



Configuring Power over Ethernet

- [Information About PoE, on page 1](#)
- [How to Configure PoE and UPoE, on page 6](#)
- [Monitoring Power Status, on page 11](#)
- [Additional References for Power over Ethernet, on page 14](#)
- [Feature History for Power over Ethernet, on page 14](#)

Information About PoE

PoE and PoE+ Ports

A PoE-capable switch port automatically supplies power to one of these connected devices if the device senses that there is no power on the circuit:

- A Cisco prestandard powered device (such as a Cisco IP Phone)
- An IEEE 802.3af-compliant powered device
- An IEEE 802.3at-compliant powered device

A powered device can receive redundant power when it is connected to a PoE switch port and to an AC power source. The device does not receive redundant power when it is only connected to the PoE port.

Supported Protocols and Standards

The device uses the following protocols and standards to support PoE:

- CDP with power consumption—The powered device notifies the device of the amount of power it is consuming. The device does not reply to the power-consumption messages. The device can only supply power to or remove power from the PoE port.
- Cisco intelligent power management—The powered device and the device negotiate through power-negotiation CDP messages for an agreed-upon power-consumption level. The negotiation allows a Cisco powered device, that requires different power levels than its current allocation, to operate. The powered device first boots with its IEEE class power or 15.4W (pre-standard Cisco PD), then negotiates power to operate at appropriate power level. The device consumption changes to requested power mode only when it receives confirmation from the device.

High-power devices can operate in low-power mode on device that do not support power-negotiation CDP.

Cisco intelligent power management is backward-compatible with CDP with power consumption; the device responds according to the CDP message that it receives. CDP is not supported on third-party powered devices; therefore, the device uses the IEEE classification to determine the power usage of the device.

- IEEE 802.3af—The major features of this standard are powered-device discovery, power administration, disconnect detection, and optional powered-device power classification. For more information, see the standard.
- IEEE 802.3at—The PoE+ standard increases the maximum power that can be drawn by a powered device from 15.4 W per port to 30 W per port.
- The Cisco UPOE feature provides the capability to source up to 60 W of power (2 x 30 W) over both signal and spare pairs of the RJ-45 Ethernet cable by using the Layer-2 power negotiation protocols such as CDP or LLDP. An LLDP and CDP request of 30 W and higher in presence of the 4-wire Cisco Proprietary spare-pair power TLV can provide power on the spare pair.
- IEEE 802.3bt or Cisco UPOE-Plus— IEEE 802.3bt standard enables delivery of up to 90W to a powered device, over four pairs of Category 5e and above cables. This standard also introduces additional classes of Power Sourcing Equipments (PSEs) and PDs, class 5 to class8, with PSE output power ranging between 45W to 90W and the PD input power ranging from 40W to 73W. It introduces new types of PSEs or PDs: Type 3(60W) and Type 4 (90W). IEEE 802.3bt standard enables support for Dual Signature PDs, Single Signature PDs, and Single Pair PDs. It also supports power demotion to handle scenarios where Type 4 PD is connected to a Type 3 PSE.

For more information, see the standard.



Note Only the following Type 3 SKUs support IEEE 802.3bt standard:

- C9400-LC-48U
- C9400-LC-48UX

802.3bt Type 4 PSE is not supported. However, you can power-up a Type 4 PD through a power demotion to 60W.

Powered-Device Detection and Initial Power Allocation

The switch detects a Cisco pre-standard or an IEEE-compliant powered device when the PoE-capable port is in the no-shutdown state, PoE is enabled (the default), and the connected device is not being powered by an AC adaptor.

After device detection, the switch determines the device power requirements based on its type:

- The initial power allocation is the maximum amount of power that a powered device requires. The switch initially allocates this amount of power when it detects and powers the powered device. As the switch receives CDP messages from the powered device and as the powered device negotiates power levels with the switch through CDP power-negotiation messages, the initial power allocation might be adjusted.

- The switch classifies the detected IEEE device within a power consumption class. Based on the available power in the power budget, the switch determines if a port can be powered. The following *IEEE Power Classifications* table lists these levels.

Table 1: IEEE Power Classifications

Class	Maximum Power Level Required from the Device
0 (class status unknown)	15.4 W
1	4 W
2	7 W
3	15.4 W
4	30 W

The switch monitors and tracks requests for power and grants power only when it is available. The switch tracks its power budget (the amount of power available on the device for PoE). The switch performs power-accounting calculations when a port is granted or denied power to keep the power budget up to date.

After power is applied to the port, the switch uses CDP to determine the *CDP-specific* power consumption requirement of the connected Cisco powered devices, which is the amount of power to allocate based on the CDP messages. The switch adjusts the power budget accordingly, through CDP or LLDP. Note that CDP does not apply to third-party PoE devices. The switch processes a request and either grants or denies power. If the request is granted, the switch updates the power budget. If the request is denied, the switch ensures that power to the port is turned off, and generates a syslog message. Powered devices can also negotiate with the switch for more power.

With PoE+, powered devices use IEEE 802.3at and LLDP power with media dependent interface (MDI) type, length, and value descriptions (TLVs), Power-via-MDI TLVs, for negotiating power up to 30 W. Cisco pre-standard devices and Cisco IEEE powered devices can use CDP or the IEEE 802.3at power-via-MDI power negotiation mechanism to request power levels up to 30 W.



Note The CDP-specific power consumption requirement is referred to as the *actual* power consumption requirement in the software configuration guides and command references.

If the switch detects a fault caused by an undervoltage, overvoltage, overtemperature, oscillator-fault, or short-circuit condition, it turns off power to the port, generates a syslog message, and updates the power budget.

Power Management Modes

The device supports these PoE modes:

- **auto**—The device automatically detects if the connected device requires power. If the device discovers a powered device connected to the port and if the device has enough power, it grants power, updates the power budget, turns on power to the port on a first-come, first-served basis.

If the device has enough power for all the powered devices, they all come up. If enough power is available for all powered devices connected to the device, power is turned on to all devices. If there is not enough

available PoE, or if a device is disconnected and reconnected while other devices are waiting for power, it cannot be determined which devices are granted or are denied power.

If granting power would exceed the system power budget, the device denies power, ensures that power to the port is turned off, and generates a syslog message. After power has been denied, the device periodically rechecks the power budget and continues to attempt to grant the request for power.

If a device being powered by the device is then connected to wall power, the device might continue to power the device. The device might continue to report that it is still powering the device whether the device is being powered by the device or receiving power from an AC power source.

If a powered device is removed, the device automatically detects the disconnect and removes power from the port. You can connect a nonpowered device without damaging it.

You can specify the maximum wattage that is allowed on the port. If the IEEE class maximum wattage of the powered device is greater than the configured maximum value, the device does not provide power to the port. If the device powers a powered device, but the powered device later requests through CDP messages more than the configured maximum value, the device removes power to the port. The power that was allocated to the powered device is reclaimed into the global power budget. If you do not specify a wattage, the device delivers the maximum value. Use the **auto** setting on any PoE port. The auto mode is the default setting.

- **static**—The device pre-allocates power to the port (even when no powered device is connected) and guarantees that power will be available for the port. The device allocates the port configured maximum wattage, and the amount is never adjusted through the IEEE class or by CDP messages from the powered device. Because power is pre-allocated, any powered device that uses less than or equal to the maximum wattage is guaranteed to be powered when it is connected to the static port. The port no longer participates in the first-come, first-served model.

However, if the powered-device IEEE class is greater than the maximum wattage, the device does not supply power to it. If the device learns through CDP messages that the powered device is consuming more than the maximum wattage, the device shuts down the powered device.

If you do not specify a wattage, the device pre-allocates the maximum value. The device powers the port only if it discovers a powered device. Use the **static** setting on a high-priority interface.

- **never**—The device disables powered-device detection and never powers the PoE port even if an unpowered device is connected. Use this mode only when you want to make sure that power is never applied to a PoE-capable port, making the port a data-only port.

For most situations, the default configuration (auto mode) works well, providing plug-and-play operation. No further configuration is required. However, perform this task to configure a PoE port for a higher priority, to make it data only, or to specify a maximum wattage to disallow high-power powered devices on a port.

Power Monitoring and Power Policing

When policing of the real-time power consumption is enabled, the device takes action when a powered device consumes more power than the maximum amount allocated, also referred to as the *cutoff-power value*.

When PoE is enabled, the device senses the real-time power consumption of the powered device. The device monitors the real-time power consumption of the connected powered device; this is called *power monitoring* or *power sensing*. The device also polices the power usage with the *power policing* feature.

Power monitoring is backward-compatible with Cisco intelligent power management and CDP-based power consumption. It works with these features to ensure that the PoE port can supply power to the powered device.

The device senses the real-time power consumption of the connected device as follows:

1. The device monitors the real-time power consumption on individual ports.
2. The device records the power consumption, including peak power usage. The device reports the information through the CISCO-POWER-ETHERNET-EXT-MIB.
3. If power policing is enabled, the device polices power usage by comparing the real-time power consumption to the maximum power allocated to the device. The maximum power consumption is also referred to as the *cutoff power* on a PoE port.

If the device uses more than the maximum power allocation on the port, the device can either turn off power to the port, or the device can generate a syslog message while still providing power to the device based on the device configuration. By default, power-usage policing is disabled on all PoE ports.

If error recovery from the PoE error-disabled state is enabled, the device automatically takes the PoE port out of the error-disabled state after the specified amount of time.

If error recovery is disabled, you can manually re-enable the PoE port by using the **shutdown** and **no shutdown** interface configuration commands.

4. If policing is disabled, the powered device can receive a maximum power of 15.4W (the port default maximum limit is 15.4W). If the powered device consumes more than this limit, the port goes to faulty state.

Power Consumption Values

You can configure the initial power allocation and the maximum power allocation on a port. However, these values are only the configured values that determine when the device should turn on or turn off power on the PoE port. The maximum power allocation is not the same as the actual power consumption of the powered device. The actual cutoff power value that the device uses for power policing is not equal to the configured power value.

When power policing is enabled, the device polices the power usage *at the switch port*, which is greater than the power consumption of the device. When you manually set the maximum power allocation, you must consider the power loss over the cable from the switch port to the powered device. The cutoff power is the sum of the rated power consumption of the powered device and the worst-case power loss over the cable.

We recommend that you enable power policing when PoE is enabled on your device. For example, for a Class 1 device, if policing is disabled and you set the cutoff-power value by using the **power inline auto max 6300** interface configuration command, the configured maximum power allocation on the PoE port is 6.3 W (6300 mW). The device provides power to the connected devices on the port if the device needs up to 6.3 W. If the CDP-power negotiated value or the IEEE classification value exceeds the configured cutoff value, the device does not provide power to the connected device. After the device turns on power on the PoE port, the device does not police the real-time power consumption of the device, and the device can consume more power than the maximum allocated amount, which could adversely affect the device and the devices connected to the other PoE ports.

Cisco Universal Power Over Ethernet

Cisco Universal Power Over Ethernet (Cisco UPOE) is a Cisco proprietary technology that extends the IEEE 802.3 at PoE standard to provide the capability to source up to 60 W of power over standard Ethernet cabling infrastructure (Class D or better) by using the spare pair of an RJ-45 cable (wires 4,5,7,8) with the signal pair (wires 1,2,3,6). Power on the spare pair is enabled when the switch port and end device mutually identify themselves as Cisco UPOE-capable using CDP or LLDP and the end device requests for power to be enabled on the spare pair. When the spare pair is powered, the end device can negotiate up to 60 W of power from the switch using CDP or LLDP.

If the end device is PoE-capable on both signal and spare pairs but does not support the CDP or LLDP extensions required for Cisco UPOE, a 4-pair forced mode configuration automatically enables power on both signal and spare pairs from the switch port.

How to Configure PoE and UPoE

Configuring a Power Management Mode on a PoE Port



Note When you make PoE configuration changes, the port being configured drops power. Depending on the new configuration, the state of the other PoE ports, and the state of the power budget, the port might not be powered up again. For example, port 1 is in the auto and on state, and you configure it for static mode. The device removes power from port 1, detects the powered device, and repowers the port. If port 1 is in the auto and on state and you configure it with a maximum wattage of 10 W, the device removes power from the port and then redetects the powered device. The device repowers the port only if the powered device is a class 1, class 2, or a Cisco-only powered device.

Procedure

	Command or Action	Purpose
Step 1	enable Example: <pre>Device> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: <pre>Device# configure terminal</pre>	Enters global configuration mode.
Step 3	interface <i>interface-id</i> Example: <pre>Device(config)# interface gigabitethernet2/0/1</pre>	Specifies the physical port to be configured, and enters interface configuration mode.
Step 4	power inline {auto [<i>max max-wattage</i>] never static [<i>max max-wattage</i>] consumption <i>milli-watts-consumption</i> } Example: <pre>Device(config-if)# power inline auto</pre>	Configures the PoE mode on the port. The keywords have these meanings: <ul style="list-style-type: none"> • auto—Enables powered-device detection. If enough power is available, automatically allocates power to the PoE port after device detection. This is the default setting. • max <i>max-wattage</i>—Limits the power allowed on the port. The range for Cisco UPOE ports is 4000 to 60000 mW. If no

	Command or Action	Purpose
		<p>value is specified, the maximum is allowed.</p> <ul style="list-style-type: none"> • never —Disables device detection, and disable power to the port. <p>Note If a port has a Cisco powered device connected to it, do not use the power inline never command to configure the port. A false link-up can occur, placing the port into the error-disabled state.</p> <ul style="list-style-type: none"> • static—Enables powered-device detection. Pre-allocate (reserve) power for a port before the device discovers the powered device. The device reserves power for this port even when no device is connected and guarantees that power will be provided upon device detection. • consumption —Sets the PoE consumption (in milliwatts) of the powered device connected to a specific interface. The power consumption can range from 4000 to 60000 milliWatts. <p>To reenable the automatic adjustment of consumption, either use the no keyword or specify 60000 milliwatts</p> <p>The device allocates power to a port configured in static mode before it allocates power to a port configured in auto mode.</p>
Step 5	end Example: Device(config-if)# end	Returns to privileged EXEC mode.
Step 6	show power inline [<i>interface-id</i>] [detail] Example: Device# show power inline	Displays PoE status for a device , for the specified interface.
Step 7	copy running-config startup-config Example: Device# copy running-config startup-config	(Optional) Saves your entries in the configuration file.

Enabling Power on Signal/Spare Pairs



Note This task is not required if the linecard on which the device is connected is in 802.3bt-compliance mode because the **power inline four-pair forced** command is redundant in the 802.3bt-compliance mode.



Note Do not enter this command if the end device cannot source inline power on the spare pair or if the end device supports the CDP or LLDP extensions for Cisco UPOE.

Procedure

	Command or Action	Purpose
Step 1	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 2	interface <i>interface-id</i> Example: Device(config)# interface gigabitethernet2/0/1	Specifies the physical port to be configured, and enters interface configuration mode.
Step 3	power inline four-pair forced Example: Device(config-if)# power inline four-pair forced	Enables power on both signal and spare pairs from a switch port. Note This step is not required if the linecard on which the device is connected is in 802.3bt compliance mode.
Step 4	end Example: Device(config-if)# end	Returns to privileged EXEC mode.

Configuring Power Policing

By default, the device monitors the real-time power consumption of connected powered devices. You can configure the device to police the power usage. By default, policing is disabled.

Procedure

	Command or Action	Purpose
Step 1	enable Example:	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
	Device> enable	
Step 2	configure terminal Example: Device# configure terminal	Enters global configuration mode.
Step 3	interface <i>interface-id</i> Example: Device(config)# interface gigabitethernet2/0/1	Specifies the physical port to be configured, and enter interface configuration mode.
Step 4	power inline police [action {log errdisable}] Example: Device(config-if)# power inline police	<p>If the real-time power consumption exceeds the maximum power allocation on the port, configures the device to take one of these actions:</p> <ul style="list-style-type: none"> • power inline police—Shuts down the PoE port, turns off power to it, and puts it in the error-disabled state. <p>Note You can enable error detection for the PoE error-disabled cause by using the errdisable detect cause inline-power global configuration command. You can also enable the timer to recover from the PoE error-disabled state by using the errdisable recovery cause inline-power interval <i>interval</i> global configuration command.</p> <ul style="list-style-type: none"> • power inline police action errdisable—Turns off power to the port if the real-time power consumption exceeds the maximum power allocation on the port. • power inline police action log—Generates a syslog message while still providing power to the port. <p>If you do not enter the action log keywords, the default action shuts down the port and puts the port in the error-disabled state.</p>
Step 5	exit Example: Device(config-if)# exit	Returns to global configuration mode.

	Command or Action	Purpose
Step 6	<p>Use one of the following:</p> <ul style="list-style-type: none"> • errdisable detect cause inline-power • errdisable recovery cause inline-power • errdisable recovery interval <i>interval</i> <p>Example:</p> <pre>Device(config)# errdisable detect cause inline-power</pre> <pre>Device(config)# errdisable recovery cause inline-power</pre> <pre>Device(config)# errdisable recovery interval 100</pre>	<p>(Optional) Enables error recovery from the PoE error-disabled state, and configures the PoE recover mechanism variables.</p> <p>By default, the recovery interval is 300 seconds.</p> <p>For interval <i>interval</i>, specifies the time in seconds to recover from the error-disabled state. The range is 30 to 86400.</p>
Step 7	<p>exit</p> <p>Example:</p> <pre>Device(config)# exit</pre>	Returns to privileged EXEC mode.
Step 8	<p>Use one of the following:</p> <ul style="list-style-type: none"> • show power inline police • show errdisable recovery <p>Example:</p> <pre>Device# show power inline police</pre> <pre>Device# show errdisable recovery</pre>	Displays the power monitoring status, and verify the error recovery settings.
Step 9	<p>copy running-config startup-config</p> <p>Example:</p> <pre>Device# copy running-config startup-config</pre>	(Optional) Saves your entries in the configuration file.

Enabling 802.3bt Type 3 mode

You can enable the 802.3bt Type 3 mode on the 802.3bt-compliant linecards using the **hw-module slot slot upoe-plus** command in the global configuration mode. Note that the **hw-module slot slot upoe-plus** command power-cycles the linecard upon configuration.

```
Device(config)# hw-module slot 4 upoe-plus
Performing oir to update poe fw on chassis 1 slot 4
Device#
*Mar 21 05:39:36.215: %IOSXE_OIR-6-REMSPA: SPA removed from subslot 4/0, interfaces disabled
```

Support for Non-compliant PD

You can allow a PD, that is capable of drawing power on both pair-sets, to draw more power than what is allowed on its physical layer per IEEE Classification ([Table 1: IEEE Power Classifications](#)), using the **power inline auto** and **power inline static** commands.

The following example shows a Class 4 PD configured to draw up to 40W on the port it is connected to:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitEthernet1/0/14
Device(config-if)# power inline static 40000
Device(config-if)# end

Device# show power inline upoe gigabitEthernet 1/0/14
Codes: DS - Dual Signature device, SS - Single Signature device
       SP - Single Pairset device
```

Interface	Admin State	Type	Oper-State Alt-A,B	Power(Watts)		Class Alt-A,B	Device Name
				Allocated	Utilized		
-----	-----	----	-----	-----	-----	-----	-----
Gil/0/14	static	SS	on,on	40.0	36.7	4	Ieee PD

Monitoring Power Status

Table 2: Show Commands for Power Status

Command	Purpose
show power inline police	Displays the power policing data.
show power inline [[<i>interface-id</i>] [<i>detail</i>]]	Displays PoE status for an interface on a switch.
show power inline consumption <i>interface-id</i>	Displays the PoE consumption for that interface.
show power inline upoe-plus [<i>interface-id</i>] [<i>module</i>]	Displays the PoE status for an interface that is enabled for 802.3bt-compliant mode.

Examples

```
Device# show power inline upoe-plus gigabitEthernet 1/0/23
Codes: DS - Dual Signature device, SS - Single Signature device
       SP - Single Pairset device
```

Interface	Admin State	Type	Oper-State Alt-A,B	Power(Watts)		Class Alt-A,B	Device Name
				Allocated	Utilized		
-----	-----	----	-----	-----	-----	-----	-----
Gil/0/4	auto	SP	on	4.0	3.8	1	Ieee PD
Gil/0/15	auto	SS	on,on	60.0	10.5	6	Ieee PD
Gil/0/23	auto	DS	on,on	45.4	26.9	3,4	Ieee PD

The following are descriptions of the fields that you see in the output of the **show power inline upoe-plus** command:

Field	Description
Type	Type of PD: Single Pairset device or Single Signature device or Dual Signature device
Oper-State	The state of each pair on the port
Power Allocated	Power allocated to the port
Power Utilized	Power consumed by the PD on the port.
Class Alt-A, B	Signal, Spare-pair respectively
Device Name	Name of the PD as advertised by CDP.

The **show power inline detail** command is enhanced to display 802.3bt-complaint device information like the Operational Status of the device, IEEE Class of the device, Physical Assigned Class, Allocated Power, (Power)Measured at the port.

Consider a scenario where a Class5 SS PD sends a request through LLDP to lower the power allocated by PSE; hence the power allocated drops to 30.0 Watts. The following is the output of the **show power inline detail** command in this case:

```

Device# show power inline gigabitEthernet 1/0/29 detail
  Interface: Gi1/0/29
  Inline Power Mode: auto
Operational status (Alt-A,B): on,on
Device Detected: yes
Device Type: Ieee PD
Connection Check: SS
IEEE Class (Alt-A,B): 5
Physical Assigned Class (Alt-A,B): 5
Discovery mechanism used/configured: Ieee and Cisco
Police: off

Power Allocated
  Admin Value: 60.0
Power drawn from the source: 30.0
Power available to the device: 30.0
Allocated Power (Alt-A,B): 30.0

Actual consumption
Measured at the port(watts) (Alt-A,B): 10.5
Maximum Power drawn by the device since powered on: 10.5

Absent Counter: 0
Over Current Counter: 0
Short Current Counter: 0
Invalid Signature Counter: 0
Power Denied Counter: 0

Power Negotiation Used: IEEE 802.3bt LLDP
LLDP Power Negotiation  --Sent to PD--      --Rcvd from PD--
Power Type:              Type 2 PSE          Type 2 PD
Power Source:            Primary              PSE
Power Priority:           low                  critical
PD 4PID:                 0                    1
Requested Power(W):      25.5                 25.5
Allocated Power(W):      25.5                 40.0
Requested Power ModeA(W): 0.0                 6.5
Allocated Power ModeA(W): 0.0                 25.5

```

```

Requested Power ModeB(W):    0.0          13.0
Allocated Power ModeB(W):    0.0          25.5
PSE Powering Status:         4 pair SS PD  Ignore
PD Powering Status:          Ignore        SS PD
PSE Power Pair ext:           Both Alternatives Both Alternatives
DS Class Mode A ext:          SS PD         Class 2
DS Class Mode B ext:          SS PD         Class 4
SS Class ext:                 Class 4       Class 5
PSE Type ext:                 Type 3 PSE     Type 3 SS PD
PSE Max Avail Power:         51.0          51.2
PSE Auto Class Supp:         No            No
PD Auto Class Req:           No            No
PD Power Down Req:           No            No
PD Power Down Time(sec):     0             70

```

```

Four-Pair PoE Supported: Yes
Spare Pair Power Enabled: Yes
Four-Pair PD Architecture: Shared

```

Here is an example of output where a DS PD sends a request to lower the power allocated by the PSE:

```

Device#show power inline gigabitEthernet 4/0/48 detail
Interface: Gi4/0/48
Inline Power Mode: auto
Operational status (Alt-A,B): on,on
Device Detected: yes
Device Type: Ieee PD
Connection Check: DS
IEEE Class (Alt-A,B): 4,4
Physical Assigned Class (Alt-A,B): 4,4
Discovery mechanism used/configured: Ieee and Cisco
Police: off

Power Allocated
Admin Value: 60.0
Power drawn from the source: 60.0
Power available to the device: 60.0
Allocated Power (Alt-A,B): 30.0,30.0
Actual consumption
Measured at the port(watts) (Alt-A,B): 10.7,10.7
Maximum Power drawn by the device since powered on: 21.4
Absent Counter: 0
Over Current Counter: 0
Short Current Counter: 0
Invalid Signature Counter: 0
Power Denied Counter: 0

Power Negotiation Used: None
LLDP Power Negotiation    --Sent to PD--    --Rcvd from PD--
Power Type:               -                -
Power Source:             -                -
Power Priority:            -                -
Requested Power(W):       -                -
Allocated Power(W):       -                -

Four-Pair PoE Supported: Yes
Spare Pair Power Enabled: Yes
Four-Pair PD Architecture: Independent

```

Additional References for Power over Ethernet

Related Documents

Related Topic	Document Title
For complete syntax and usage information pertaining to the commands used in this chapter.	See the "Interface and Hardware Commands" section in the <i>Command Reference Guide</i> .
For complete information on IEEE 802.3bt standard	See Cisco UPOE+: The Catalyst for Expanded IT-OT Convergence

Feature History for Power over Ethernet

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 16.6.1	Power over Ethernet (PoE)	Power over Ethernet (PoE) allows the LAN switching infrastructure to provide power to an endpoint, called a powered device, over a copper Ethernet cable. The following types of end points can be powered through PoE: <ul style="list-style-type: none">• A Cisco prestandard powered device• An IEEE 802.3af-compliant powered device• An IEEE 802.3at-compliant powered device
Cisco IOS XE Gibraltar 16.11.1	Support for IEEE 802.3bt Type 3 PDs (up to 60 W)	The hw-module slot upoe-plus command was introduced to enable 802.3bt-compliant mode on the C9400-LC-48U, and C9400-LC-48UX line cards.

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

