This section describes how to identify and resolve problems that might occur in the mixed generation hardware components of the Cisco MDS 9000 Family. It includes the following sections:

Contents

- 1 Overview
  - 1.1 Port Groups
  - 1.2 Port Speed Mode
  - 1.3 Dynamic Bandwidth Management
  - 1.4 Out-of-Service Interfaces
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    - 4.4.1 Selecting the Correct Software Images

Overview

The following table identifies the modules supported by the Cisco MDS 9500 Series switches and Cisco MDS 9216A and Cisco MDS 9216i switches, as well as the Generation 2 switches:

Table 5-1 Generation 2 Modules and Switches

Part Number	Description
Modules	
DS-X9148	48-port 4-Gbps Fibre Channel switching module
DS-9304-18K9	18-port 1/2/4-Gbps Fibre Channel switching module with 4 Gigabit Ethernet ports
DS-X9112	12-port 4-Gbps Fibre Channel switching module
DS-X9704	4-port 10-Gbps Fibre Channel switching module
DS-X9530-SF2-K9	Supervisor-2 module (Cisco MDS 9500 Series switches only)
Switches	
DS-C9222i-K9	

	10-port 4-Gbps Fibre Channel switch with 4 Gigabit Ethernet IP storage services ports, and a modular expansion slot to host Cisco MDS 9000 Family Switching and Services Modules
DS-9134-K9	34-port 4-Gbps Fibre Channel switch
DS-X9124	24-port 4-Gbps Fibre Channel switch
DS-9304-K9	18-port 1/2/4-Gbps Fibre Channel switch with 4 Gigabit Ethernet ports in fixed slot1

Note: Generation 2 Fibre Channel switching modules are not supported on the Cisco MDS 9216 switch; however, they are supported by both the Supervisor-1 module and the Supervisor-2 module.

The 4-port 10-Gbps Fibre Channel switching module supports 10-Gbps port rates. The rest of the Generation 2 modules support 1-Gbps, 2-Gbps, 4-Gbps, or autosensing port rates.

For detailed information about the installation and specifications for these modules, refer to the hardware installation guide or the Configuration guides at the following website:

http://cisco.com/en/US/products/ps5989/tsd_products_support_series_home.html.

Port Groups

Each module has four groups of one or more ports in port groups that share common resources, such as bandwidth and buffer credits. The following table shows the port groups for the Generation 2 Fibre Channel switches and modules.

Table 5-2 Bandwidth and Port Groups for Generation 2 Modules

Module or Switch	Description	Number of Ports Per Port Group	Bandwidth Per Port Group	Maximum Bandwidth Per Port
DS-X9148	48-port 4-Gbps	12	12.8	4-Gbps[1]
DS-X9124	24-port 4-Gbps	6	12.8	4-Gbps [2]
DS-9304-18K9	18-port/4-port 4-Gbps (MSM-18/4 module)	6	12.8	4-Gbps[1]
DS-X9112	12-port 4-Gbps	3	12.8	4-Gbps[1]
DS-X9704	4-port 10-Gbps	1	10	10-Gbps[2]
DS-C9134-K9	32-port 4-Gbps	4	16	4-Gbps
	2-port 10-Gbps	1	10	10-Gbps
DS-C9124	24-port 4 Gbps	6	12.8	4-Gbps
DS-C9222i-K9	18-port 4-Gbps	6	12.8	4-Gbps

[1] Dedicated bandwidth with no oversubscription.

[2] Dedicated bandwidth or oversubscribed using shared buffer resources.

Note: Port groups are defined by the hardware and consist of sequential ports. For example, ports 1 through 12, ports 13 through 24, ports 25 through 36, and ports 37 through 48 are the port groups on the 48-port 4-Gbps Fibre Channel switching modules.

Port Speed Mode

The following table shows the port speeds allowed on each Generation 2 switching module.

Table 5-3 Configurable Port Speeds on Generation 2 Switching Modules

Module	Port Speed Modes	Default Configuration
48-port 4-Gbps	Auto, auto (max 2 Gbps), 1, 2, 4	Auto, shared
24-port 4-Gbps	Auto, auto max 2000 (2 Gbps), 1, 2, 4	Auto, shared
12-port 4-Gbps	Auto, auto max 2000 (2 Gbps), 1, 2, 4	Auto, dedicated
4-port 10-Gbps	Auto[1]	Auto, dedicated

[1] 4-port 10-Gbps can be configured as auto mode, but only supports 10-Gbps connections.

Dynamic Bandwidth Management

Table 5-4 Bandwidth Reserved for Dedicated Mode

Port Speed	Bandwidth Reserved per Port
Auto / 4 Gbps	
4 Gbps	
Auto max 2000 / 2 Gbps	
2 Gbps	
1 Gbps	
1 Gbps	
10[1]	
10 Gbps	

[1] Available only on the 4-port 10-Gbps switching module.

Table 5-5 shows the bandwidth reserved based on port speed for ports in shared mode.

Table 5-5 Bandwidth Reserved for Shared Mode

Module Type	Port Speed	Bandwidth Reserved
24-port 4-Gbps	Auto / 4 Gbps	1 Gbps
	Auto max 2000 / 2 Gbps	0.5 Gbps
	1 Gbps	1 Gbps

0.25 Gbps

48-port 4-Gbps

Auto / 4 Gbps

0.8 Gbps

Auto max 2000 / 2 Gbps

0.4 Gbps

1 Gbps

0.2 Gbps

Note: When migrating a host only supporting up to 2-Gbps traffic to the 4-Gbps switching modules, use autosensing with 2-Gbps maximum bandwidth.

Note: The 4-port 10-Gbps switching module only supports 10-Gbps links.

Out-of-Service Interfaces

You can take interfaces out of service to release shared resources that are needed for dedicated bandwidth. This feature is especially useful for the 48-port 4-Gbps switching modules. When an interface is taken out of service, all shared resources are released and made available to the other interface in the port group or module.

Caution: If you need to bring an interface back into service, you might disrupt traffic if you need to release shared resources from other interfaces.

Port Index Availability

Each chassis in the Cisco MDS 9000 Series has a hardware-based maximum port availability based on internally assigned port indexes. When the maximum number of port indexes is reached in a chassis, any modules remaining or added to the chassis will not boot up. The number of physical ports on a Fibre Channel module is equal to its number of port indexes. However, for Gigabit Ethernet modules (IPS-8, IPS-4, and MPS-14/2), one physical port is equal to four port indexes (one port index for iSCSI and three port indexes for FC IP tunnels). Table 5-6 lists the physical ports and port indexes (virtual ports) allocated per Cisco MDS 9000 module.

Table 5-6 Port Index Allocation

Module

Physical Ports

Port Indexes Allocated

48-port 4-Gbps Fibre Channel switching module

48

48

24-port 4-Gbps Fibre Channel switching module

24

24

12-port 4-Gbps Fibre Channel switching module

12

12

4-port 10-Gbps Fibre Channel switching module

4

4

16-port 2-Gbps Fibre Channel module

16

16[1]

32-port 2-Gbps Fibre Channel module

32

321

8-port Gigabit Ethernet IP Storage services module

8

321

4-port Gigabit Ethernet IP Storage services module

4

32 (with Supervisor-1)16 (with Supervisor-2)

32-port 2-Gbps Fibre Channel Storage Services Module (SSM).

32

321

14-port Fibre Channel/2-port Gigabit Ethernet Multiprotocol Services (MPS-14/2) module

16[2]

32 (with Supervisor-1)22 (with Supervisor-2)

[1] All Generation 1 modules reserve port indexes on fixed boundaries with Supervisor-1. See Table 5-7.

[2] Fourteen Fibre Channel ports and two Gigabit Ethernet ports.

Using any combination of modules that include a Generation 1 module or a Supervisor-1 module limits the port index availability to 252 on all Cisco MDS 9500 Series directors. Generation 1 modules also require contiguous port indexes where the system assigns a block of port index numbers contiguously starting from the first port index reserved for the slot that the module is inserted in (See Table 5-7). Even though there may be enough port indexes available for a Generation 1 module, the module may not boot up because the available port indexes are not in a contiguous range or the contiguous block does not start at the first port index for a given slot.

Example 5-1 shows a case with a Supervisor-1 module, where a 48-port Generation 2 module borrowed port indexes from the first slot. Slot 1 still has 16 port indexes available, but the full 32 indexes are no longer available (28-31 are used by the module in slot 4). This means that no Generation 1 module except a 16-port Fibre Channel switching module can be inserted into slot 1 because some of the port indexes for the slot are already in use.

Example 5-1 Borrowing Port Indexes from Another Slot

```
 switch#show port index-allocation
Module index distribution:
-----------------------------------------------------+
Slot    | Allowed |      Alloted indices info        |
        |  range* | Total |          Index values    |
-------|---------|-------|--------------------------|
1       |   0-  31|   -   |   -                      |
2       |  32-  63|   32  |   32-63                  |
3       |  64-  95|   48  |   64-95,224-239          |
4       |  96- 127|   48  |  96-127, 240-252, 28-31  |
7       | 128- 159|   32  |   128-159                |
8       | 160- 191|   32  | 160-191                  |
9       | 192- 223|   32  | 192-223                  |
SU      | 253-255 |   3   |  253-255                 |
*Allowed range applicable only for Generation-1 modules .
```

If you use any combination of modules that include a Generation 1 module and a Supervisor-2 module the port index availability is limitedt to 252 on all Cisco MDS 9500 Series directors. The Generation 1 modules can use any contiguous block of port indexes that start on the first port index reserved for any slot in the range 0-252.

Using any combination of only Generation 2 with a Supervisor-2 module allows a maximum of 528 (with an architectural limit of 1020) port indexes on all Cisco MDS 9500 Series directors. Generation 2 modules do not need contiguous port indexes. Generation 2 modules use the available indexes in the slot that it is installed and then borrow available indexes from the supervisors. If the module requires more indexes, it starts borrowing available indexes from slot 1 of the chassis until it has the number of port indexes necessary.

Note: Use the **purge module** CLI command to free up reserved port indexes after you remove a module.

Table 5-7 Port Index

Requirements

Supervisor

Module

Port Index Requirements

Supervisor-1

Generation 1

Indexes must:

•Be contiguous.

•In the range assigned to the given slot.

•Start with the lowest value assigned to that slot.[1] [2]

•Have no port indexes above 256 allocated to any other operational modules.

Maximum 252 assignable port indexes available.

Generation 2

Indexes can be any available number in the range 0 to 252.

Supervisor-2

Generation 1

Indexes must:

•Be contiguous.

•Start with the lowest value assigned to any slot. [2.]

•Have no port indexes above 256 allocated to any other operational modules.

Maximum 252 assignable port indexes available.

Generation 2

Indexes can be any available number in the range 0 to 1020 if all modules are Generation 2 modules. Otherwise, indexes can be any available number in the range 0 to 252.

[1] See the Allowed Ranges column in Example 5-1 for the port indexes assigned to each slot for Generation 1 modules.

[2] 16-port Fibre Channel switching modules can use the upper 16 indexes within a slot (for example, 16-31).

Combining Modules and Supervisors

All the existing Generation 1 and Generation 2 switching modules are supported by Cisco MDS SAN-OS Release 3.0(1) and later. However, there are limitations to consider when combining the various modules and supervisors in the Cisco MDS 9500 Series platform chassis.

You can combine Generation 1 and Generation 2 switching modules with either Supervisor-1 modules or Supervisor-2 modules. However, combining switching modules and supervisor modules has the following limitations:

- Use a Supervisor-2 module and all Generation 2 modules in a chassis to get up to 1020 port indexes.
- Use the show port index-allocation CLI command to determine available port index values before inserting new modules in a chassis if you have a mix of Generation 1 and Generation 2 modules.
- Use only Supervisor-2 modules on a Cisco MDS 9513 director.

Note: You cannot downgrade from a Supervisor-2 module to a Supervisor-1 module.

Initial Troubleshooting Checklist

Begin troubleshooting Generation 1 and Generation 2 module issues by checking the following issues:

Checklist	Check off
Verify the port index allocation if a newly inserted module does not power up.	
Check that the interface that you plan to use is not set to out-of-service.	
Verify appropriate port rate mode and port speed for your configuration.	
Ensure that both ends of a 10-Gbps link terminate in 10-Gbps ports.	
Verify that no Supervisor-1 modules are used in a Generation 2 switch.	

Use the **show interface transceiver** CLI command to view enhanced diagnostics on the X2 transceivers for Generation 2 modules. This is supported on 4-Gbps and 10-Gbps ports. Use these diagnostics to isolate physical layer problems, such as contact problems, major failures within SFPs, or abnormal error rates associated with excessive optical attenuation. The diagnostic information includes temperature, voltage and current, transmit power level, and receive power level.

Generation 1 and Generation 2 Issues

This section describes troubleshooting issues for Generation 1 and Generation 2 modules.

Module Does Not Come Online

Symptom Module does not come online.

Table 5-8 Module Does Not Come Online

Symptom

Possible Cause

Solution

Module does not come online.

Not enough port indexes are available.

See the "Verifying Port Index Allocation Using Device Manager" section or the "Verifying Port Index Allocation Using the CLI" section. If the switch has Generation 1 modules inserted, upgrade to all Generation 2 modules to gain higher total port index availability.

Available port indexes are non-contiguous.

See the "Verifying Port Index Allocation Using Device Manager" section or the "Verifying Port Index Allocation Using the CLI" section.

Not enough power is available in the chassis.

Use the **show environment** CLI command to determine if you have enough available power for the module. Upgrade your power supply, if necessary.

Verifying Port Index Allocation Using Device Manager

To verify port index allocation using Device Manager, follow these steps:

---

1. Choose **Interfaces > Show Port Index Allocation > Current** to display the allocation of port indexes on the switch.

```
Module index distribution:
-----------------------------------------------------+
Slot | Allowed |      Alloted indices info            |
     |  range  | Total |          Index values        |
-----|---------|-------|------------------------------|
 1   |   0- 255|   16  | 32-47                        |
 2   |   0- 255|   12  | 0-11                         |
 3   |   0- 255|   -   | (None)                       |
 4   |   0- 255|   -   | (None)                       |
 7   |   0- 255|   -   | (None)                       |
 8   |   0- 255|   -   | (None)                       |
 9   |   0- 255|   -   | (None)                       |
SUP  |  -----  |    3  | 253-255                      |
```

In some cases, the sequence in which switching modules are inserted into the chassis determines if one or more modules is powered up.

2. Choose **Interfaces > Show Port Index Allocation > Startup** to display the index allocation that the switch uses when it reboots.

```
Startup module index distribution:
-----------------------------------------------------+
Slot | Allowed |      Alloted indices info            |
     |  range  | Total |          Index values        |
-----|---------|-------|------------------------------|
 1   |   0- 255|   16  | 64-79                        |
 2   |   0- 255|   12  | 0-11                         |
SUP  |  -----  |    3  | 253-255                      |
```

3. Choose **Physical > Modules** to display the reason why a module does not power up.

Verifying Port Index Allocation Using the CLI

To verify port index allocation using the CLI, follow these steps:

---

1. Use the **show port index-allocation** command to display the allocation of port indexes on the switch.

```
 switch# show port index-allocation
Module index distribution:
-----------------------------------------------------+
Slot | Allowed |      Alloted indices info            |
     |  range  | Total |          Index values        |
-----|---------|-------|------------------------------|
 1   |   0- 255|   16  | 32-47                        |
 2   |   0- 255|   12  | 0-11                         |
 3   |   0- 255|   -   | (None)                       |
 4   |   0- 255|   -   | (None)                       |
 7   |   0- 255|   -   | (None)                       |
 8   |   0- 255|   -   | (None)                       |
 9   |   0- 255|   -   | (None)                       |
SUP  |  -----  |    3  | 253-255                      |
```

In some cases, the sequence in which switching modules are inserted into the chassis determines if one or more modules is powered up.

2. Use the **show port index-allocation startup** command to display the index allocation the switch uses when it reboots.

```
 switch# show port index-allocation startup
Startup module index distribution:
-----------------------------------------------------+
Slot | Allowed |      Alloted indices info            |
     |  range  | Total |          Index values        |
-----|---------|-------|------------------------------|
 1   |   0- 255|   16  | 64-79                        |
 2   |   0- 255|   12  | 0-11                         |
SUP  |  -----  |    3  | 253-255                      |
```

3. Use the **show module** command to display the reason why a module does not power up.

```
sw# show module
Mod  Ports  Module-Type                        Model              Status
---  -----  -------------------------------- ------------------ ------------
1    48     1/2/4 Gbps FC Module             DS-X9148           ok
2    48     1/2/4 Gbps FC Module             DS-X9148           ok
3    48     1/2/4 Gbps FC Module             DS-X9148           ok
4    32     1/2 Gbps FC Module               DS-X9032           ok
5    0      Supervisor/Fabric-1              DS-X9530-SF1-K9    active *
6    0      Supervisor/Fabric-1              DS-X9530-SF1-K9    ha-standby
7    16     1/2 Gbps FC Module               DS-X9016           ok
```

```
8    48     1/2/4 Gbps FC Module                                powered-dn
9    48     1/2/4 Gbps FC Module            DS-X9148            ok

Mod  Power-Status  Power Down Reason
---  ------------  ---------------------------
8    powered-dn    Insufficient resources (dest Index)
* this terminal session
```

4. If the module is powered down because of port index issues, use the **show module recovery-steps** command to determine how to correct the problem.

```
switch# show module 4 recovery-steps
Failure Reason:
Contiguous and aligned indices unavailable for Generation-1 modules
Check "show port index-allocation" for more details
Please follow the steps below:
1. Power-off module in one of the following slots: 12
2. Power-on module in slot 4 and wait till it comes online
3. Power-on the module powered-off in step 1
4. Do "copy running-config startup-config" to save this setting
```

Note: Verify that the **debug module no-power-down** command is not turned on.

Cannot Configure Port in Dedicated Mode

Symptom Cannot configure port in dedicated mode.

Table 5-9 Cannot Configure Port in Dedicated Mode

Symptom

Possible Cause

Solution

Cannot configure a port in dedicated mode.

Not enough bandwidth is available in the port group.

See the "Verifying Bandwidth Utilization in a Port Group Using Device Manager" section or the "Verifying Bandwidth Utilization in a Port Group Using the CLI" section.

Verifying Bandwidth Utilization in a Port Group Using Device Manager

To verify bandwidth utilization in a port group using Device Manager, follow these steps:

1. Right-click the module and select **Show Port Resources....** to display the Generation 2 module shared resources configuration.

```
Module 2
Available dedicated buffers are 5164
```

```
 Port-Group 1
  Total bandwidth is 12.8 Gbps
  Total shared bandwidth is 4.8 Gbps
  Allocated dedicated bandwidth is 8.0 Gbps
  --------------------------------------------------------------------
  Interfaces in the Port-Group       B2B Credit  Bandwidth  Rate Mode
                                        Buffers     (Gbps)
  --------------------------------------------------------------------
  fc2/1                                      16        4.0  shared
  fc2/2                                      16        4.0  shared
  fc2/3                                      16        4.0  shared
  fc2/4                                      16        4.0  shared
  fc2/5                                      16        4.0  dedicated
  fc2/6                                      16        4.0  dedicated

...
```

In this example, there is not enough available shared bandwidth in Port-Group 1 to switch any more ports to 4-Gbps dedicated mode.

2. Do one of the following to free up bandwidth for the port that you want to place in dedicated mode.

- Right-click one or more ports and choose **Service > Out** to put a port in out-of-service mode to free up more resources.
- Right-click a port and select **Configure**. Lower the port speed.

See the "Dynamic Bandwidth Management" section for the minimum bandwidth requirements for port rate modes and port speeds.

Verifying Bandwidth Utilization in a Port Group Using the CLI

To verify bandwidth utilization in a port group using the CLI, follow these steps:

---

1. Use the **show port-resources module** command to display the Generation 2 module shared resources configuration.

```
switch# show port-resources module 2
Module 2
Available dedicated buffers are 5164

Port-Group 1
  Total bandwidth is 12.8 Gbps
  Total shared bandwidth is 4.8 Gbps
  Allocated dedicated bandwidth is 8.0 Gbps
  --------------------------------------------------------------------
  Interfaces in the Port-Group       B2B Credit  Bandwidth  Rate Mode
                                        Buffers     (Gbps)
  --------------------------------------------------------------------
  fc2/1                                      16        4.0  shared
  fc2/2                                      16        4.0  shared
  fc2/3                                      16        4.0  shared
  fc2/4                                      16        4.0  shared
  fc2/5                                      16        4.0  dedicated
  fc2/6                                      16        4.0  dedicated


...
```

In this example, there is not enough available shared bandwidth in Port-Group 1 to switch any more ports to 4 Gbps dedicated mode.

2. Free bandwidth for the port that you want to place in dedicated mode by performing one of these tasks:

- Use the **out-of-service** command in interface mode to put one or more ports in out- of-service mode to free more resources.
- Use the **swtichport speed** command on one or more ports to change the port speed to a lower port speed. See the "Dynamic Bandwidth Management" section for the minimum bandwidth requirements for port rate modes and port speeds.

Cannot Enable a Port

Symptom Cannot enable a port.

Table 5-10 Cannot Enable a Port

Symptom

Possible Cause

Solution

Cannot enable a port.

Port is out of service.

In Device Manager, right-click the port and select **Configure** to see if the port is out of service.

Using the CLI, use the **show interface brief** command to see if the port is out of service.

See the "Verifying Bandwidth Utilization in a Port Group Using Device Manager" section or the "Verifying Bandwidth Utilization in a Port Group Using the CLI" section to free up enough port resources to bring the port in service.

Not enough bandwidth is available in the port group.

See the "Verifying Bandwidth Utilization in a Port Group Using Device Manager" section or the "Verifying Bandwidth Utilization in a Port Group Using the CLI" section.

Cannot Upgrade Supervisor System Image

Symptom Cannot upgrade supervisor system image.

Table 5-11 Cannot Upgrade Supervisor System Image

Symptom

Possible Cause

Solution

Cannot upgrade supervisor system image.

Wrong Cisco SAN-OS image type.

Use the appropriate Cisco SAN-OS image for your supervisor. See the "Selecting the Correct Software Images" section. In Device Manager, choose **Physical > Modules** to find the supervisor type.

Also, use the **show module** CLI command to determine the supervisor type.

Selecting the Correct Software Images

The Supervisor-1 and Supervisor-2 modules supported by Cisco MDS 9100, 9200, and 9500 Series switches require different system and kickstart images. You can determine which images to use on your switch by the naming conventions shown in table 5-12 below.

Table 5-12 Supervisor Module Software Image Naming Conventions

Cisco MDS 9500 Series Switch Type

Supervisor Module Type

Naming Convention

9120 or 9140

Supervisor-1 module

Filename begins with m9100-s1ek9

9134

Cisco Fabric Switch for HP-c Class BladeSystem

Cisco Fabric Switch for IBM BladeCenter

Supervisor-2 module

Filename begins with m9100-s2ek9

9221i

Supervisor-2 module

Filename begins with m9200-s2ek9

9216, 9216A or 9216i

Supervisor-1 module

Filename begins with m9200-s1k9

9506 or 9509

Supervisor-1 module

Filename begins with m9500-sf1ek9

Supervisor-2module

Filename begins with m9500-sf2ek9

9513

Supervisor-2 module

Filename begins with m9500-sf2ek9

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