



Stack Manager and High Availability Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Catalyst 9200 Switches)

First Published: 2019-03-29

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CHAPTER 1

Managing Switch Stacks

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

Prerequisites for Switch Stacks

- All the switches in the stack must be running the same license level as the active switch. For information about license levels, see the *System Management* section of this guide.
- All the switches in the switch stack must be running compatible software versions.

Restrictions for Switch Stacks

The following are the restrictions for switch stack configuration:

- A switch stack can have up to eight stacking-capable switches connected through their StackWise ports.
- Only homogenous stacking is supported, that is, a stack of Cisco Catalyst 9200 Series Switches with only Cisco Catalyst 9200 Series Switches as stack members.

- You cannot have a switch stack containing a mix of different license levels.
- Do not stack Cisco Catalyst 9200L Series Switches with Cisco Catalyst 9200 Series Switches.

Information About Switch Stacks

Switch Stack Overview

A switch stack can have up to eight stacking-capable switches connected through their StackWise ports. The stack members work together as a unified system. Layer 2 and Layer 3 protocols present the entire switch stack as a single entity to the network.

The active switch controls the operation of the switch stack, and is the single point of stack-wide management.

From the active switch, you configure:

- System-level (global) features that apply to all stack members
- Interface-level features for each stack member

The active switch contains the saved and running configuration files for the switch stack. The configuration files include the system-level settings for the switch stack and the interface-level settings for each stack member. Each stack member has a current copy of these files for back-up purposes.

Switch Stack Bridge ID and MAC Address

A switch stack is identified in the network by its *bridge ID* and, if it is operating as a Layer 3 device, its router MAC address. The bridge ID and router MAC address are determined by the MAC address of the active switch.

If the active switch changes, the MAC address of the new active switch determines the new bridge ID and router MAC address.

If the entire switch stack reloads, the switch stack uses the MAC address of the active switch.

Persistent MAC Address on the Switch Stack

You can use the persistent MAC address feature to set a time delay before the stack MAC address changes. During this time period, if the previous active switch rejoins the stack, the stack continues to use its MAC address as the stack MAC address, even if the switch is now a stack member and not an active switch. If the previous active switch does not rejoin the stack during this period, the switch stack takes the MAC address of the new active switch as the stack MAC address. By default, the stack MAC address will be the MAC address of the first active switch, even if a new active switch takes over.



Note

You can also configure stack MAC persistency so that the stack MAC address never changes to the new active switch MAC address, by using the **stack-mac persistent timer 0** command. This avoids Link Aggregation Control Protocol (LACP) and Port Aggregation Protocol (PAgP) flaps or inconsistencies.

Upgrading a Switch Running Incompatible Software

The auto-upgrade and auto-advise features enable a switch with software packages that are incompatible with the switch stack to be upgraded to a compatible software version so that it can join the switch stack.

Switch Stack Management Connectivity

You manage the switch stack and the stack member interfaces through the active switch. You can use the CLI, SNMP, and supported network management applications such as CiscoWorks. You cannot manage stack members on an individual basis.

How to Configure a Switch Stack

Monitoring the Stack

Table 1: Commands for Displaying Stack Information

Command	Description
show module	Displays summary information about the stack.
show switch detail	Displays detailed information about the stack.
show switch neighbors	Displays the stack neighbors.
show switch stack-ports [summary]	Displays port information for the stack. Use the summary keyword to display the stack cable length, the stack link status, and the loopback status.
show redundancy	Displays the redundant system and the current processor information. The redundant system information includes the system uptime, standby failures, switchover reason, hardware, configured and operating redundancy mode. The current processor information displayed includes the active location, the software state, the uptime in the current state and so on.
show redundancy state	Displays all the redundancy states of the active and standby .

Configuration Examples for Switch Stacks

Switch Stack Configuration Scenarios

Most of these switch stack configuration scenarios assume that at least two devices are connected through their StackWise ports.

Table 2: Configuration Scenarios

Scenario		Result
Active switch election specifically determined by existing active switches	Connect two powered-on switch stacks through the StackWise ports.	Only one of the two active switches becomes the new active switch.
Active switch election specifically determined by the stack member priority value	<ol style="list-style-type: none"> 1. Connect two switches through their StackWise ports. 2. Use the switch stack-member-number priority new-priority-number command to set one stack member with a higher member priority value. 3. Restart both member switches at the same time. 	The stack member with the higher priority value is elected active switch.
Active switch election specifically determined by the configuration file	<p>Assuming that both member switches have the same priority value:</p> <ol style="list-style-type: none"> 1. Make sure that one stack member has a default configuration and that the other stack member has a saved (nondefault) configuration file. 2. Restart both member switches at the same time. 	The stack member with the saved configuration file is elected active switch.
Active switch election specifically determined by the MAC address	Assuming that both member switches have the same priority value, configuration file, and license level, restart both member switches at the same time.	The stack member with the lower MAC address is elected active switch.

Scenario		Result
Stack member number conflict	<p>Assuming that one stack member has a higher priority value than the other stack member:</p> <ol style="list-style-type: none"> 1. Ensure that both member switches have the same stack member number. If necessary, use the switch <i>current-stack-member-number</i> renumber <i>new-stack-member-number</i> command. 2. Restart both member switches at the same time. 	The stack member with the higher priority value retains its stack member number. The other stack member has a new stack member number.
Add a stack member	<ol style="list-style-type: none"> 1. Power off the new switch. 2. Through their StackWise ports, connect the new switch to a powered-on switch stack. 3. Power on the new switch. 	The active switch is retained. The new switch is added to the switch stack.
Active switch failure	Remove (or power off) the active switch.	One of the remaining member switches becomes the new active switch. All other member switches in the stack remain as member switches and do not reboot.
Add member switches	<ol style="list-style-type: none"> 1. Through their StackWise ports, connect devices. 2. Power on all devices. 	<p>Two devices become active switches. One active switch has member switches. The other active switch remains as a standalone device.</p> <p>Use the Mode button and port LEDs on the device to identify which devices are active switches and which devices belong to each active switch.</p>

Enabling the Persistent MAC Address Feature: Example

This example shows how to configure the persistent MAC address feature for a 7-minute time delay and to verify the configuration:

```
(config)# stack-mac persistent timer 7
WARNING: The stack continues to use the base MAC of the old Master
WARNING: as the stack MAC after a master switchover until the MAC
WARNING: persistency timer expires. During this time the Network
WARNING: Administrators must make sure that the old stack-mac does
WARNING: not appear elsewhere in this network domain. If it does,
WARNING: user traffic may be blackholed.
(config)# end
# show switch
```

show switch stack-ports summary Command Output: Example

```

Switch/Stack Mac Address : 0016.4727.a900
Mac persistency wait time: 7 mins

Switch#  Role  Mac Address      Priority  H/W  Current
          |      |              |         |    |      |
-----+-----+-----+-----+----+-----+
*1        | 0016.4727.a900 | 1       | P2B    | Ready

```

show switch stack-ports summary Command Output: Example

Only Port 1 on stack member 2 is disabled.

```

# show switch stack-ports summary
# / Stack Neighbor Cable Link Link Sync # In
Port# Port Length OK Active OK Changes Loopback
      Status
-----+-----+-----+-----+----+-----+-----+-----+
1/1   OK      3       50 cm  Yes  Yes  Yes  1      No
1/2   Down    None    3 m    Yes  No   Yes  1      No
2/1   Down    None    3 m    Yes  No   Yes  1      No
2/2   OK      3       50 cm  Yes  Yes  Yes  1      No
3/1   OK      2       50 cm  Yes  Yes  Yes  1      No
3/2   OK      1       50 cm  Yes  Yes  Yes  1      No

```

Table 3: show switch stack-ports summary Command Output

Field	Description
Switch#/Port#	Member number and its stack port number.
Stack Port Status	Status of the stack port. <ul style="list-style-type: none"> Absent—No cable is detected on the stack port. Down—A cable is detected, but either no connected neighbor is up, or the stack port is disabled. OK—A cable is detected, and the connected neighbor is up.
Neighbor	Switch number of the active member at the other end of the stack cable.
Cable Length	Valid lengths are 50 cm, 1 m, or 3 m. If the switch cannot detect the cable length, the value is <i>no cable</i> . The cable might not be connected, or the link might be unreliable.
Link OK	Whether the stack cable is connected and functional. There may or may not be a neighbor connected on the other end. The <i>link partner</i> is a stack port on a neighbor switch. <ul style="list-style-type: none"> No—There is no stack cable connected to this port or the stack cable is not functional. Yes—There is a functional stack cable connected to this port.

Field	Description
Link Active	Whether a neighbor is connected on the other end of the stack cable. <ul style="list-style-type: none"> • No—No neighbor is detected on the other end. The port cannot send traffic over this link. • Yes—A neighbor is detected on the other end. The port can send traffic over this link.
Sync OK	Whether the link partner sends valid protocol messages to the stack port. <ul style="list-style-type: none"> • No—The link partner does not send valid protocol messages to the stack port. • Yes—The link partner sends valid protocol messages to the port.
#Changes to LinkOK	The relative stability of the link. If a large number of changes occur in a short period of time, link flapping can occur.
In Loopback	Whether a stack cable is attached to a stack port on the member. <ul style="list-style-type: none"> • No—At least one stack port on the member has an attached stack cable. • Yes—None of the stack ports on the member has an attached stack cable.

Software Loopback: Examples

In a stack with three members, stack cables connect all the members:

```
# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link  Link   Sync   #Changes   In
           Status                                OK    Active OK     To LinkOK Loopback
-----
 1/1       OK        3         50 cm   Yes   Yes   Yes    1           No
 1/2       OK        2         3 m     Yes   Yes   Yes    1           No
 2/1       OK        1         3 m     Yes   Yes   Yes    1           No
 2/2       OK        3         50 cm   Yes   Yes   Yes    1           No
 3/1       OK        2         50 cm   Yes   Yes   Yes    1           No
 3/2       OK        1         50 cm   Yes   Yes   Yes    1           No
```

If you disconnect the stack cable from Port 1 on Switch 1, these messages appear:

```
01:09:55: %STACKMGR-4-STACK_LINK_CHANGE: Stack Port 2 Switch 3 has changed to state DOWN
01:09:56: %STACKMGR-4-STACK_LINK_CHANGE: Stack Port 1 Switch 1 has changed to state DOWN

# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link  Link   Sync   #Changes   In
           Status                                OK    Active OK     To LinkOK Loopback
-----
 1/1       Absent    None      No cable No    No    No     1           No
 1/2       OK        2         3 m     Yes   Yes   Yes    1           No
 2/1       OK        1         3 m     Yes   Yes   Yes    1           No
 2/2       OK        3         50 cm   Yes   Yes   Yes    1           No
```

3/1	OK	2	50 cm	Yes	Yes	Yes	1	No
3/2	Down	None	50 cm	No	No	No	1	No

If you disconnect the stack cable from Port 2 on Switch 1, the stack splits.

Switch 2 and Switch 3 are now in a two-member stack connected through stack cables:

```
# show sw stack-ports summary
#
Sw#/Port# Port Neighbor Cable Link Link Sync #Changes In
          Status          Length OK Active OK To LinkOK Loopback
-----
2/1      Down      None    3 m    No    No    No    1      No
2/2      OK         3      50 cm  Yes   Yes   Yes   1      No
3/1      OK         2      50 cm  Yes   Yes   Yes   1      No
3/2      Down      None    50 cm  No    No    No    1      No
```

Switch 1 is a standalone switch:

```
# show switch stack-ports summary
#
Sw#/Port# Port Neighbor Cable Link Link Sync #Changes In
          Status          Length OK Active OK To LinkOK Loopback
-----
1/1      Absent    None    No cable No    No    No    1      Yes
1/2      Absent    None    No cable No    No    No    1      Yes
```

Software Loopback with Connected Stack Cables: Examples

- On Port 1 on Switch 1, the port status is *Down*, and a cable is connected.

On Port 2 on Switch 1, the port status is *Absent*, and no cable is connected.

```
# show switch stack-ports summary
#
Sw#/Port# Port Neighbor Cable Link Link Sync #Changes In
          Status          Length OK Active OK To LinkOK Loopback
-----
1/1      Down      None    50 Cm  No    No    No    1      No
1/2      Absent    None    No cable No    No    No    1      No
```

- In a *physical loopback*, a cable connects both stack ports on a switch. You can use this configuration to test
 - Cables on a switch that is running properly
 - Stack ports with a cable that works properly

```
# show switch stack-ports summary
#
Sw#/Port# Port Neighbor Cable Link Link Sync #Changes In
          Status          Length OK Active OK To LinkOK Loopback
-----
2/1      OK         2      50 cm  Yes   Yes   Yes   1      No
2/2      OK         2      50 cm  Yes   Yes   Yes   1      No
```

The port status shows that

- Switch 2 is a standalone switch.
- The ports can send and receive traffic.

Software Loopback with no Connected Stack Cable: Example

```
# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link  Link  Sync  #Changes  In
           Status                    Length  OK    Active OK    To LinkOK Loopback
-----
1/1        Absent    None      No cable No    No    No    1         Yes
1/2        Absent    None      No cable No    No    No    1         Yes
```

Finding a Disconnected Stack Cable: Example

Stack cables connect all stack members. Port 2 on Switch 1 connects to Port 1 on Switch 2.

This is the port status for the members:

```
# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link  Link  Sync  #Changes  In
           Status                    Length  OK    Active OK    To LinkOK Loopback
-----
1/1        OK         2         50 cm   Yes   Yes   Yes   0         No
1/2        OK         2         50 cm   Yes   Yes   Yes   0         No
2/1        OK         1         50 cm   Yes   Yes   Yes   0         No
2/2        OK         1         50 cm   Yes   Yes   Yes   0         No
```

If you disconnect the cable from Port 2 on Switch 1, these messages appear:

```
%STACKMGR-4-STACK_LINK_CHANGE: Stack Port 1 Switch 2 has changed to state DOWN
%STACKMGR-4-STACK_LINK_CHANGE: Stack Port 2 Switch 1 has changed to state DOWN
```

This is now the port status:

```
# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link  Link  Sync  #Changes  In
           Status                    Length  OK    Active OK    To LinkOK Loopback
-----
1/1        OK         2         50 cm   Yes   Yes   Yes   1         No
1/2        Absent    None      No cable No    No    No    2         No
2/1        Down      None      50 cm   No    No    No    2         No
2/2        OK         1         50 cm   Yes   Yes   Yes   1         No
```

Only one end of the cable connects to a stack port, Port 1 on Switch 2.

- The *Stack Port Status* value for Port 2 on Switch 1 is *Absent*, and the value for Port 1 on Switch 2 is *Down*.
- The *Cable Length* value is *No cable*.

Diagnosing the problem:

- Verify the cable connection for Port 2 on Switch 1.
- Port 2 on Switch 1 has a port or cable problem if
 - The *In Loopback* value is *Yes*.

or

- The *Link OK*, *Link Active*, or *Sync OK* value is *No*.

Fixing a Bad Connection Between Stack Ports: Example

Stack cables connect all members. Port 2 on Switch 1 connects to Port 1 on Switch 2.

This is the port status:

```
# show switch stack-ports summary
#
Sw#/Port#  Port      Neighbor  Cable   Link   Link   Sync   #Changes  In
            Status                                OK     Active OK     To LinkOK Loopback
-----
  1/1       OK        2         50 cm   Yes    Yes    Yes    1         No
  1/2       Down     None      50 cm   No     No     No     2         No
  2/1       Down     None      50 cm   No     No     No     2         No
  2/2       OK        1         50 cm   Yes    Yes    Yes    1         No
```

Diagnosing the problem:

- The Stack Port Status value is *Down*.
- Link OK, Link Active, and Sync OK values are *No*.
- The Cable Length value is *50 cm*. The switch detects and correctly identifies the cable.

The connection between Port 2 on Switch 1 and Port 1 on Switch 2 is unreliable on at least one of the connector pins.

Additional References for Switch Stacks

Related Documents

Related Topic	Document Title
Cabling and powering on a switch stack.	<i>Cisco Catalyst 9200 Series Switches Hardware Installation Guide</i>
SGACL High Availability	" Cisco TrustSec SGACL High Availability " module of the <i>Cisco TrustSec Switch Configuration Guide</i>

Error Message Decoder

Description	Link
To help you research and resolve system error messages in this release, use the Error Message Decoder tool.	https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi

Standards and RFCs

Standard/RFC	Title
None	—

MIBs

MIB	MIBs Link
All the supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS releases, and , use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/support

Feature History and Information for Switch Stacks

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use the Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required

Table 4: Feature Information for Switch Stacks

Feature Name	Release	Feature Information
Switch Stack	Cisco IOS XE Fuji 16.9.1	A switch stack can have up to eight stacking-capable switches connected through their StackWise ports. The stack members work together as a unified system. Layer 2 and Layer 3 protocols present the entire switch stack as a single entity to the network.



CHAPTER 2

Configuring 1:1 Redundancy

- [Prerequisites for 1:1 Redundancy, on page 13](#)
- [Information About 1:1 Redundancy, on page 13](#)
- [How to Configure 1:1 Redundancy, on page 13](#)
- [Configuration Examples for 1:1 Redundancy, on page 14](#)
- [Verifying the Stack Mode, on page 15](#)
- [Additional References for 1:1 Redundancy, on page 15](#)
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Prerequisites for 1:1 Redundancy

- All the switches in the stack must be running the same license level as the active switch. For information about license levels, see the *System Management Configuration Guide* of the required release.
- All the switches in the stack must be running compatible software versions.

Information About 1:1 Redundancy

1:1 redundancy is used to assign active and standby roles to specific switches in the stack. This overrides the traditional N+1 role selection algorithm, where any switch in the stack can be active or standby. In 1:1 redundancy, the stack manager determines the active and standby role for a specific switch, based on the flash ROMMON variable. The algorithm assigns one switch as active, another switch as standby, designating all remaining switches in the stack as members. When an active switch reboots it becomes standby and the existing standby switch becomes the new active. The existing member switches remain in the same state.

How to Configure 1:1 Redundancy

Enabling 1:1 Redundancy Stack Mode

Follow these steps to enable the 1:1 redundancy stack mode, and set a switch as the active switch in a stack, or as the standby:

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	switch switch-number role {active standby} Example: Device# switch 1 role active	Changes stack mode to 1:1 mode and designates the switch as active or standby.

Disabling 1:1 Redundancy Stack Mode

On a switch where 1:1 redundancy is enabled, follow these steps to disable the feature. This changes the stack mode to N+1:

Procedure

	Command or Action	Purpose
Step 1	enable Example: Device> enable	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	switch clear stack-mode Example: Device# switch clear stack-mode	Changes stack mode to the N+1 mode and removes active and standby assignments.

Configuration Examples for 1:1 Redundancy

Example: Enabling 1:1 Redundancy Stack Mode

You can use the **switch switch-number role** command to set the active and standby switch in 1:1 stack mode. The stack operates in the 1:1 stack mode with the specified active or standby after reboot. In the following example, switch 1 is assigned the active role, and switch 2 is assigned the standby role.

```
Device# switch 1 role active
```

```
WARNING: Changing the switch role may result in redundancy mode being configured to 1+1 mode for this stack. If the configured Active or Standby switch numbers do not boot up, then the stack will not be able to boot. Do you want to continue?[y/n]? [yes]: yes
```

```
Device# switch 2 role standby
```

```
WARNING: Changing the switch role may result in redundancy mode being configured to 1+1
```

```
mode for this stack. If the configured Active or Standby switch numbers do not boot up,
then the stack will not be able to boot. Do you want to continue?[y/n]? [yes]: yes
```

Example: Disabling 1:1 Redundancy

You can use the **switch clear stack-mode** command to remove 1:1 stack mode, and change it back to N+1 stack mode.

```
Device# switch clear stack-mode
WARNING: Clearing the chassis HA configuration will result in the chassis coming up in Stand
Alone mode after reboot. The HA configuration will remain the same on other chassis. Do you
wish to continue? [y/n]? [yes]:
```

Verifying the Stack Mode

To verify the current stack mode on a switch, enter the **show switch stack-mode** command in privileged EXEC mode. The output displays detailed status of the currently running stack mode.

```
Device# show switch stack-mode
Switch  Role    Mac Address    Version  Mode    Configured  State
-----
1        Member  3c5e.c357.c880          1+1 '    Active'    Ready
*2        Active  547c.69de.cd00    V05     1+1 '    Standby'   Ready
3        Member  547c.6965.cf80    V05     1+1 '    Member'    Ready
```

The `Mode` field indicates the current stack mode

The `Configured` field refers to the switch state expected after a reboot.

Single quotation marks (') indicate that the stack mode has been changed.

Additional References for 1:1 Redundancy

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the <i>Stacking and High Availability Commands</i> section of the Command Reference for the release.

Feature History for 1:1 Redundancy

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Fuji 16.9.2	1:1 Redundancy	Enables the 1:1 redundancy stack mode and enables you to assign active and standby roles to specific switches in the stack.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>.