode. All the power supplies are always powering the chassis. However, for managing, reporting, and budgeting the power supplies, Cisco MDS NX-OS supports various configurable power supply modes. One of the features of the power supply modes is to make assumptions, especially in grid configuration, to identify power supplies that are connected to grid A and grid B power whips. For information on connecting power supplies, see the "Product Overview" section in the *Cisco MDS 9700 Series Hardware Installation Guide*.

The following table provides information about the power supply bays with respect to grid configurations:

Table 1: Cisco MDS 9700 Grid-Slot Location

Cisco MDS Switch	Grid A	Grid B
Cisco MDS 9718	PSU1, PSU2, PSU5, PSU6, PSU9, PSU10, PSU13, PSU14	PSU3, PSU4, PSU7, PSU8, PSU11, PSU12, PSU15, PSU16
Cisco MDS 9710	PSU1, PSU2, PSU5, PSU6	PSU3, PSU4, PSU7, PSU8
Cisco MDS 9706	PSU1, PSU2	PSU3, PSU4

The following is a list of power supply modes supported on Cisco MDS switches:

Note Changing between power modes is non disruptive and is possible only if there is enough power available in the target mode. If enough power is not available, MDS NX-OS rejects the command with “Insufficient capacity” message.

- Ps-redundant mode—The default power supply mode is the ps-redundant mode, which is equivalent to the N+1 redundant mode because this mode is flexible enough to cover the deployments in the most diverse environments. In this mode, N functioning power supplies are used for budgeting, alerting, reporting, and monitoring, and one power supply is used as reserve. The total available power is the sum of capacities of the N power supplies.

  In the ps-redundant mode, there is no restriction for the placement of power supplies in the chassis slots. The power supplies need not be placed in grid A or grid B as recommended. Even if the power supplies are placed as recommended in grid A or grid B, MDS NX-OS will not support budgeting, alerting, reporting, and monitoring as per a grid configuration because of the N+1 redundancy mode.

  Table 2: ps-redundant Mode

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
	Power Supply 1 (Watts)	Power Supply 2 (Watts)	Power Supply 5 (Watts)	Power Supply 3 (Watts)	Power Supply 4 (Watts)	Power Supply 7 (Watts)		

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
1	3000	3000	3000	3000	3000	3000	15000	N+1 redundant mode. Available power capacity is the sum of power capacities of all the operational power supply units (PSUs), except one, which is used as reserve.
2	3000	3000	3000	3000	3000	Off	12000	
3	3000	3000	3000	3000	Off	Off	9000	
4	3000	3000	3000	Off	Off	Off	6000	

- insrc-redundant mode—If a grid (N+N) mode is required in a chassis for proper budgeting, alerting, reporting, and monitoring purposes, power supplies must be configured, as shown in Table 2: ps-redundant Mode, on page 15 and then the ps-redundant mode should be changed to the insrc-redundant mode.

  After the insrc-redundant mode is configured, and if a power supply fails, the power supply mode is changed to combined (nonredundant) mode in relation to the least-populated grid.

  When the insrc-redundant mode is configured and a grid fails, the insrc-redundant mode is disabled until the grid is back online. In the meantime, the operational power supply mode is changed to combined (nonredundant) mode and power is used from all the power supplies for budgeting, alerting, reporting, and monitoring.

Table 3: insrc-redundant Mode

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
	Power Supply 1 (Watts)	Power Supply 2 (Watts)	Power Supply 5 (Watts)	Power Supply 3 (Watts)	Power Supply 4 (Watts)	Power Supply 7 (Watts)		
1	3000	3000	3000	3000	3000	3000	9000	3+3 redundant mode. Available capacity is the sum of power capacities of three PSUs, which are used as reserve.

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
2	3000	3000	3000	3000	3000	Off	6000	Combined (nonredundant) mode because of uneven distribution of PSUs in grids. Available capacity is the sum of power capacities of PSUs of the least populated grid.
3	3000	3000	3000	3000	Off	Off	3000	Combined (nonredundant) mode because of uneven distribution of PSUs in grids. Available capacity is the sum of power capacities of PSUs of the least populated grid.
4	3000	3000	3000	Off	Off	Off	9000	Combined (nonredundant) mode because of the grid B failure.

- Redundant mode—Redundant mode is a combination of grid (N+N) and ps-redundant (N+1) modes. If the MDS NX-OS power supply mode is set to redundant mode and if there are an equal number of functioning power supplies in each grid location (grid A and grid B), the operational power supply mode is set to the grid (insrc-redundant) mode. If a grid fails, the operational power supply mode is changed to ps-redundant (N+1) mode. The ps-redundant mode is different from the insrc-redundant mode because a grid failure in insrc-redundant mode defaults to combined (nonredundant) mode.

  When configured in redundant mode and if a power supply fails, the power supply mode is changed to combined (nonredundant) mode in relation to the least-populated grid.

Table 4: Redundant Mode

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
	Power Supply 1 (Watts)	Power Supply 2 (Watts)	Power Supply 5 (Watts)	Power Supply 3 (Watts)	Power Supply 4 (Watts)	Power Supply 7 (Watts)		
1	3000	3000	3000	3000	3000	3000	9000	3+3 redundant mode with three PSUs in each grid.
2	3000	3000	3000	3000	3000	Off	6000	Combined (non redundant) mode because of uneven distribution of PSUs in grids. Available capacity is the sum of PSUs of the last-populated grid.

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
3	3000	3000	3000	3000	Off	Off	3000	Combined (non redundant) mode because of uneven distribution of PSUs in grids. Available capacity is the sum of PSUs of the least populated grid.
4	3000	3000	3000	Off	Off	Off	6000	Power supply mode switched to ps-redundant (N+1) mode because of grid B failure.

Note When the insrc-redundant or redundant mode is configured, the grid power supply with an unbalanced configuration (that is, 2+4, and so on) results in the power supply mode to change to combined (nonredundant) operational mode and insufficient power may be budgeted. We recommend that you do not use a grid power supply with an unbalanced configuration when the insrc-redundant or redundant mode is configured.

- Combined (nonredundant) mode—This has no restrictions on how external power sources are connected to a Cisco MDS 9710 switch. The power that is available to the switch is the sum of all the working power supplies in the chassis. You can change from other power modes to the combined mode without disrupting the traffic.

Table 5: Combined (Nonredundant) Mode

Scenario	Grid A			Grid B			Available Capacity (Watts)	Power Supply Operational Mode
	Power Supply 1 (Watts)	Power Supply 2 (Watts)	Power Supply 5 (Watts)	Power Supply 3 (Watts)	Power Supply 4 (Watts)	Power Supply 7 (Watts)		
1	3000	3000	3000	3000	3000	3000	18000	In the combined (non redundant) mode, the position of PSUs do not matter. All PSUs are available for budgeting.
2	3000	3000	3000	3000	3000	Off	15000	
3	3000	3000	3000	3000	Off	Off	12000	
4	3000	3000	3000	Off	Off	Off	9000	

The following table provides information about moving from combined (nonredundant) mode to other power supply modes:

Table 6: Moving from Combined (Nonredundant) Mode to Other Power Supply Modes

Scenario	Grid A			Grid B			Current Usage (Watts)	Current Mode	New Mode	Capacity (Watts)	Power Supply Operational Mode
	Power Supply 1 (Watts)	Power Supply 2 (Watts)	Power Supply 5 (Watts)	Power Supply 3 (Watts)	Power Supply 4 (Watts)	Power Supply 7 (Watts)					
1	3000	3000	3000	3000	3000	3000	6500	Combined	NA	18000	Combined mode.
	3000	3000	3000	3000	3000	3000	6500	NA	Redundant or insrc-redundant	9000	The new capacity has changed to redundant mode.

Scenario	Grid A			Grid B			Current Usage (Watts)	Current Mode	New Mode	Capacity (Watts)	Power Supply Operational Mode
2	3000	3000	3000	3000	3000	Off	6500	Combined	NA	15000	Combined mode.
	3000	3000	3000	3000	3000	Off	6500	NA	Redundant or insrc-redundant	NA	Rejected due to insufficient capacity. Power supply mode reverts to the combined (non redundant) mode, because the power availability in one grid is less than the current usage.
3	3000	3000	3000	3000	3000	Off	5500	Combined	NA	15000	Combined mode.
	3000	3000	3000	3000	3000	Off	5500	NA	Redundant or insrc-redundant	6000	The new capacity has changed to redundant mode.
4	3000	3000	3000	3000	3000	Off	6500	Combined	NA	15000	Combined mode.
	3000	3000	3000	3000	3000	Off	6500	NA	Ps-redundant	12000	The new capacity has changed to psredundant mode.

Configuring the Power Supply Mode

You can configure power supply modes.

SUMMARY STEPS

1. **configure terminal**
2. **power redundancy-mode** {**combined** | **insrc-redundant** | **ps-redundant** |**redundant**}
3. (Optional) **show environment power**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**power redundancy-mode** {**combined**	**insrc-redundant**	**ps-redundant** |**redundant**} **Example:** `switch(config)# power redundancy-mode combined`	Configures the power supply mode. The default is **redundant**.
Step 3	(Optional) **show environment power** **Example:** `switch(config)# show environment power`	Displays the power mode configuration.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

About Crossbar Management

Cisco MDS NX-OS software supports three types of hardware for the Cisco MDS 9500 Series Directors: Generation 1, Generation 2, and Generation 3.

Generation 3 includes the following:

- 48-port 8-Gbps Fibre Channel switching module
- 24-port 8-Gbps Fibre Channel switching module
- 4/44-port 8-Gbps Host-Optimized Fibre Channel module
- Cisco MDS 9513 Fabric-2 Crossbar Switching module

Note The new software features in Cisco MDS NX-OS Release 4.1(1b) and later are not supported in the Generation 1 hardware.

Note The Cisco MDS NX-OS software does not support the following hardware: Supervisor-1 module, the IPS-4 and IPS-8 storage modules, the Cisco MDS 9216 switch, the Cisco MDS 9216A switch, the Cisco MDS 9020 switch, the Cisco MDS 9120 switch, and the Cisco MDS 9140 switch.

Generation 2 hardware includes the following:

- Cisco MDS 9513 Director chassis
- Supervisor-2 module
- MSM-18/4 Multiservice Storage module
- Cisco MDS 9222i Module-1 module
- 48-port 4-Gbps Fibre Channel switching module
- 24-port 4-Gbps Fibre Channel switching module
- 12-port 4-Gbps Fibre Channel switching module
- 4-port 10-Gbps Fibre Channel switching module

The Cisco MDS NX-OS software on the Cisco MDS 9500 Series Directors supports the following types of crossbars:

- Integrated crossbar—Located on the Supervisor-1 and Supervisor-2 modules. The Cisco MDS 9506 and 9509 Directors only use integrated crossbars.
- External crossbar—Located on an external crossbar switching module. Cisco MDS 9513 Directors require external crossbar modules.

Generation 1 hardware includes the following:

- Cisco MDS 9506 and 9509 Director chassis
- Supervisor-1 module
- 32-port 2-Gbps Fibre Channel switching module
- 16-port 2-Gbps Fibre Channel switching module
- 8-port IP Storage Services (IPS-8) module
- 4-port IP Storage Services (IPS-4) module
- Storage Services Module (SSM)
- 14/2-port Multiprotocol Services (MPS-14/2) module

Operational Considerations when Removing Crossbars

You can mix and match Generation 1 and Generation 2 hardware on the Cisco MDS 9500 Series Directors running Cisco MDS NX-OS software without compromising the integrity and availability of your SANs based on Cisco MDS 9500 Series Directors.

To realize these benefits, you must gracefully shutting down the crossbars and consider the backward compatibility of the Generation 1 modules.

Gracefully Shutting Down a Crossbar

You must perform a graceful shutdown of a crossbar (integrated or external) before removing it from the MDS 9500 Series Director.

- You must enter the EXEC mode **out-of-service xbar** command for a graceful shutdown of external crossbar modules in a Cisco MDS 9513 Director.

  out-of-service xbar *slot*

  slot indicates the external crossbar module slot number.

  Note To reactivate the external crossbar module, you must remove and reinsert or replace the crossbar module.

- You must enter the EXEC mode **out-of-service module** command for a graceful shutdown of integrated crossbars on the supervisor module in a Cisco MDS 9506 or 9509 Director.

  out-of-service module *slot*

  slot indicates the chassis slot number on either the Supervisor-1 module or the Supervisor-2 module in which the integrated crossbar resides.

  Note To reactivate the integrated crossbar, you must remove and reinsert or replace the Supervisor-1 module or Supervisor-2 module.

  Caution Taking the crossbar out-of-service may cause a supervisor switchover.

Provideing Backward Compatibility for Generation 1 Modules in Cisco MDS 9513 Directors

To provide backward compatibility for a Generation 1 module in a Cisco MDS 9513 chassis, the active and backup Supervisor-2 modules are associated to a specific crossbar module. The Supervisor-2 module in slot 7 is associated with crossbar module 1, and Supervisor-2 module in slot 8 is associated with crossbar module 2. You must plan for the following operational considerations before removing crossbar modules:

- Whenever a crossbar module associated with the active Supervisor-2 module goes offline or is brought online in a system that is already online, a stateful supervisor switchover occurs. This switchover does not disrupt traffic. Events that cause a crossbar module to go offline include the following:

- Out-of-service requests
- Physical removal
- Errors

- Supervisor-2 module switchovers do not occur if the crossbar switching module associated with the backup Supervisor-2 module goes offline.

Note Supervisor-2 module switchovers do not occur when removing crossbar switch modules on a Cisco MDS 9513 that has only Generation 2 modules installed.

About Module Temperature Monitoring

Built-in automatic sensors are provided in all switches in the Cisco MDS 9000 Family to monitor your switch at all times.

Each module (switching and supervisor) has four sensors: 1 (outlet sensor), 2 (intake sensor), and 3 (onboard sensor). Each sensor has two thresholds (in degrees Celsius): minor and major.

Note A threshold value of –127 indicates that no thresholds are configured or applicable.

- Minor threshold—When a minor threshold is exceeded, a minor alarm occurs and the following action is taken for all four sensors:
  - System messages are displayed.
  - Call Home alerts are sent (if configured).
  - SNMP notifications are sent (if configured).
- Major threshold—When a major threshold is exceeded, a major alarm occurs and the following action is taken:
  - For sensors 1 and 3 (outlet and onboard sensors):

    System messages are displayed.

    Call Home alerts are sent (if configured).

    SNMP notifications are sent (if configured).
  - For sensor 2 (intake sensor):

    If the threshold is exceeded in a switching module, only that module is shut down.

    If the threshold is exceeded in an active supervisor module with HA-standby or standby present, only that supervisor module is shut down and the standby supervisor module takes over.

If you do not have a standby supervisor module in your switch, you have an interval of 2 minutes to decrease the temperature. During this interval the software monitors the temperature every five (5) seconds and continuously sends system messages as configured.

Tip To realize the benefits of these built-in automatic sensors on any switch in the Cisco MDS 9700 Series, we highly recommend that you install dual supervisor modules. If you are using a Cisco MDS 9000 Series switch without dual supervisor modules, we recommend that you immediately replace the fan module if even one fan is not working.

Displaying Module Temperatures

Use the **show environment temperature** command to display temperature sensors for each module.

This example shows the temperature information.

```
switch# show environment temperature
Temperature:
-----------------------------------------------------------------------
Module   Sensor        MajorThresh   MinorThres   CurTemp     Status
                       (Celsius)     (Celsius)    (Celsius)
-----------------------------------------------------------------------
3        Crossbar0 (s1)  125             115         46         Ok
3        Crossbar1 (s2)  125             115         54         Ok
3        Arb-mux  (s3)   125             105         48         Ok
3        CPU      (s4)   125             105         48         Ok
3        PCISW    (s5)   125             105         66         Ok
3        IOSlice0 (s6)   125             115         38         Ok
3        IOSlice1 (s7)   125             115         39         Ok
3        IOSlice2 (s8)   125             115         40         Ok
5        Inlet  (s1)     60              42          23         Ok
5        Crossbar(s2)    125             115         71         Ok
5        Arbiter (s3)    125             105         51         Ok
5        L2L3Dev1(s4)    125             110         41         Ok
5        CPU1CORE1(s5)   85              75          35         Ok
5        CPU1CORE2(s6)   85              75          28         Ok
5        CPU1CORE3(s7)   85              75          35         Ok
5        CPU1CORE4(s8)   85              75          31         Ok
5        DDR3DIMM1(s9)   95              85          31         Ok
6        Inlet  (s1)     60              42          25         Ok
6        Crossbar(s2)    125             115         70         Ok
6        Arbiter (s3)    125             105         52         Ok
6        L2L3Dev1(s4)    125             110         41         Ok
6        CPU1CORE1(s5)   85              70          36         Ok
6        CPU1CORE2(s6)   85              70          34         Ok
6        CPU1CORE3(s7)   85              70          36         Ok
6        CPU1CORE4(s8)   85              70          33         Ok
6        DDR3DIMM1(s9)   95              85          31         Ok
7        Crossbar0 (s1)  125             115         83         Ok
7        Crossbar1 (s2)  125             115         82         Ok
7        Arb-mux  (s3)   125             115         52         Ok
7        CPU      (s4)   125             115         53         Ok
7        L2L3Dev0 (s5)   125             115         66         Ok
7        IOSlice0 (s6)   125             115         56         Ok
7        IOSlice1 (s7)   125             115         56         Ok
7        IOSlice2 (s8)   125             115         57         Ok
```

```
7        FC-IP 0 (s9)    95              85          55          Ok
7        FC-IP 1 (s10)   95              85          56          Ok
8        Crossbar0 (s1)  125             115         52          Ok
8        Crossbar1 (s2)  125             115         52          Ok
8        Arb-mux  (s3)   125             105         50          Ok
8        CPU      (s4)   125             105         47          Ok
8        PCISW    (s5)   125             105         56          Ok
8        IOSlice0 (s6)   125             115         40          Ok
8        IOSlice1 (s7)   125             115         41          Ok
8        IOSlice2 (s8)   125             115         42          Ok
10       Crossbar1(s1)   125             115         79          Ok
10       Crossbar2(s2)   125             115         78          Ok
10       Arb-mux (s3)    125             105         56          Ok
10       L2L3Dev1(s5)    125             110         61          Ok
10       L2L3Dev2(s6)    125             110         61          Ok
10       L2L3Dev3(s7)    125             110         57          Ok
10       L2L3Dev4(s8)    125             110         56          Ok
10       L2L3Dev5(s9)    125             110         61          Ok
10       L2L3Dev6(s10)   125             110         52          Ok
10       L2L3Dev7(s11)   125             110         58          Ok
10       L2L3Dev8(s12)   125             110         66          Ok
10       L2L3Dev9(s13)   125             110         57          Ok
10       L2L3Dev10(s14)  125             110         58          Ok
10       L2L3Dev11(s15)  125             110         66          Ok
10       L2L3Dev12(s16)  125             110         61          Ok
xbar-1   Crossbar1(s1)   125             115         49          Ok
xbar-1   Crossbar2(s2)   125             115         54          Ok
xbar-2   Crossbar1(s1)   125             115         56          Ok
xbar-2   Crossbar2(s2)   125             115         63          Ok
xbar-3   Crossbar1(s1)   125             115         51          Ok
xbar-3   Crossbar2(s2)   125             115         64          Ok
xbar-4   Crossbar1(s1)   125             115         59          Ok
xbar-4   Crossbar2(s2)   125             115         67          Ok
xbar-5   Crossbar1(s1)   125             115         61          Ok
xbar-5   Crossbar2(s2)   125             115         68          Ok
```

About Fan Modules

Hot-swappable fan modules (fan trays) are provided in all switches in the Cisco MDS 9000 Series to manage airflow and cooling for the entire switch. Each fan module contains multiple fans to provide redundancy. The switch can continue functioning in the following situations:

- One or more fans fail within a fan module—Even with multiple fan failures, switches in the Cisco MDS 9000 Series can continue functioning. When a fan fails within a module, the functioning fans in the module increase their speed to compensate for the failed fan(s).
- The fan module is removed for replacement—The fan module is designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system. When replacing a failed fan module in a running switch, be sure to replace the new fan module within five minutes.

Note If one or more fans fail within a fan module, the Fan Status LED turns red. A fan failure could lead to temperature alarms if not corrected immediately.

The fan status is continuously monitored by the Cisco MDS NX-OS software. In case of a fan failure, the following action is taken:

- System messages are displayed.
- Call Home alerts are sent (if configured).
- SNMP notifications are sent (if configured).

Use the **show environment fan** command to display the fan module status.

This example shows the chassis fan information.

```
switch# show environment fan
Fan:
-----------------------------------------------------
Fan             Model                Hw         Status
-----------------------------------------------------
Fan1(sys_fan1)  DS-C9710-FAN         0.2        Ok
Fan2(sys_fan2)  DS-C9710-FAN         0.2        Ok
Fan3(sys_fan3)  DS-C9710-FAN         0.2        Ok
Fan_in_PS1      --                   --         Ok
Fan_in_PS2      --                   --         Ok
Fan_in_PS3      --                   --         Ok
Fan_in_PS4      --                   --         Absent
Fan_in_PS5      --                   --         Absent
Fan_in_PS6      --                   --         Absent
Fan_in_PS7      --                   --         Absent
Fan_in_PS8      --                   --         Ok
Fan Zone Speed %(Hex): Zone 1: 40.78(0x68)
```

The possible Status field values for a fan module on the Cisco MDS 9700 Series switches are as follows:

- If the fan module is operating properly, the status is ok.
- If the fan is physically absent, the status is absent.
- If the fan is physically present but not working properly, the status is failure.

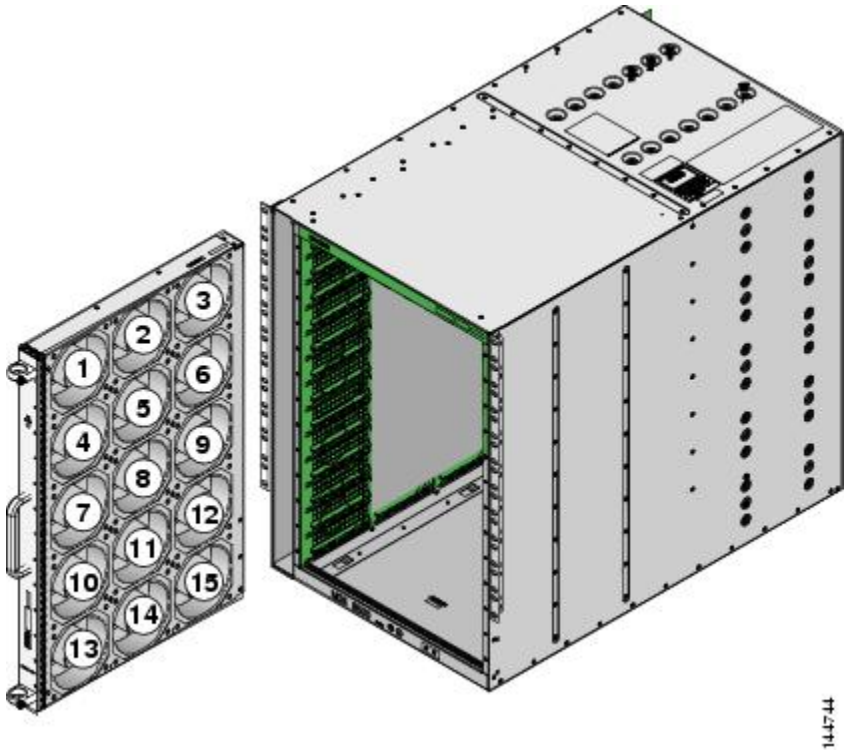
On the Cisco MDS 9513 Director, the front fan module has 15 fans. If the front fan module (DS-13SLT-FAN-F) State field contains "failure" in the **show environment fan** command output, it also displays the numbers of the failing fans.

This example shows a Cisco MDS 9513 front fan module failure.

```
switch# show environment fan
-----------------------------------------------------
Fan             Model                Hw         Status
-----------------------------------------------------
Chassis         DS-13SLT-FAN-F       0.3        failure 3 5 6 13
Chassis         DS-13SLT-FAN-R       0.3        ok
PS-1            --                   --         ok
PS-2            --                   --         ok
```

Figure 1: Cisco MDS 9513 Front Fan Module Numbering

This figure shows the numbering of the fans in the front fan module on the Cisco MDS 9513 Director.



The rear fan module (DS-13SLT-FAN-R) on the Cisco MDS 9513 Director has only two fans. If a fan in the rear fan module fails, the State field in the **show environment fan** command output only displays "failure" and not the failing fan number.

This example shows a fan module failure on a Cisco MDS 9513 Director.

```
switch# show environment fan
-------------------------------------------------------
Fan             Model                Hw         Status
-------------------------------------------------------
Chassis         DS-13SLT-FAN-F       0.3        ok
Chassis         DS-13SLT-FAN-R       0.3        failure
PS-1            --                   --         ok
PS-2            --                   --         ok
```

About Clock Modules

All switches in the Cisco MDS 9000 Series have two clock modules: Module A (primary) and Module B (redundant). The clock modules are designed, tested, and qualified for mission-critical availability with a mean time between failures (MTBF) of 3,660,316 hours. This translates to a potential failure every 365 years. Additionally, Cisco MDS 9000 Series switches are designed to automatically switch to the redundant clock module should the active clock module fail.

Tip We recommend that you replace a failed clock module during a maintenance window.

Use the **show environment clock** command to display the status for both clock modules.

This example shows clock module information.

```
switch# show environment clock
Clock:
----------------------------------------------------------
Clock           Model                Hw         Status
----------------------------------------------------------
A               Clock Module         0.0        ok/active
B               Clock Module         0.0        ok/standby
```

Displaying Environment Information

Use the **show environment** command to display all environment-related switch information.

```
switch# show environment
Power Supply:
Voltage: 50 Volts
Power                                  Actual        Total
Supply    Model                        Output     Capacity    Status
-------  -------------------  -----------  -----------  --------------
1        DS-CAC97-3KW               548 W       3000 W     Ok
2        DS-CAC97-3KW               535 W       3000 W     Ok
3        DS-CAC97-3KW               535 W       3000 W     Ok
4        ------------                 0 W          0 W     Absent
5        ------------                 0 W          0 W     Absent
6        ------------                 0 W          0 W     Absent
7        ------------                 0 W          0 W     Absent
8        DS-CAC97-3KW               535 W       3000 W     Ok


                                    Actual        Power
Module    Model                       Draw    Allocated    Status
-------  -------------------  -----------  -----------  --------------
2        DS-X9448-768K9              N/A            0 W    Powered-Dn
3        DS-X9648-1536K9             265 W        350 W    Powered-Up
5        DS-X97-SF1-K9               107 W        190 W    Powered-Up
6        DS-X97-SF1-K9               106 W        190 W    Powered-Up
7        DS-X9334-K9                 441 W        480 W    Powered-Up
8        DS-X9648-1536K9             252 W        750 W    Powered-Up
10       DS-X9848-480K9              363 W        500 W    Powered-Up
Xb1      DS-X9710-FAB1                95 W        150 W    Powered-Up
Xb2      DS-X9710-FAB1                94 W        150 W    Powered-Up
Xb3      DS-X9710-FAB1                91 W        150 W    Powered-Up
Xb       DS-X9710-FAB1               N/A          150 W    Powered-Dn
fan1     DS-C9710-FAN                 45 W        600 W    Powered-Up
fan2     DS-C9710-FAN                 45 W        600 W    Powered-Up
fan3     DS-C9710-FAN                 50 W        600 W    Powered-Up

N/A - Per module power not available


Power Usage Summary:
--------------------
Power Supply redundancy mode (configured)               Redundant
Power Supply redundancy mode (operational)              Redundant

Total Power Capacity (based on configured mode)              6000 W
```

```
Total Power of all Inputs (cumulative)                      12000 W
Total Power Output (actual draw)                             2153 W
Total Power Allocated (budget)                               5560 W
Total Power Available for additional modules                  440 W

Clock:
----------------------------------------------------------
Clock           Model               Hw         Status
----------------------------------------------------------
A               Clock Module        --         NotSupported/None
B               Clock Module        --         NotSupported/None


Fan:
-------------------------------------------------------
Fan             Model               Hw         Status
-------------------------------------------------------
Fan1(sys_fan1)  DS-C9710-FAN        0.2        Ok
Fan2(sys_fan2)  DS-C9710-FAN        0.2        Ok
Fan3(sys_fan3)  DS-C9710-FAN        0.2        Ok
Fan_in_PS1      --                  --         Ok
Fan_in_PS2      --                  --         Ok
Fan_in_PS3      --                  --         Ok
Fan_in_PS4      --                  --         Absent
Fan_in_PS5      --                  --         Absent
Fan_in_PS6      --                  --         Absent
Fan_in_PS7      --                  --         Absent
Fan_in_PS8      --                  --         Ok
Fan Zone Speed %(Hex): Zone 1: 40.78(0x68)


Temperature:
--------------------------------------------------------------------------
Module   Sensor        MajorThresh   MinorThres   CurTemp     Status
                       (Celsius)     (Celsius)    (Celsius)
--------------------------------------------------------------------------
3        Crossbar0 (s1)  125             115         46         Ok
3        Crossbar1 (s2)  125             115         54         Ok
3        Arb-mux  (s3)   125             105         49         Ok
3        CPU      (s4)   125             105         48         Ok
3        PCISW    (s5)   125             105         66         Ok
3        IOSlice0 (s6)   125             115         38         Ok
3        IOSlice1 (s7)   125             115         39         Ok
3        IOSlice2 (s8)   125             115         40         Ok
5        Inlet  (s1)     60              42          24         Ok
5        Crossbar(s2)    125             115         71         Ok
5        Arbiter (s3)    125             105         51         Ok
5        L2L3Dev1(s4)    125             110         42         Ok
5        CPU1CORE1(s5)   85              75          35         Ok
5        CPU1CORE2(s6)   85              75          29         Ok
5        CPU1CORE3(s7)   85              75          35         Ok
5        CPU1CORE4(s8)   85              75          30         Ok
5        DDR3DIMM1(s9)   95              85          31         Ok
6        Inlet  (s1)     60              42          26         Ok
6        Crossbar(s2)    125             115         70         Ok
6        Arbiter (s3)    125             105         52         Ok
6        L2L3Dev1(s4)    125             110         41         Ok
6        CPU1CORE1(s5)   85              70          36         Ok
6        CPU1CORE2(s6)   85              70          34         Ok
6        CPU1CORE3(s7)   85              70          36         Ok
6        CPU1CORE4(s8)   85              70          33         Ok
6        DDR3DIMM1(s9)   95              85          31         Ok
7        Crossbar0 (s1)  125             115         83         Ok
7        Crossbar1 (s2)  125             115         82         Ok
```

```
7        Arb-mux  (s3)   125             115         52          Ok
7        CPU      (s4)   125             115         53          Ok
7        L2L3Dev0 (s5)   125             115         66          Ok
7        IOSlice0 (s6)   125             115         56          Ok
7        IOSlice1 (s7)   125             115         57          Ok
7        IOSlice2 (s8)   125             115         57          Ok
7        FC-IP 0 (s9)    95              85          56          Ok
7        FC-IP 1 (s10)   95              85          56          Ok
8        Crossbar0 (s1)  125             115         52          Ok
8        Crossbar1 (s2)  125             115         52          Ok
8        Arb-mux  (s3)   125             105         50          Ok
8        CPU      (s4)   125             105         47          Ok
8        PCISW    (s5)   125             105         56          Ok
8        IOSlice0 (s6)   125             115         40          Ok
8        IOSlice1 (s7)   125             115         41          Ok
8        IOSlice2 (s8)   125             115         42          Ok
10       Crossbar1(s1)   125             115         79          Ok
10       Crossbar2(s2)   125             115         79          Ok
10       Arb-mux (s3)    125             105         56          Ok
10       L2L3Dev1(s5)    125             110         61          Ok
10       L2L3Dev2(s6)    125             110         61          Ok
10       L2L3Dev3(s7)    125             110         57          Ok
10       L2L3Dev4(s8)    125             110         56          Ok
10       L2L3Dev5(s9)    125             110         61          Ok
10       L2L3Dev6(s10)   125             110         52          Ok
10       L2L3Dev7(s11)   125             110         58          Ok
10       L2L3Dev8(s12)   125             110         66          Ok
10       L2L3Dev9(s13)   125             110         57          Ok
10       L2L3Dev10(s14)  125             110         59          Ok
10       L2L3Dev11(s15)  125             110         66          Ok
10       L2L3Dev12(s16)  125             110         62          Ok
xbar-1   Crossbar1(s1)   125             115         49          Ok
xbar-1   Crossbar2(s2)   125             115         54          Ok
xbar-2   Crossbar1(s1)   125             115         56          Ok
xbar-2   Crossbar2(s2)   125             115         63          Ok
xbar-3   Crossbar1(s1)   125             115         51          Ok
xbar-3   Crossbar2(s2)   125             115         64          Ok
xbar-4   Crossbar1(s1)   125             115         59          Ok
xbar-4   Crossbar2(s2)   125             115         67          Ok
xbar-5   Crossbar1(s1)   125             115         61          Ok
xbar-5   Crossbar2(s2)   125             115         68          Ok
```

Default Settings

This table lists the default hardware settings

Table 7: Default Hardware Parameter Settings

Parameter	Default Setting
Power supply mode	PS redundant mode.