Configuring Stack Power

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 StackPower

StackPower uses these terms:

- *Available power* is the total power available for PoE from all power supplies in the power stack. To see the available power in a stack, enter the **show power inline** privileged EXEC command.
- *Budgeted power* is the power allocated to all powered devices connected to PoE ports in the stack. Budgeted power is referred to as *Used (Watts)* in the output of the **show power inline** command.

- *Consumed power* is the actual power consumed by the powered devices. Consumed power is typically less that the budgeted power. To see the consumed power in a stack, enter the **show power inline police** privileged EXEC command.

Information About StackPower

Power Supplies for the Stacking Switch

The switch has two power supplies per system, allowing the power load to be split between them. This accommodates the increased maximum power of 30 watts per port provided to a powered device to meet the PoE+ standard (802.3at). With PoE+, a 48-port system would need 1440 Watts to provide 30 Watts per powered device for the PoE ports. Systems with fewer powered devices might require only one power supply. In this case, the additional power supply can provide one-to-one redundancy for the active supply.

In addition, the stacking switch supports StackPower, which allows the power supplies to share the load across multiple systems in a stack. By connecting the switches with power stack cables, you can manage the power supplies of up to four stack members as a one large power supply that provides power to all switches and to the powered devices connected to switch ports. Since power supplies are most effective when running at 30 to 90% of their maximum load, taking some of the power supplies offline provides maximum power efficiency. Switches in a power stack must be members of the same switch (data) stack.

The reasons for connecting individual Switch in a power stack are:

- In case of power supply failure, if there is enough spare power budget in the rest of the power stack, Switch can continue to function.
- You can replace a defective power supply without having to shut down all powered devices in the systems.
- System operation can become more green by maximizing power supply efficiency and working with the most efficient load (30 to 90% of their maximum load).

StackPower Modes

You can configure the power stack to run in one of two modes:

- In power-sharing mode (the default), all input power is available to be used for power loads. The total available power in all switches in the power stack (up to four) is treated as a single large power supply, with power available to all switches and to all powered devices connected to PoE ports. In this mode, the total available power is used for power budgeting decisions and no power is reserved to accommodate power-supply failures. If a power supply fails, powered devices and switches could be shut down (load shedding).
- In redundant mode, the power from the largest power supply in the system is subtracted from the power budget, which reduces the total available power, but provides backup power in case of a power-supply failure. Although there is less available power in the pool for switches and powered devices to draw from, the possibility of having to shut down switches or powered devices in case of a power failure or extreme power load is reduced.

In addition, you can configure the mode to run a strict power budget or a non-strict (relaxed) power budget. In both modes, power is denied when there is no more power available in the power budget.

- In strict mode, when a power supply fails and the available power drops below the budgeted power, the system balances the budget through load shedding of powered devices, even if the actual power being consumed is less than the available power.
- In non-strict mode, the power stack is allowed to run in an over-allocated state and is stable as long as the actual power does not exceed the available power. In this mode, a powered device drawing more than normal power could cause the power stack to start shedding loads. This is normally not a problem because most devices do not run at full power and the chances of multiple powered devices in the stack requiring maximum power at the same time is small.

You configure power modes at a power-stack level (that is, the mode is the same for all switches in the power stack).

You can also configure a switch connected in a power stack to not participate in the power stack by setting the switch to standalone power mode. This mode shuts down both stack power ports.

Related Topics

Configuring PowerStack Parameters, on page 5
Configuring PowerStack Parameters: Example, on page 10

Power Priority

You can configure the priority of a switch or powered device to receive power. This priority determines the order in which devices are shut down in case of a power shortage. You can configure three priorities per system: the system (or switch) priority, the priority of the high-priority PoE ports on a switch, and the priority of the low-priority PoE ports on a switch.

You set port priority at the interface level for powered devices connected to a PoE port. By default, all ports are low priority.

You configure the priority values of each switch in the power stack and of all high and low priority ports on that switch to set the order in which switches and ports are shut down when power is lost and load shedding must occur. Priority values are from 1 to 27; switches and ports with highest values are shut down first.

Note The 27 priorities are used to accommodate power stacks connected in a star configuration with the expandable power supply. In this configuration, there would be nine members (switches) per system with three priorities per switch.

On any switch, the switch priority must be lower than port priorities. and the high priority value must be set lower than the low priority value. We recommend that you configure different priority values for each switch and for its high priority ports and low priority ports. This limits the number of devices shut down at one time during a loss of power. If you try to configure the same priority value on different switches in a power stack, the configuration is allowed, but you receive a warning message.

The default priority ranges, if none are configured, are 1-9 for switches, 10-18 for high-priority ports, and 19-27 for low-priority ports.

Related Topics

Configuring PowerStack Switch Power Parameters, on page 6
Configuring PowerStack Switch Power Parameters: Example, on page 11
Configuring PoE Port Priority, on page 8
Configuring PoE Port Priority: Example, on page 11

Load Shedding

Load shedding is the process of shutting down devices in case of power supply, cable, or system failures. For power stacks in power-sharing mode, there are two types of load-shedding: immediate and graceful.

- Immediate load shed occurs when a failure could cause the power stack to fail very quickly. For example, if the largest power supply in the power stack fails, this could cause the stack to immediately start shutting down powered devices.
- Graceful load-shedding can occur when a smaller power supply fails. Switches and powered devices are shut down in order of their configured priority, starting with devices with priority 27, until the power budget matches the input power.

Graceful load shedding is always enabled and immediate load shedding occurs only when necessary, so both can occur at the same time.

Note Load shedding does not occur in redundant mode unless two or more power supplies fail, because the largest power supply is used as a backup power source.

Notes on load shedding:

- The method (immediate or graceful) is not user-configurable, but is based on the power budget.
- Immediate load shedding also occurs in the order of configured priority, but occurs very quickly to prevent hardware damage caused by loss of power.
- If a switch is shut down because of load shedding, the output of the **show stack-power** privileged EXEC command still includes the MAC address of the shut down switch as a neighbor switch, even though the switch is down. This command output shows the StackPower topology, even if there is not enough power to power up a switch.

Related Topics

Immediate Load Shedding: Examples, on page 9

How to Configure StackPower

Configuring stack power includes these tasks:

Configuring PowerStack Parameters

SUMMARY STEPS

1. **configure terminal**
2. **stack-power stack** *power stack name*
3. **mode** {**power-sharing** | **redundant**} [**strict**]
4. **end**
5. **show stack-power**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	**stack-power stack** *power stack name* **Example:** `Switch(config)# stack-power stack power 1`	Enters the stack power stack name and enter power stack configuration mode. The name can be up to 31 characters.
Step 3	**mode** {**power-sharing** | **redundant**} [**strict**] **Example:** `Switch(config-stackpower)# mode redundant`	Sets the operating mode for the power stack: • **power-sharing—**The input power from all switches in the power stack can be used for loads, and the total available power appears as one huge power supply. This is the default. • **redundant—**The largest power supply is removed from the power pool to be used as backup power in case one of the other power supplies fails. This is the recommended mode if enough power is available in the system. • **strict—**(Optional) Configures the power stack mode to run a strict power budget. The stack power needs cannot exceed the available power. The default is non-strict.
Step 4	**end** **Example:** `Switch(config-stackpower)# end`	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 5	**show stack-power** **Example:** `Switch# show stack-power`	Verifies your entries.

Related Topics

StackPower Modes, on page 2
Configuring PowerStack Parameters: Example, on page 10

Configuring PowerStack Switch Power Parameters

SUMMARY STEPS

1. **configure terminal**
2. **stack-power switch** *switch-number*
3. **stack** [*power-stack-name*]
4. **power-priority switch** *value*
5. **power-priority high** *value*
6. **power-priority low** *value*
7. **end**
8. **show stack-power**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	
Step 2	**stack-power switch** *switch-number* **Example:** `Switch(config)# stack-power switch 4`	Enters global configuration mode. Enters switch stack power configuration mode for the stack member switch number. The range is from 1 to 9. **Note** Only four switches can belong to the same power stack.

	Command or Action	Purpose
Step 3	**stack** [*power-stack-name*] **Example:** `Switch(config-switch-stackpower)# stack power2`	Enters the name of the power stack to which the switch belongs. The name can be up to 31 characters. If you do not enter a name and no other switches in the power stack have a name configured, a power-stack name is automatically generated.
Step 4	**power-priority switch** *value* **Example:** `Switch(config-switch-stackpower)# power-priority switch 5`	Sets the power priority of the switch. The range is from 1 to 27. This value must be lower than the value set for the low and high-priority ports.
Step 5	**power-priority high** *value* **Example:** `Switch(config-switch-stackpower)# power-priority high 12`	Sets the power priority of the PoE ports on the switch that are configured as high-priority ports. The range is from 1 to 27, with 1 as the highest priority. The **high** value must be lower than the value set for the low-priority ports and higher than the value set for the switch.
Step 6	**power-priority low** *value* **Example:** `Switch(config-switch-stackpower)# power-priority low 20`	Sets the power priority of the PoE ports on the switch that are configured as low-priority ports. The range is from 1 to 27. This value must be higher than the value set for the high-priority ports and the value set for the switch.
Step 7	**end** **Example:** `Switch(config-switch-stackpower)# end`	Returns to privileged EXEC mode.
Step 8	**show stack-power** **Example:** `Switch# show stack-power`	Verifies your entries.

Related Topics

Power Priority, on page 3
Configuring PowerStack Switch Power Parameters: Example, on page 11

Configuring PoE Port Priority

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-id*
3. **power inline port priority** {**high** | **low**}
4. **end**
5. **show power inline priority**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Switch# configure terminal`	Enters global configuration mode.
Step 2	**interface** *interface-id* **Example:** `Switch(config)# interface gigabitethernet 1/0/1`	Enters the interface ID of the port in the stack and enters interface configuration mode. The interface must be a PoE port.
Step 3	**power inline port priority** {**high**	**low**} **Example:** `Switch(config-if)# power inline port priority high`	Sets the power priority of the port to **high** or **low**. Powered devices connected to low priority ports are shut down first in case of a power reduction. The default is low priority. **Note** Although the **power inline port priority** {**high** | **low**} command is visible on the nonstacking switch PoE ports, it has no effect because these switches do not participate in stack power.
Step 4	**end** **Example:** `Switch(config-if)# end`	Returns to privileged EXEC mode.
Step 5	**show power inline priority** **Example:** `Switch# show power inline priority`	Verifies your entries.

Related Topics

Power Priority, on page 3

Configuring PoE Port Priority: Example, on page 11

Configuration Examples for Stack Power

Immediate Load Shedding: Examples

For power stacks in power-sharing mode, if a large power supply in the power stack fails, the stack immediately starts shutting down powered devices until the power budget matches the input power. This example has a power stack of four switches (*Powerstack1*) in power sharing mode and shows which devices would be shut down in the immediate load shedding process caused by loss of either of two power supplies.

The output of the **show env all** command shows that power supplies included in power sharing are a 715 W power supply in switch 1, and one 350 W and one 1100 W power supply in switch 4. Other power supplies are inactive (disabled or not present).

```
Switch# show env all
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is OK
FAN PS-2 is OK
Switch 1: SYSTEM TEMPERATURE is OK
SW  PID                 Serial#     Status           Sys Pwr  PoE Pwr  Watts
--  ------------------  ----------  ---------------  -------  -------  -----
1A  PWR-C1-715WAC       LIT133705FH  OK              Good     Good     715
1B  PWR-C1-715WAC       DTN1341K018  Disabled        Good     Good     715
2A  Not Present
2B  PWR-C1-350WAC       LIT13330FNM  Disabled        Good     Good     350
3A  PWR-C1-350WAC       LIT13330FN3  Disabled        Good     Good     350
3B  Not Present
4A  PWR-C1-350WAC       DTN1342L00T  OK              Good     Good     350
4B  PWR-C1-1100WAC      LIT13370577  OK              Good     Good     1100
```

The output of the **show stack-power** privileged EXEC command shows the priorities of the powered devices and switches in the power stack.

```
Switch# show stack-power
Power stack name: Powerstack1
    Stack mode: Power sharing
    Switch 1:
        Power budget: 206
        Low port priority value: 17
        High port priority value: 16
        Switch priority value: 2
        Port A status: Not shut
        Port B status: Not shut
        Neighbor on port A: 0022.bdcf.ab00
        Neighbor on port B: 0022.bdd0.4380

    Switch 2:
        Power budget: 206
        Low port priority value: 12
        High port priority value: 11
        Switch priority value: 1
        Port A status: Not shut
        Port B status: Not shut
        Neighbor on port A: 0022.bdd0.6d00
        Neighbor on port B: 0022.bdcf.af80

    Switch 3:
        Power budget: 656
```

```
        Low port priority value: 22
        High port priority value: 21
        Switch priority value: 3
        Port A status: Not shut
        Port B status: Not shut
        Neighbor on port A: 0022.bdcf.af80
        Neighbor on port B: 0022.bdd0.6d00

    Switch 4:
        Power budget: 682
        Low port priority value: 27
        High port priority value: 26
        Switch priority value: 4
        Port A status: Not shut
        Port B status: Not shut
        Neighbor on port A: 0022.bdd0.4380
        Neighbor on port B: 0022.bdcf.ab00
```

If the 715 W or 1100 W power supply fails, devices (powered devices connected to PoE ports and the switches themselves) would be shut down in the this order until power consumption drops below 105% of the rated power of the remaining power supplies:

- Devices connected to Switch 4 low priority ports (priority 27)
- Devices connected to Switch 4 high priority ports (priority 26)
- Devices connected to Switch 3 low priority ports (priority 22)
- Devices connected to Switch 3 high priority ports (priority 21)
- Devices connected to Switch 1 low priority ports (priority 17)
- Devices connected to Switch 1 high priority ports (priority 16)
- Devices connected to Switch 2 low priority ports (priority 12)
- Devices connected to Switch 2 high priority ports (priority 11)
- Switch 4 (priority 4)
- Switch 3 (priority 3)
- Switch 1 (priority 2)

Switch 2 would never have to be shut down because all power would have been lost by the time priority 1 devices were reached.

Related Topics

Load Shedding, on page 4

Configuring PowerStack Parameters: Example

This is an example of setting the stack power mode for the stack named *power1* to redundant power mode. The largest power supply in the stack is removed from the power budget and used as a backup in case of power supply failure.

```
Switch(config)# stack-power stack power1
Switch(config-stackpower)# mode redundant
Switch(config-stackpower)# exit
```

Related Topics

StackPower Modes, on page 2
Configuring PowerStack Parameters, on page 5

Configuring PowerStack Switch Power Parameters: Example

This is an example of setting the switch stack power parameters for switch 3 in the stack that is connected to the power stack with the stack ID *power2*. If load-shedding becomes necessary, switches and powered devices in the power stack with the higher numbers are shut down first, with shutdown proceeding in order.

```
Switch(config)# stack-power switch 3
Switch(config-switch-stackpower)# stack power2
Switch(config-switch-stackpower)# power-priority switch 5
Switch(config-switch-stackpower)# power-priority high 12
Switch(config-switch-stackpower)# power-priority low 20
Switch(config-switch-stackpower)# exit
Switch(config-stackpower)# exit
```

Note Entering the **write erase** and **reload** privileged EXEC commands does not change the power priority or power mode non-default configuration saved in the switch flash memory.

Related Topics

Power Priority, on page 3
Configuring PowerStack Switch Power Parameters, on page 6

Configuring PoE Port Priority: Example

This is an example of setting the power priority of a port to high so that it is one of the last ports to shut down in case of a power failure.

```
Switch(config)# interface gigabitetherent1/0/1
Switch(config-if)# power inline port priority high
Switch(config-if)# exit
```

Related Topics

Power Priority, on page 3
Configuring PoE Port Priority, on page 8

Where to Go Next

See the hardware installation guide for information

- Designing and connecting the power stack.
- StackPower star and ring configuration

Additional References for StackPower

Related Topic	Document Title
Configuring the Cisco eXpandable Power System 2200	Consolidated Platform Configuration Guide, Cisco IOS XE 3.7E and Later (Catalyst 3850 Switches)

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

MIBs

MIB	MIBs Link
All supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, 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 History and Information for StackPower

Table 1: Feature Information for StackPower

Release	Feature
Cisco IOS XE 15.2.(3)E1	StackPower and XPS 2200 features are introduced