Managing Switch Stacks

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release.

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.

Related Topics

Feature History and Information for Troubleshooting Software Configuration

Prerequisites for Switch Stacks

If one stack member is running the LAN Base license level, all switches in the stack must run the LAN Base license level.

Restrictions for Switch Stacks

Information About Switch Stacks

Switch Stack Overview

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.

Supported Features in a Switch Stack

The system-level features supported on the active switch are supported on the entire switch stack. If a switch in the stack is running the IP Base or IP Services licence level and the cryptographic (that is, supporting encryption) universal software image, we recommend that this switch be the active switch. Encryption features are unavailable if the active switch is running the IP Base or IP Services licence level and the noncryptographic software image.

Switch Stack Membership

A standalone switch is a switch stack with one stack member that also operates as the active switch. You can connect one standalone switch to another to create a switch stack containing two stack members, with one of them as the active switch. You can connect standalone switches to an existing switch stack to increase the stack membership.

If you replace a stack member with an identical model, the new switch functions with exactly the same configuration as the replaced switch, assuming that the new switch (referred to as the provisioned switch) is using the same member number as the replaced switch.

The operation of the switch stack continues uninterrupted during membership changes unless you remove the active switch or you add powered-on standalone switches or switch stacks.

- Adding powered-on switches (merging) causes all switches to reload and elect a new active switch from among themselves. The newly elected active switch retains its role and configuration. All other switches change their stack member numbers to the lowest available numbers and use the stack configuration of the newly elected active switch.

- Removing powered-on stack members causes the switch stack to divide (partition) into two or more switch stacks, each with the same configuration. This can cause an IP address configuration conflict in

your network. If you want the switch stacks to remain separate, change the IP address or addresses of the newly created switch stacks.

If a newly created switch stack does not have an active switch or standby switch, the switch stack will reload and elect a new active switch.

Note   Make sure that you power off the switches that you add to or remove from the switch stack.

After adding or removing stack members, make sure that the switch stack is operating at full bandwidth . Press the Mode button on a stack member until the Stack mode LED is on. The last two right port LEDs on all switches in the stack should be green. Depending on the switch model, the last two right ports are 10-Gigabit Ethernet ports or small form-factor pluggable (SFP) module ports (10/100/1000 ports). If one or both of these LEDs are not green on any of the switches, the stack is not operating at full bandwidth.

If you did not intend to partition the switch stack:

- Power off the switches in the newly created switch stacks.

- Power on the switches.

For cabling and power considerations that affect creating switch stacks, see the switch hardware installation guide.

Stack Member Numbers

A new, out-of-the-box switch (one that has not joined a switch stack or has not been manually assigned a stack member number) ships with a default stack member number of 1. When it joins a switch stack, its default stack member number changes to the lowest available member number in the stack.

Stack members in the same switch stack cannot have the same stack member number. Every stack member, including a standalone switch, retains its member number until you manually change the number or unless the number is already being used by another member in the stack.

- If you manually change the stack member number by using the **switch** *current-stack-member-number* **renumber** *new-stack-member-number* EXEC command, the new number goes into effect after that stack member resets (or after you use the **reload slot** *stack-member-number* privileged EXEC command) and only if that number is not already assigned to any other members in the stack. Another way to change the stack member number is by changing the SWITCH_NUMBER environment variable.

   If the number is being used by another member in the stack, the switch selects the lowest available number in the stack.

   If you manually change the number of a stack member and no interface-level configuration is associated with that new member number, that stack member resets to its default configuration.

   You cannot use the **switch** *current-stack-member-number* **renumber** *new-stack-member-number* EXEC command on a provisioned switch. If you do, the command is rejected.

- If you move a stack member to a different switch stack, the stack member retains its number only if the number is not being used by another member in the stack. If it is being used, the switch selects the lowest available number in the stack.

- If you merge switch stacks, the switches that join the switch stack of a new active switch select the lowest available numbers in the stack.

As described in the hardware installation guide, you can use the switch port LEDs in Stack mode to visually determine the stack member number of each stack member.

Stack Member Priority Values

A higher priority value for a stack member increases its likelihood of being elected active switch and retaining its stack member number. The priority value can be 1 to 15. The default priority value is 1. You can display the stack member priority value by using the **show switch** EXEC command.

> **Note** We recommend assigning the highest priority value to the switch that you prefer to be the active switch. This ensures that the switch is re-elected as active switch if a re-election occurs.

To change the priority value for a stack member, use the **switch** *stack-member-number* **priority** *new priority-value* EXEC command. Another way to change the member priority value is by changing the SWITCH_PRIORITY environment variable.

The new priority value takes effect immediately but does not affect the current active switch. The new priority value helps determine which stack member is elected as the new active switch when the current active switch or the switch stack resets.

Switch Stack Bridge ID

A switch stack is identified in the network by its *bridge ID*, which is determined by the MAC address of the stack master.

If the stack master changes, the MAC address of the new active switch determines the new bridge ID.

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

Persistent MAC Address on the Switch Stack

The switch stack MAC address is determined by the MAC address of the stack master. When a stack master is removed from the stack and a new stack master takes over, the default is for the MAC address of the new stack master to immediately become the new stack MAC address.

However, 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 stack master rejoins the stack, the stack continues to use that MAC address as the stack MAC address, even if the switch is now a stack member and not a stack master. If the previous stack master does not rejoin the stack during this period, the switch stack takes the MAC address of the new stack master as the stack MAC address.

You can also configure stack MAC persistency so that the stack MAC address never changes to the new master MAC address.

> **Note** If the entire switch stack reloads, it uses the MAC address of the stack master as the stack MAC address.

Active Switch Election and Re-Election

All stack members are eligible to be the active switch or the standby switch. If the active switch becomes unavailable, the standby switch becomes the active switch.

An active switch retains its role unless one of these events occurs:

- The switch stack is reset.

- The active switch is removed from the switch stack.

- The active switch is reset or powered off.

- The active switch fails.

- The switch stack membership is increased by adding powered-on standalone switches or switch stacks.

The active switch is elected or re-elected based on one of these factors and in the order listed:

1 The switch that is currently the active switch.

2 The switch with the highest stack member priority value.

Note We recommend assigning the highest priority value to the switch that you prefer to be the active switch. This ensures that the switch is re-elected as active switch if a re-election occurs.

3 The switch with the shortest start-up time. Differences in start-up times between the feature image licenses determine the active switch. For example, a switch running the IP Services license level has a higher priority than the switch running the IP Base license level, but the switch running the IP Base license level becomes the active switch because the other switch takes 10 seconds longer to start. To avoid this problem, upgrade the switch running the IP Base license level to the same licensed feature set and software image as the other switch, or manually start the active switch and wait at least 8 seconds before starting the new member switch that is running the IP Base license level.

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5 The switch with the lowest MAC address.

After election, the new active switch becomes available after a few seconds. In the meantime, the switch stack uses the forwarding tables in memory to minimize network disruption. The physical interfaces on the other available stack members are not affected during a new active switch election and reset.

When the previous active switch becomes available, it *does not* resume its role as the active switch.

If you power on or reset an entire switch stack, some stack members *might not* participate in the active switch election. Stack members that are powered on within the same 2-minute timeframe participate in the active switch election and have a chance to become the active switch. Stack members that are powered on after the 20-second timeframe do not participate in this initial election and become stack members. For powering considerations that affect active-switch elections, see the switch hardware installation guide.

As described in the hardware installation guide, you can use the ACTV LED on the switch to see if the switch is the active switch.

Switch Stack Configuration Files

The active switch has the saved and running configuration files for the switch stack. All stack members periodically receive synchronized copies of the configuration files from the active switch. If the active switch becomes unavailable, any stack member assuming the role of active switch has the latest configuration files.

The configuration files record these settings:

- System-level (global) configuration settings—such as IP, STP, VLAN, and SNMP settings—that apply to all stack members

- Stack member interface-specific configuration settings that are specific for each stack member

Note The interface-specific settings of the active switch are saved if the active switch is replaced without saving the running configuration to the startup configuration.

A new, out-of-box switch joining a switch stack uses the system-level settings of that switch stack. If a switch is moved to a different switch stack, that switch loses its saved configuration file and uses the system-level configuration of the new switch stack.

The interface-specific configuration of each stack member is associated with the stack member number. Stack members retain their numbers unless they are manually changed or they are already used by another member in the same switch stack.

- If an interface-specific configuration does not exist for that member number, the stack member uses its default interface-specific configuration.

- If an interface-specific configuration exists for that member number, the stack member uses the interface-specific configuration associated with that member number.

If you replace a failed member with an identical model, the replacement member automatically uses the same interface-specific configuration as the failed switch. You do not need to reconfigure the interface settings. The replacement switch (referred to as the provisioned switch) must have the same stack member number as the failed switch.

You back up and restore the stack configuration in the same way as you would for a standalone switch configuration.

Offline Configuration to Provision a Stack Member

You can use the offline configuration feature to *provision* (to supply a configuration to) a new switch before it joins the switch stack. You can configure the stack member number, the switch type, and the interfaces associated with a switch that is not currently part of the stack. The configuration that you create on the switch stack is called the *provisioned configuration*. The switch that is added to the switch stack and that receives this configuration is called the *provisioned switch*.

You manually create the provisioned configuration through the **switch** *stack-member-number* **provision** *type* global configuration command. The provisioned configuration is automatically created when a switch is added to a switch stack and when no provisioned configuration exists. When you configure the interfaces associated with a provisioned switch (for example, as part of a VLAN), the switch stack accepts the configuration, and the information appears in the running configuration. The interface associated with the provisioned switch is

not active, operates as if it is administratively shut down, and the **no shutdown** interface configuration command does not return it to active service. The interface associated with the provisioned switch does not appear in the display of the specific feature; for example, it does not appear in the **show vlan** user EXEC command output.

The switch stack retains the provisioned configuration in the running configuration whether or not the provisioned switch is part of the stack. You can save the provisioned configuration to the startup configuration file by entering the **copy running-config startup-config** privileged EXEC command. The startup configuration file ensures that the switch stack can reload and can use the saved information whether or not the provisioned switch is part of the switch stack.

Effects of Adding a Provisioned Switch to a Switch Stack

When you add a provisioned switch to the switch stack, the stack applies either the provisioned configuration or the default configuration. This table lists the events that occur when the switch stack compares the provisioned configuration with the provisioned switch.

Table 1: Results of Comparing the Provisioned Configuration with the Provisioned Switch

Scenario		Result
The stack member numbers and the switch types match.	1 If the stack member number of the provisioned switch matches the stack member number in the provisioned configuration on the stack, and 2 If the switch type of the provisioned switch matches the switch type in the provisioned configuration on the stack.	The switch stack applies the provisioned configuration to the provisioned switch and adds it to the stack.
The stack member numbers match but the switch types do not match.	1 If the stack member number of the provisioned switch matches the stack member number in the provisioned configuration on the stack, but 2 The switch type of the provisioned switch does not match the switch type in the provisioned configuration on the stack.	The switch stack applies the default configuration to the provisioned switch and adds it to the stack. The provisioned configuration is changed to reflect the new information.
The stack member number is not found in the provisioned configuration.		The switch stack applies the default configuration to the provisioned switch and adds it to the stack. The provisioned configuration is changed to reflect the new information.

Scenario		Result
The stack member number of the provisioned switch is in conflict with an existing stack member.	The active switch assigns a new stack member number to the provisioned switch. The stack member numbers and the switch types match: 1 If the new stack member number of the provisioned switch matches the stack member number in the provisioned configuration on the stack, and 2 If the switch type of the provisioned switch matches the switch type in the provisioned configuration on the stack.	The switch stack applies the provisioned configuration to the provisioned switch and adds it to the stack. The provisioned configuration is changed to reflect the new information.
	The stack member numbers match, but the switch types do not match: 1 If the stack member number of the provisioned switch matches the stack member number in the provisioned configuration on the stack, but 2 The switch type of the provisioned switch does not match the switch type in the provisioned configuration on the stack.	The switch stack applies the default configuration to the provisioned switch and adds it to the stack. The provisioned configuration is changed to reflect the new information.
The stack member number of the provisioned switch is not found in the provisioned configuration.		The switch stack applies the default configuration to the provisioned switch and adds it to the stack.

If you add a provisioned switch that is a different type than specified in the provisioned configuration to a powered-down switch stack and then apply power, the switch stack rejects the (now incorrect) **switch** *stack-member-number* **provision** *type* global configuration command in the startup configuration file. However, during stack initialization, the nondefault interface configuration information in the startup configuration file for the provisioned interfaces (potentially of the wrong type) is executed. Depending on the differences between the actual switch type and the previously provisioned switch type, some commands are rejected, and some commands are accepted.

> **Note** If the switch stack does not contain a provisioned configuration for a new switch, the switch joins the stack with the default interface configuration. The switch stack then adds to its running configuration with a **switch** *stack-member-number* **provision** *type* global configuration command that matches the new switch.

Effects of Replacing a Provisioned Switch in a Switch Stack

When a provisioned switch in a switch stack fails, is removed from the stack, and is replaced with another switch, the stack applies either the provisioned configuration or the default configuration to it. The events that occur when the switch stack compares the provisioned configuration with the provisioned switch are the same as those when you add a provisioned switch to a stack.

Effects of Removing a Provisioned Switch from a Switch Stack

If you remove a provisioned switch from the switch stack, the configuration associated with the removed stack member remains in the running configuration as provisioned information. To completely remove the configuration, use the **no switch** *stack-member-number* **provision** global configuration command.

Stack Protocol Version

Each software image includes a *stack protocol version*. The stack protocol version has a *major* version number and a *minor* version number (for example 1.4, where 1 is the major version number and 4 is the minor version number). Both version numbers determine the level of compatibility among the stack members.

Switches with the same Cisco IOS software version have the same stack protocol version. Such switches are fully compatible, and all features function properly across the switch stack. A switch with the same Cisco IOS software version as the active switch can immediately join the switch stack.

If an incompatibility exists, the fully functional stack members generate a system message that describes the cause of the incompatibility on the specific stack members. The active switch sends the message to all stack members.

Major Stack Protocol Version Number Incompatibility Among Stack-Capable Switches

Switches with different major Cisco IOS software versions usually have different stack protocol versions. Switches with different major version numbers are incompatible and cannot exist in the same switch stack.

Minor Stack Protocol Version Number Incompatibility Among Stack-Capable Switches

Switches with the same major version number but with a different minor version number are considered partially compatible. When connected to a switch stack, a partially compatible switch enters version-mismatch (VM) mode and cannot join the stack as a fully functioning member. The software detects the mismatched software and tries to upgrade (or downgrade) the switch in VM mode with the switch stack image or with a tar file image from the switch stack flash memory. The software uses the automatic upgrade (auto-upgrade) and the automatic advise (auto-advise) features.

SDM Template Mismatch in Switch Stacks

All stack members use the Switch Database Management (SDM) template configured on the active switch.

Version-mismatch (VM) mode has priority over SDM-mismatch mode. If a VM-mode condition and an SDM-mismatch mode exist, the switch stack first attempts to resolve the VM-mode condition.

You can use the **show switch** privileged EXEC command to see if any stack members are in SDM-mismatch mode.

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 switch basis.

Note Use SNMP to manage network features across the stack that are defined by supported MIBs. The switch does not support MIBs to manage stacking-specific features such as stack membership and election.

Connectivity to Specific Stack Members

If you want to configure a specific stack member port, you must include the stack member number in the CLI command interface notation.

Connectivity to the Switch Stack Through an IP Address

The switch stack is managed through a single IP address. The IP address is a system-level setting and is not specific to the active switch or to any other stack member. You can still manage the stack through the same IP address even if you remove the active switch or any other stack member from the stack, provided there is IP connectivity.

Note Stack members retain their IP addresses when you remove them from a switch stack. To avoid a conflict by having two devices with the same IP address in your network, change the IP addresses of any switches that you remove from the switch stack.

Connectivity to the Switch Stack Through an SSH Session

In a mixed stack, Secure Shell (SSH) connectivity to the switch stack can be lost if an active switch running the cryptographic software image and the IP Base or IP Services license level fails and is replaced by a switch that is running the noncryptographic image and the same license level. We recommend that a switch running the cryptographic software image and the IP Base or IP Services license level be the an active switch. Encryption features are unavailable if the an active switch is running the noncryptographic software image.

Connectivity to the Switch Stack Through Console Ports or Ethernet Management Ports

You can connect to the active switch by using one of these methods:

- You can connect a terminal or a PC to the active switch through the console port of one or more stack members.

- You can connect a PC to the active switch through the Ethernet management ports of one or more stack members.

Be careful when using multiple CLI sessions to the active switch. Commands that you enter in one session are not displayed in the other sessions. Therefore, it is possible that you might not be able to identify the session from which you entered a command.

We recommend using only one CLI session when managing the switch stack.

Switch Stack Upgrade

Before you start the process, configure a redundant uplink to the network to ensure that the stack has network connectivity. You can also set the stack boot time.

When upgrading the whole switch stack, or a subset of switches in the stack, the active switch communicates with each stack member to coordinate the upgrade. When the upgrade completes, all switches in the stack reload to complete the installation.

The active switch copies the source bundle to each member in the stack. Each stack member then performs various installation steps. If any step fails on a stack member, the active switch instructs all stack members to abort the installation.

If the active switch becomes unavailable during the installation, all stack members abort the installation.

Auto-Upgrade

The purpose of the auto-upgrade feature is to allow a switch to be upgraded to a compatible software image, so that the switch can join the switch stack.

When a new switch attempts to join a switch stack, each stack member performs compatibility checks with itself and the new switch. Each stack member sends the results of the compatibility checks to the active switch, which uses the results to determine whether the switch can join the switch stack. If the software on the new switch is incompatible with the switch stack, the new switch enters version-mismatch (VM) mode.

If the auto-upgrade feature is enabled on the new switch, the active switch automatically upgrades the new switch with the same software image running on a compatible stack member. Auto-upgrade starts a few minutes after the mismatched software is detected before starting.

Auto-upgrade is disabled, by default.

Auto-upgrade includes an auto-copy process and an auto-extract process.

- Auto-copy automatically copies the software image running on any stack member to the new switch to automatically upgrade it. Auto-copy occurs if auto-upgrade is enabled, if there is enough flash memory in the new switch, and if the software image running on the switch stack is suitable for the new switch.

> **Note** A switch in VM mode might not run all released software. For example, new switch hardware is not recognized in earlier versions of software.

- Automatic extraction (auto-extract) occurs when the auto-upgrade process cannot find the appropriate software in the stack to copy to the new switch. In that case, the auto-extract process searches all switches in the stack for the tar file needed to upgrade the switch stack or the new switch. The tar file can be in any flash file system in the switch stack or in the new switch. If a tar file suitable for the new switch is found on a stack member, the process extracts the file and automatically upgrades the new switch.

The auto-upgrade feature is not available in bundle mode. The switch stack must be running in installed mode. If the switch stack is in bundle mode, use the **software expand** privileged EXEC command to change to installed mode.

You can enable auto-upgrade by using the **software auto-upgrade enable** global configuration command on the new switch. You can check the status of auto-upgrade by using the **show boot** privileged EXEC command and by checking the *Auto upgrade* line in the display.

You can configure auto-upgrade to upgrade the new switch with a specific software bundle by using the software **auto-upgrade source url** global configuration command. If the software bundle is invalid, the new switch is upgraded with the same software image running on a compatible stack member.

When the auto-upgrade process is complete, the new switch reloads and joins the stack as a fully functioning member. If you have both cables connected during the reload, network downtime does not occur because the switch stack operates on two rings.

> **Note** Auto-upgrade performs the upgrade only when the two feature sets are the same type.

Auto-Advise

The auto-advise feature is triggered when:

- The auto-upgrade feature is disabled.

- The new switch is in bundle mode and the stack is in installed mode. Auto-advise displays syslog messages about using the **software auto-upgrade** privileged EXEC command to change the new switch to installed mode.

- The stack is in bundle mode. Auto-advise displays syslog messages about booting the new switch in bundle mode so that it can join the stack.

- An auto-upgrade attempt fails because the new switch is running incompatible software. After the switch stack performs compatibility checks with the new switch, auto-advise displays syslog messages about whether the new switch can be auto-upgraded.

Auto-advise cannot be disabled. It does *not* give suggestions when the switch stack software and the software of the switch in version-mismatch (VM) mode do not contain the same licensed feature set.

Examples of Auto-Advise Messages

Auto-Upgrade Is Disabled and Incompatible Switch Attempting to Join: Example

This sample auto-advise output shows the system messages displayed when the auto-upgrade feature is disabled and an incompatible switch 1 tries to join the switch stack:

```
*Oct 18 08:36:19.379: %INSTALLER-6-AUTO_ADVISE_SW_INITIATED: 2 installer:  Auto advise
initiated for switch 1
*Oct 18 08:36:19.380: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  Searching stack for software
 to upgrade switch 1
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  Switch 1 with incompatible
 software has been
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  added to the stack. The
software running on
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  all stack members was
scanned and it has been
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  determined that the 'software
 auto-upgrade'
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  command can be used to
install compatible
*Oct 18 08:36:19.382: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  software on switch 1.
```

Auto-Upgrade is Disabled and New Switch is in Bundle Mode: Example

This sample auto-advise output shows the system messages displayed when auto-upgrade is disabled and a switch running in bundle mode tries to join the stack that's running in installed mode:

```
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW_INITIATED: 2 installer:  Auto advise
initiated for switch 1
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  Switch 1 running bundled
software has been added
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  to the stack that is running
 installed software.
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  The 'software auto-upgrade'
 command can be used to
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  convert switch 1 to the
installed running mode by
*Oct 18 11:09:47.005: %INSTALLER-6-AUTO_ADVISE_SW: 2 installer:  installing its running
software.
```

How to Configure a Switch Stack

Enabling Persistent MAC Address

This procedure is optional.

When you enter the command to configure this feature, a warning message appears containing the consequences of your configuration. You should use this feature cautiously. Using the old active switch MAC address elsewhere in the same domain could result in lost traffic.

SUMMARY STEPS

1. **configure terminal**
2. **stack-mac persistent timer** [**0** | *time-value*]
3. **end**
4. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure terminal** **Example:** Switch# **configure terminal**	Enters global configuration mode.
Step 2	**stack-mac persistent timer** [**0**	*time-value*] **Example:** Switch(config)# **stack-mac persistent timer 7**	Enables a time delay after a stack-master change before the stack MAC address changes to that of the new stack master. If the previous stack master rejoins the stack during this period, the stack uses that MAC address as the stack MAC address. • Enter the command with no value to set the default delay of approximately 4 minutes. We recommend that you always enter a value. If the command is entered without a value, the time delay appears in the running-config file with an explicit timer value of 4 minutes. • Enter **0** to continue using the MAC address of the current stack master indefinitely. The stack MAC address of the previous stack master is used until you enter the **no stack-mac persistent timer** command, which immediately changes the stack MAC address to that of the current stack master. • Enter a *time-value* from 1 to 60 minutes to configure the time period before the stack MAC address changes to the new stack master. The stack MAC address of the previous stack master is used until the configured time period expires or until you enter the **no stack-mac persistent timer** command. **Note** If you enter the **no stack-mac persistent timer** command after a new stack master takes over, before the time expires, the switch stack moves to the current stack master MAC address.
Step 3	**end** **Example:** Switch(config)# **end**	Returns to privileged EXEC mode.
Step 4	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Command or Action	Purpose
Example: Switch# **copy running-config startup-config**	

Assigning a Stack Member Number

This optional task is available only from the active switch.

SUMMARY STEPS

1. **switch** *current-stack-member-number* **renumber** *new-stack-member-number*
2. **reload slot** *stack-member-number*
3. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**switch** *current-stack-member-number* **renumber** *new-stack-member-number* **Example:** Switch# **switch 3 renumber 5**	You can display the current stack member number by using the **show switch** user EXEC command.
Step 2	**reload slot** *stack-member-number* **Example:** Switch# **reload slot 5**	Resets the stack member.
Step 3	**copy running-config startup-config** **Example:** Switch# **copy running-config startup-config**	Saves your entries in the configuration file.

Setting the Stack Member Priority Value

This optional task is available only from the active switch.

SUMMARY STEPS

1. **switch** *stack-member-number* **priority** *new-priority-number*
2. **reload slot** *stack-member-number*
3. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**switch** *stack-member-number* **priority** *new-priority-number* **Example:** Switch# **switch 3 priority 2**	You can display the current priority value by using the **show switch** user EXEC command. The new priority value takes effect immediately but does not affect the current active switch. The new priority value helps determine which stack member is elected as the new active switch when the current active switch or switch stack resets.
Step 2	**reload slot** *stack-member-number* **Example:** Switch# **reload slot 3**	Resets the stack member, and applies this configuration change.
Step 3	**copy running-config startup-config** **Example:** Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Removing Provisioned Switch Information

This optional task is available only from the active switch.

SUMMARY STEPS

1. Remove the provisioned switch from the stack.
2. **no switch** *stack-member-number* **provision**
3. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	Remove the provisioned switch from the stack.	

	Command or Action	**Purpose**
Step 2	**no switch** *stack-member-number* **provision** **Example:** Switch(config)# **no switch 3 provision**	Removes the provisioning information for the specified member.
Step 3	**copy running-config startup-config** **Example:** Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

If you are removing a provisioned switch in a stack with this configuration:

- The stack has four members
- Stack member 1 is the active switch
- Stack member 3 is a provisioned switch

and want to remove the provisioned information and to avoid receiving an error message, you can remove power from stack member 3, disconnect the cables between the stack member 3 and switches to which it is connected, reconnect the cables between the remaining stack members, and enter the **no switch** *stack-member-number* **provision** global configuration command.

Displaying Incompatible Switches in the Switch Stack

SUMMARY STEPS

1. **show switch**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**show switch** **Example:** Switch# **show switch**	Displays any incompatible switches in the switch stack (indicated by a 'Current State' of 'V-Mismatch'). The V-Mismatch state identifies the switches with incompatible software.

Upgrading an Incompatible Switch in the Switch Stack

SUMMARY STEPS

    1. software auto-upgrade

    2. copy running-config startup-config

DETAILED STEPS

	Command or Action	Purpose
Step 1	**software auto-upgrade** **Example:** Switch# **software auto-upgrade**	Upgrades incompatible switches in the switch stack, or changes switches in bundle mode to installed mode.
Step 2	**copy running-config startup-config** **Example:** Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Troubleshooting the Switch Stack

Accessing the CLI of a Specific Member

SUMMARY STEPS

    1. session switch *stack-member-number*

    2. exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	**session switch** *stack-member-number* **Example:** Switch# **session switch 2**	Accesses a specific stack member. The prompt for member 2 is Switch-2#, and system prompt for the active switch is Switch#.

	Command or Action	**Purpose**
Step 2	**exit** **Example:** Switch# **exit**	Returns to the CLI session on the active switch.

Temporarily Disabling a Stack Port

When a stack port is flapping and causing instability in the stack, be careful when using the **switch** *stack-member-number* **stack port** *port-number* **disable** privileged EXEC command. When you disable the stack port, the stack operates at half bandwidth.

A stack is in the full-ring state when all members are connected through the stack ports and are in the ready state.

The stack is in the partial-ring state when

- All members are connected through the stack ports, but some all are not in the ready state.

- Some members are not connected through the stack ports.

SUMMARY STEPS

1. **switch** *stack-member-number* **stack port** *port-number* **disable**
2. **switch** *stack-member-number* **stack port** *port-number* **enable**
3. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**switch** *stack-member-number* **stack port** *port-number* **disable** **Example:** Switch# **switch 2 stack port 1 disable**	Disables the specified stack port.
Step 2	**switch** *stack-member-number* **stack port** *port-number* **enable** **Example:** Switch# **switch 2 stack port 1 enable**	Re-enables the stack port after the problem is resolved.
Step 3	**copy running-config startup-config** **Example:** Switch# **copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

When you disable a stack port and the stack is in the full-ring state, you can disable only one stack port. This message appears:

```
Enabling/disabling a stack port may cause undesired stack changes. Continue?[confirm]
```

When you disable a stack port and the stack is in the partial-ring state, you cannot disable the port. This message appears:

```
Disabling stack port not allowed with current stack configuration.
```

Re-Enabling a Stack Port While Another Member Starts

Stack Port 1 on Switch 1 is connected to Port 2 on Switch 4. If Port 1 is flapping, you can disable Port 1 with the **switch 1 stack port 1 disable** privileged EXEC command. While Port 1 on Switch 1 is disabled and Switch 1 is still powered on:

SUMMARY STEPS

1. Disconnect the stack cable between Port 1 on Switch 1 and Port 2 on Switch 4.
2. Remove Switch 4 from the stack.
3. Add a switch to replace Switch 4 and assign it switch-number 4.
4. Reconnect the cable between Port 1 on Switch 1 and Port 2 on Switch 4 (the replacement switch).
5. Re-enable the link between the switches. Enter the **switch 1 stack port 1 enable** privileged EXEC command to enable Port 1 on Switch 1.
6. Power on Switch 4

DETAILED STEPS

Step 1	Disconnect the stack cable between Port 1 on Switch 1 and Port 2 on Switch 4.
Step 2	Remove Switch 4 from the stack.
Step 3	Add a switch to replace Switch 4 and assign it switch-number 4.
Step 4	Reconnect the cable between Port 1 on Switch 1 and Port 2 on Switch 4 (the replacement switch).
Step 5	Re-enable the link between the switches. Enter the **switch 1 stack port 1 enable** privileged EXEC command to enable Port 1 on Switch 1.
Step 6	Power on Switch 4

Powering on Switch 4 before enabling the Port 1 on Switch 1 might cause one of the switches to reload.

If Switch 4 is powered on first, you might need to enter the **switch 1 stack port 1 enable** and the **switch 4 stack port 2 enable** privileged EXEC commands to bring up the link.

Monitoring the Switch Stack

Table 2: Commands for Displaying Stack Information

Command	Description
show switch	Displays summary information about the stack, including the status of provisioned switches and switches in version-mismatch mode.
show switch *stack-member-number*	Displays information about a specific member.
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.

Configuration Examples for Switch Stacks

Switch Stack Configuration Scenarios

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

Table 3: Configuration Scenarios

Scenario		Result
Active switch election specifically determined by existing active switches	Connect two powered-on switch stacks through the ports.	Only one of the two active switches becomes the new active switch. None of the other stack members become the active switch.

Scenario		Result
Active switch election specifically determined by the stack member priority value	**1** Connect two switches through their ports. **2** Use the **switch** *stack-member-number* **priority** *new-priority-number* EXEC command to set one stack member with a higher member priority value. **3** Restart both stack members at the same time.	The stack member with the higher priority value is elected active switch.
Active switch election specifically determined by the MAC address	Assuming that both stack members have the same priority value, configuration file, and license level, restart both stack members at the same time.	The stack member with the lower MAC address is elected active switch.
Stack member number conflict	Assuming that one stack member has a higher priority value than the other stack member: **1** Ensure that both stack members have the same stack member number. If necessary, use the **switch** *current-stack-member-number* **renumber** *new-stack-member-number* EXEC command. **2** Restart both stack members 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	**1** Power off the new switch. **2** Through their 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 stack members becomes the new stack master. All other stack members in the stack remain as stack members and do not reboot.

Scenario		Result
Add more than stack members	1 Through their ports, connect switches. 2 Power on all switches.	Two switches become active switches. One active switch has stack members. The other active switch remains as a standalone switch. Use the Mode button and port LEDs on the switches to identify which switches are active switches and which switches belong to each active switch.

Enabling Persistent MAC Address: Example

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

```
Switch(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.
Switch(config)# end
Switch# show switch
Switch/Stack Mac Address : 0016.4727.a900
Mac persistency wait time: 7 mins
                                       H/W   Current
Switch#  Role   Mac Address    Priority Version State
----------------------------------------------------------
*1       Active 0016.4727.a900    1      P2B    Ready
```

Provisioning a New Member for a Switch Stack: Example

This example shows how to provision a switch with a stack member number of 2 for the switch stack. The **show running-config** command output shows the interfaces associated with the provisioned switch:

```
Switch(config)# switch 2 provision switch_PID
  Switch(config)# end
  Switch# show running-config | include switch 2
  !
  interface GigabitEthernet2/0/1
  !
  interface GigabitEthernet2/0/2
  !
  interface GigabitEthernet2/0/3
  <output truncated>
```

show switch stack-ports summary Output: Example

Only Port 1 on stack member 2 is disabled.

```
Switch# show switch stack-ports summary
  Switch#/  Stack    Neighbor  Cable    Link    Link    Sync       #         In
   Port#    Port                Length   OK     Active   OK     Changes   Loopback
            Status                                               To LinkOK
  --------  ------   --------  --------  ----   ------   ----   --------   --------
    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 4: 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. • 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 *no cable*. 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 *link partner* is a stack port on a neighbor switch. • 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. • 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. • 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. • 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.

```
Switch# show switch stack-ports summary
 Switch#/  Stack   Neighbor  Cable     Link   Link    Sync     #         In
 Port#     Port              Length    OK     Active  OK     Changes   Loopback
           Status                                            To LinkOK
 --------  ------  --------  --------  ----   ------  ----   ---------  --------
    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
```

```
Switch# show switch stack-ports summary
```

Switch#/ Port#	Stack Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	# Changes To LinkOK	In 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.

```
Switch# show sw stack-ports summary
```

Switch#/ Port#	Stack Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	# Changes To LinkOK	In 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.

```
Switch# show switch stack-ports summary
```

Switch#/ Port#	Stack Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	# Changes To LinkOK	In 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 No Connected Stack Cable: Example

```
Switch# show switch stack-ports summary
```

Switch#/ Port#	Stack Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	# Changes To LinkOK	In 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.

```
Switch# show switch stack-ports summary
```

Switch#/ Port#	Stack Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	# Changes To LinkOK	In 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

```
Switch# show switch stack-ports summary
  Switch#/  Stack    Neighbor   Cable     Link   Link    Sync     #         In
   Port#    Port                Length    OK     Active  OK     Changes   Loopback
            Status                                              To LinkOK
  --------  ------   --------   --------  ----   ------  ----   --------- --------
    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.

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:

```
Switch# show switch stack-ports summary
Switch#/  Stack    Neighbor   Cable     Link   Link    Sync     #         In
 Port#    Port                Length    OK     Active  OK     Changes   Loopback
          Status                                              To LinkOK
--------  ------   --------   --------  ----   ------  ----   --------- --------
  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:

```
Switch# show switch stack-ports summary
Switch#/  Stack    Neighbor   Cable     Link   Link    Sync     #         In
 Port#    Port                Length    OK     Active  OK     Changes   Loopback
          Status                                              To LinkOK
--------  ------   --------   --------  ----   ------  ----   --------- --------
  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:

```
Switch# show switch stack-ports summary
Switch#/   Stack    Neighbor   Cable    Link   Link    Sync      #        In
 Port#     Port                Length    OK    Active   OK    Changes   Loopback
           Status                                             To LinkOK
--------   ------   --------   --------  ----  ------  ----  ---------  --------
  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.	*Catalyst 3850 Switch Hardware Installation Guide*

Standards and RFCs

Standard/RFC	Title
None	—

MIBs

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

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for Switch Stack Features

This table lists the features in this module and provides links to specific configuration information:

Feature Name	Releases	Feature Information