Configuring the Cisco Expandable Power System 2200

This module contains the following sections:

- Restrictions for Configuring the Expandable Power System 2200, on page 1
- Information About Cisco Expandable Power System 2200, on page 1
- How to Configure the Cisco Expandable Power System 2200, on page 5
- Monitoring and Maintaining the Cisco Expandable Power System 2200, on page 8
- Additional References for Cisco Expandable Power System 2200, on page 8
- Feature History for Cisco Expandable Power System 2200, on page 9

Restrictions for Configuring the Expandable Power System 2200

- When using the Expandable Power System (XPS) power supplies in the RPS mode for backing up switch power supplies, the smallest power supply in the XPS must be greater than the largest power supply in a switch connected to an XPS port in RPS mode.
- In RPS mode, each XPS power supply can back up only one switch power supply, regardless of the size.
- If you remove a power supply from the power stack (from a switch or the XPS), be sure that removing it does not deplete available power enough to cause load shedding.
- Cisco Catalyst 9300L Series Switches do not support Stack Power and XPS 2200.
- Cisco Catalyst 9300X Series Switches do not support XPS 2200.

Information About Cisco Expandable Power System 2200

The following sections provide an overview of XPS 2200 and its Power Supply Modes.

Cisco eXpandable Power System (XPS) 2200 Overview

The Cisco eXpandable Power System (XPS) 2200 is a standalone power system that you can connect to Catalyst switches. The XPS 2200 can provide backup power to connected devices that experience a power supply failure or, in a Catalyst switch power stack, it can supply additional power to the power stack budget.

The XPS 2200 power ports and internal power supplies can operate in redundant power supply (RPS) mode or stack power (SP) mode.

Stack-power mode is used only on stacking-capable switches in a power stack. With no XPS, a power stack operates in ring topology with a maximum of four switches in the stack. If you merge two stacks, the total number of switches cannot exceed four. When an XPS is in the power stack, you can connect up to nine switches in the stack plus the XPS, providing power budgets to power stack members similar to stack-power ring topology operation.

All Catalyst switches connected to an XPS on SP ports are part of the same power stack, and all power from the XPS and the switch is shared across all switches in the stack. Power sharing is the default mode, but the XPS supports the same stack power modes that are supported in a ring topology (strict and nonstrict power-sharing or redundant modes).

When two power supplies are present, the system can operate in mixed mode, where one power supply operates in RPS mode and the other in SP mode. You can configure the ports and power supplies for the way that you plan to use the XPS 2200.

The XPS 2200 has nine power ports that can operate in an RPS role or in an automatic stack power (Auto-SP) role (the default), where mode of operation is determined by the type of switch connected to the port . You can also use the CLI to force the mode to be RPS for stackable switches.

- When a Catalyst (stackable) switch running the Network Essentials or Network Advantage license is connected to the port, the mode is SP, which enables the switch to be part of the stack power system.

You configure the XPS through any switch connected to a power port. You can use any XPS port for configuration, and you can configure any port from any switch connected to the XPS. If you enter XPS configuration commands on more than one switch, the last configuration applied takes effect.

Although all XPS configuration is done through a switch, the XPS 2200 also runs its own software. You can upgrade this software through the XPS Service Port.

XPS 2200 Power Supply Modes

The XPS has two power supplies that can also be in either RPS or SP mode.

In SP mode, all SP ports on the XPS belong to the same power stack. When a power stack includes an XPS, the stack topology is a star topology and consists of up to nine member switches plus the XPS 2200. The XPS power supply or power supplies that are in SP mode are considered in the power budgeting. If both XPS power supplies are in RPS mode, the power stack consists only of the switches connected to XPS ports in SP mode, and the power budget is determined by the power supplies in these switches.

If there is a power supply role mismatch, for example, if an XPS port is configured for RPS and both power supplies are in SP mode, the XPS detects the mismatch, and an error message is sent.

RPS Mode

When both XPS power supplies are in RPS mode, the XPS can back up two power supply failures for switch power supplies of equal value or less. The smallest power supply in the XPS must be greater than the largest power supply in a switch connected to an XPS port in RPS mode.

If only one supply is in RPS mode, the XPS can back up only one power supply, even when the failed power supply is much smaller. For example, if an XPS 1100 W power supply is in RPS mode and two 350 W switch power supplies fail, the XPS can back up only one of the switch power supplies.

When one XPS power supply in RPS mode is backing up a switch power supply and another switch power supply fails, a message appears that the XPS backup is not available. When the failed power supply comes up, the XPS becomes available to back up other power supplies.

If the XPS is backing up two failed power supplies in a single switch (both XPS power supplies in RPS mode), the XPS is not available to back up other switch power supplies until both of the failed supplies are repaired or replaced.

In mixed mode, with one power supply in RPS mode and one in SP mode, if two power supplies in a single switch fail, because the XPS can back up only one of them, it denies power to both power supplies, and the switch shuts down. This occurs only in mixed power mode.

If a switch is connected to a port configured as RPS, but neither of the power supplies is RPS, the RPS port configuration is rejected and the XPS attempts to add the switch to a power stack. If the switch is not capable of operating in SP mode (is not a stackable switch), the port is disabled.

Ports in RPS mode have a configurable priority. The default priority is based on the XPS port number, with port 1 as the highest priority port. A higher priority port has a higher precedence for backup than a lower priority port. If a switch connected to a higher priority port has a power supply failure while a switch connected to a low priority port is being backed up, the XPS drops power to the low priority port to supply power to the high priority port.

Stack Power Mode

Stack-power mode is used only on Catalyst switches in a power stack. With no XPS, a power stack operates in ring topology with a maximum of four switches in the stack. When an XPS is in the power stack, you can connect up to nine switches in the stack plus the XPS, providing power budgets to power stack members similar to stack-power ring topology operation.

All Catalyst switches connected to an XPS on SP ports are part of the same power stack, and all power from the XPS and the switches is shared across all switches in the stack. Power sharing is the default mode, but the XPS supports the same stack power modes that are supported in a ring topology (strict and nonstrict power-sharing or redundant modes).

The XPS uses neighbor discovery to create the power stack. When it discovers a Catalyst switch on an unconfigured port, it marks the port as an SP port, and the switch joins the power stack. The XPS notifies the switch, begins the power-budgeting process, and assigns budgets to each switch in the power stack based on their requirements, priorities, current power allocations, and the stack aggregate power capability.

The XPS sends the power budget to each switch. If not enough input power is available to provide every switch with its maximum requested power, power is distributed based on priority. Switches with the highest priority receive required power first, followed by any powered devices that have already been allocated power, in order of their priority. Any remaining power is distributed equally through the stack.

The RPS port priority (1 through 9) does not affect stack power priority. Each switch participating in stack power has its own system priority and a high and low priority for devices connected to its ports. These priorities are used for stack power, as is the case in a ring topology. You configure stack power priority for the system and for high and low-priority ports by using the **power-priority switch**, **power-priority high**, and **power-priority low** commands in switch stack power configuration mode. If a system or set of powered devices are using the default priority, the XPS automatically assigns a priority (1 through 27), with lower MAC addresses receiving higher priorities.

There are four power stack modes: power sharing, strict power sharing, redundant, or strict redundant. You configure the power stack mode by using the **mode** {**power-sharing** | **redundant**} [**strict**] command in power-stack configuration mode. The **power-sharing** or **redundant** configurations affect the power budgeting

aspect of the stack; **strict** or non-strict affects the actions of the PoE application when a budget reduction does not result in load shedding.

- In power sharing modes (strict or nonstrict), the stack power budget is the cumulative capacity of all the power supplies in the stack (minus 30 W reserved power). This is the default.
- In redundant modes (strict or nonstrict), the stack power budget is the total available power (minus 30 W) after the capacity of the largest power supply in the power stack is subtracted. Redundant mode guarantees that no switch or powered device loses power or experiences load sheds if a single power supply fails, but load sheds can occur if more than one power supply fails.
- In strict modes, if a loss of input power results in reduced power budgets but does not result in any hardware load shedding, the XPS automatically begins denying power to low-priority powered devices and then the high-priority powered devices until the amount of allocated power is less than or equal to the amount of available PoE power.
- In nonstrict modes, in the event of a power reduction, the amount of allocated power is allowed to fall under budget.

For example, a system with a total PoE budget (available power) of 400 W can allocate 390 W of the budget (allocated power) to powered devices. The allocated power of a device is the maximum amount of power that the device needs. The actual power consumption (consumed power) for a set of powered devices is usually not equal to the allocated power. In this example, the actual power might be approximately 200 W. If a power loss in the stack reduces the available power to 210 W, this amount is enough to sustain the power being consumed by the powered devices, but less than the worst-case allocated power, which would put the system *under budget*. In strict mode, the stack would immediately deny power to powered devices until the allocated power was 210 W or less. In nonstrict mode, no action is taken, and the state is allowed to persist. In nonstrict mode if the actual power consumption becomes more than 210 W, this triggers a load shed and can result in the loss of power to all powered devices or switches with the lowest priority level.

Mixed Modes

The XPS 2200 can also operate in mixed mode, where some ports connected to switches are RPS and others are SP. At least one power supply must be an RPS power supply in this configuration. The power supply in the XPS can back up only one switch power supply and the XPS supply must be greater than the largest power supply in a switch connected to an XPS port in RPS mode.

Switches connected to SP ports belong to a single power stack. If the SP switches have a large enough power budget, an SP power supply is not required on the XPS. When an XPS power supply is configured, its power is added to the power pool shared by the power stack.

XPS 2200 System Defaults

The default role for a port is Auto-SP, where the power mode is determined by the switch connected to the port (SP for Catalyst switches with the Network Essentials or Network Advantage license)

The default for the XPS power supply A (PS1) is RPS mode. The default for power supply B (PS2) is SP mode.

The default mode for all ports and power supplies is enabled.

On ports configured for RPS, the default priority is the same as the port number.

How to Configure the Cisco Expandable Power System 2200

You can configure the XPS from any switch connected to an XPS port. If you enter XPS configuration commands on more than one switch, the last configuration applied takes effect. Only the switch and port name are saved in the switch configuration file.

Configuring System Names

Procedure

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**power xps** *switch-number* **name** {*name* | **serialnumber**}	**Note** In a stacked system, the switch-number entered must be the switch number of the active switch. Configures a name for the XPS 2200 system. • *name*: Enter a name for the XPS 2200 system. The name can have up to 20 characters. • **serialnumber**: Use the serial number of the XPS 2200 as the system name.
Step 4	**power xps** *switch-number* **port** {*name* | **hostname** | **serialnumber**}	**Note** The *switch-number* appears only on Catalyst switches and represents the device number in the data stack, Configures a name for an XPS 2200 port connected to the device. • *name*: Enter a name for the XPS 2200 port. • **serialnumber**: Use the serial number of the device connected to the port. • **hostname**: Use the hostname of the device connected to the port.
Step 5	**end**	Returns to privileged EXEC mode.
Step 6	**show env xps system**	Verifies the configured name of the system and ports.

	Command or Action	Purpose
Step 7	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Configuring XPS Ports

Procedure

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**power xps** *switch-number* **port** {*number* | **connected**} **mode** {**disable** | **enable**}	**Note** The *switch-number* appears only on Catalyst switches and represents the switch number in the data stack, a value from 1 to 9. Sets the port to be enabled or disabled. • *number*: Enter the XPS 2200 port number. The range is 1 to 9. • **connected**: Enter this keyword if you do not know the port number to which the switch is connected. • **mode disable**: Disable (shut down) the XPS port. **Note** Disabling an XPS port is like removing the cable and appears the same in the **show** command outputs. If the physical cable is connected, you can still use the **enable** keyword to enable the port. • **mode enable**: Enable the XPS port. This is the default.
Step 3	**power xps** *switch-number* **port** {*number* | **connected**} **role** {**auto** | **rps**}	**Note** The *switch-number* represents the switch number in the data stack, a value from 1 to 9. Sets the role of the XPS port. • **role auto**: The port mode is determined by the switch connected to the port. This is the default.

	Command or Action	Purpose
		• **role RPS**: The XPS acts as a back up if the switch power supply fails. At least one RPS power supply must be in RPS mode for this configuration.
Step 4	**power xps** *switch-number* **port** {*number* | **connected**} **priority** *port-priority*	**Note** The *switch-number* represents the switch number in the data stack, a value from 1 to 9. Sets the RPS priority of the port, where higher priority ports take precedence over low priority ports if multiple power supplies fail. This command takes effect only when the port mode is RPS. When the port mode is stack power, you set priority by using the stack power commands. • **priority** *port-priority*: Set the RPS priority of the port. The range is 1 to 9, with 1 being the highest priority. The default priority is the XPS port number.
Step 5	**show env xps port**	Verifies the XPS configuration of the port.
Step 6	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Configuring XPS Power Supplies

Procedure

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**power xps** *switch-number* **supply** {**A** | **B**} **mode** {**rps** | **sp**}	**Note** The *switch-number* represents the switch number in the data stack, a value from 1 to 9. Sets the XPS power supply mode. • **supply** {**A** | **B**}: Select the power supply to configure. Power supply A is on the left (labeled PS1) and power supply B (PS2) is on the right. • **mode rps**: Set the power supply mode to RPS, to back up connected switches. This

	Command or Action	Purpose
		is the default setting for power supply A (PS1). • **mode sp**: Set the power supply mode to stack power (SP), to participate in the power stack. This is the default setting for power supply B (PS2).
Step 3	**power xps** *switch-number* **supply** {**A** | **B**} {**on** | **off**}	**Note** The *switch-number* represents the switch number in the data stack, a value from 1 to 9. Sets the XPS power supply to be on or off. The default is for both power supplies to be on.
Step 4	**end**	Returns to privileged EXEC mode.
Step 5	**show env xps power**	Displays the status of the XPS power supplies.

Monitoring and Maintaining the Cisco Expandable Power System 2200

Command	Purpose
show env xps system	Verifies the configured name of the system and ports.
show env xps port	Verifies the XPS configuration of the port.
show env xps power	Displays the status of the XPS power supplies.

Additional References for Cisco Expandable Power System 2200

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	See the *Interface and Hardware Commands* section of the *Command Reference (Catalyst 9300 Series Switches)* .

Feature History for Cisco Expandable Power System 2200

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 Everest 16.5.1a	Cisco Expandable Power System (XPS) 2200	The XPS 2200 is a standalone power system that can provide backup power to connected devices that experience a power supply failure; or, in a Catalyst switch power stack, it can supply additional power to the power stack budget. Support for this feature was introduced only on the 9300 switch models of the Cisco Catalyst 9300 Series Switches.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to Cisco Feature Navigator.