Configuring Power over Ethernet

✎
Note Before reading this chapter, read the "Preparing for Installation" section of the
Catalyst 4500 Series Installation Guide. You must ensure that your installation site has enough power
and cooling to accommodate the additional electrical load and heat introduced by PoE.

This chapter describes how to configure Power over Ethernet (PoE) on the Catalyst 4500 series switch.

This chapter contains the following sections:

✎
Note For complete syntax and usage information for the switch commands used in this chapter, look at the
Cisco Catalyst 4500 Series Switch Command Reference and related publications at this location:

http://www.cisco.com/en/US/products/hw/switches/ps4324/index.html

If the command is not found in the Catalyst 4500 Command Reference, it is located in the larger Cisco
IOS library. Refer to the *Cisco IOS Command Reference* and related publications at this location:

http://www.cisco.com/en/US/products/ps6350/index.html

About Power over Ethernet

The Catalyst 4500 series switch provides Power over Ethernet (PoE) support for both Cisco Prestandard
PoE and the IEEE 802.3af standard (ratified in 2003). PoE is supported by all Catalyst 4500 series
chassis and requires a PoE module and power supply. The amount of PoE power available depends on

the PoE capabilities of individual power supplies. Support for PoE enables the system to power inline devices, such as IP phones, IP video phones, and wireless access points over standard copper cabling (Category 5, 5e, or 6 cabling).

In addition, with PoE, you do not need to provide wall power for each PoE enabled device. This eliminates the cost for additional electrical cabling that is otherwise necessary for connected devices. Moreover, PoE enables you to isolate critical devices on a single power system, enabling the entire system to be supported by UPS backup.

You typically deploy a Catalyst 4500 series switch in one of two deployment scenarios. The first scenario is data-only, which requires power to operate the switch and the associated modules. The second scenario supports data and PoE (also termed "inline power") for deployments where the attached device derives power from the Ethernet port.

Catalyst 4500 series switches can sense if a powered device is connected to a PoE module. They can supply PoE to the powered device if there is no power on the circuit. (If there is power on the circuit, the switch does not supply it.) The powered device can also be connected to an AC power source and supply its own power to the voice circuit.

Note   You should select the amount of PoE desired using the Cisco Power Calculator:

http://tools.cisco.com/cpc/

Hardware Requirements

To power a device using PoE, your chassis must use at least one of the power supplies listed in Table 11-1, and connect the device to at least one of the switching modules listed in Table 11-1.

Table 11-1   Hardware Requirements

Switching Modules	Power Supplies
WS-X4148-RJ45V	PWR-C45-1300ACV=
WS-X4224-RJ45V	PWR-C45-1400DCV=
WS-X4248-RJ21V	PWR-C45-2800ACV=
WS-X4248-RJ45V	PWR-C45-4200ACV=
WS-X4506-GB-T	
WS-X4524-GB-RJ45V	
WS-X4548-RJ45V+	
WS-X4548-GB-RJ45V	
WS-X4648-RJ45V-E	
WS-X4648-RJ45V+E	

Power Management Modes

If your switch has a module capable of providing PoE to end stations, you can set each interface on the module to automatically detect and apply PoE if the end station requires power.

The Catalyst 4500 series switch has three PoE modes:

- **auto**—PoE interface. The supervisor engine directs the switching module to power up the interface *only* if the switching module discovers the phone and the switch has enough power. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch delivers no more than the hardware-supported maximum value. This mode has no effect if the interface is not capable of providing PoE.

- **static**—High priority PoE interface. The supervisor engine preallocates power to the interface, even when nothing is connected, guaranteeing that power exists for the interface. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch preallocates the hardware-supported maximum value. If the switch does not have enough power for the allocation, the command fails. The supervisor engine directs the switching module to power up the interface *only* if the switching module discovers the powered device.

- **never**—Data interface only The supervisor engine never powers up the interface, even if an unpowered phone is connected. This mode is only needed when you want to make sure power is never applied to a PoE-capable interface.

The switch can measure the actual PoE consumption for an 802.3af-compliant PoE module, and displays this in the **show power module** command.

PoE consumption cannot be measured on the WS-X4148-RJ45V PoE module. For all PoE calculations, the PoE consumption on this module is presumed to be equal to its administrative PoE.

For more information, see the "Displaying the PoE Consumed by a Module" section on page 11-7.

For most users, the default configuration of "auto" works well, providing plug-and-play capability. No further configuration is required. However, to make an interface higher priority or data only, or to specify a maximum wattage, perform this task:

	Command	Purpose
Step 1	Switch(config)# **interface** {**fastethernet** | **gigabitethernet**} *slot/port*	Selects the interface to configure.
Step 2	Switch(config-if)# **power inline** {**auto** [**max** *milli-watts*] | **never** | **static** [**max** *milli-watts*]}	The **auto** keyword sets the interface to automatically detect and supply power to the powered device. it is the default configuration.
		The **static** keyword sets the interface to higher priority than auto.
		If necessary, use the **max** keyword to specify the maximum wattage allowed on the interface (4000 to 15400 milliwatts for most switching modules. As of Cisco IOS Release 12.2(44)SG, the WS-X4648-RJ45V+E can support up to 30 W available per-port and the WS-X4648-RJ45V-E supports up to 20 W. For more information, see "Enhanced Power PoE Support on the E-Series Chassis" on page 15).
		Use the **never** keyword to disable detection and power for the PoE capable interface.
Step 3	Switch(config-if)# **end**	Exits configuration mode.
Step 4	Switch# **show power inline** {**fastethernet** | **gigabitethernet**} *slot/port*	Displays the PoE state for the switch.

Note   If you set a non-PoE-capable interface to automatically detect and apply power, an error message indicates that the configuration is not valid.

The following example shows how to set the Fast Ethernet interface 4/1 to automatically detect PoE and send power through that interface, and to verify the PoE configuration:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline auto
Switch(config-if)# end
Switch# show power inline fastethernet 4/1
Available:677(w)  Used:11(w)  Remaining:666(w)

Interface Admin  Oper           Power(Watts)    Device              Class
                           From PS    To Device
--------- ------ ---------- ---------- ---------- ------------------- -----
Fa4/1     auto   on         11.2       10.0       Ieee PD             0

Interface  AdminPowerMax   AdminConsumption
           (Watts)         (Watts)
---------- --------------- -------------------
Fa4/1                15.4                 10.0
Switch#
```

The following example shows how to configure an interface so that it never supplies power through the interface:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface fastethernet 5/2
Switch(config-if)# power inline never
Switch(config-if)# end
Switch#
```

Intelligent Power Management

All Catalyst 4500 PoE-capable modules use Intelligent Power Management to provide power on each interface. When a powered device (PD) is attached to a PoE-capable port, the port detects the PD and provision power accordingly. If a Cisco PD is used, the switch and PD negotiate power using CDP packets to determine the precise amount of power needed by the PD. If the PD is 802.3af compatible, the difference between what is mandated by the 802.3af class and what is actually needed by the PD is returned to the power budget for use by additional devices. In this way, power negotiation enables customers to stretch their power budget and use it more effectively.

Power negotiation also enables the interoperability of newer Cisco powered devices with older legacy PoE-capable ports from Cisco. Newer Cisco PDs do not consume more than what the switch port can provide.

Configuring Power Consumption for Powered Devices on an Interface

By default, when the switch detects a powered device on an interface, it assumes the powered device consumes the maximum the port can provide (7 W on a legacy PoE module and 15.4W on the IEEE PoE modules introduced in Cisco IOS Release 12.2(18)EW). When the switch receives a CDP packet from the powered device, the wattage automatically adjusts downward to the specific amount required by that device. Normally, this automatic adjustment works well, and no further configuration is required or recommended. However, you can specify the powered device's consumption for a particular interface to provide extra functionality from your switch. This behavior is useful when CDP is disabled or not available.

> **Note** When manually configuring the consumption for powered devices, you need to account for the power loss over the cable between the switch and the powered device.

> **Note** The **inline power consumption** command overrides the power allocated to the port through IEEE/Cisco phone discovery and CDP/LLDP power negotiation. To guarantee safe operation of the system, ensure that the value configured here is no less than the actual power requirement of the attached device. If the power drawn by the inline powered devices exceeds the capability of the power supply, it could trip the power supply.

To change the power consumption of a single powered device, perform this task:

	Command	Purpose
Step 1	Switch(config)# **interface** {**fastethernet** | **gigabitethernet**} *slot/port*	Selects the interface to configure.
Step 2	Switch(config-if)# [**no**] **power inline consumption** *milli-watts*	Sets the PoE consumption (in milliwatts) of the powered device connected to a specific interface. The power consumption can range from 4000 to 15,400. To reenable the automatic adjustment of consumption, either use the **no** keyword or specify 15,400 milliwatts.
Step 3	Switch(config-if)# **end**	Exits configuration mode.
Step 4	Switch# **show power inline consumption** {**fastethernet** | **gigabitethernet**} *slot/port*	Displays the PoE consumption for the interface.

This example shows how to set the PoE consumption to 5000 milliwatts for interface gi 7/1 regardless what is mandated by the 802.3af class of the discovered device, or by any CDP packet received from the powered device. This example also verifies the PoE consumption on interface gi 7/1.

The following output displays the initial power consumption of the interface:

```
Switch# show power inline gi 7/1
Available:627(w)  Used:267(w)  Remaining:360(w)

Interface Admin  Oper           Power(Watts)    Device            Class
                               From PS   To Device
--------- ------ ---------- ---------- ---------- ------------------- -----

Gi7/1     auto   on         7.9        7.0        IP Phone 7941       3
```

```
Interface  AdminPowerMax   AdminConsumption
           (Watts)         (Watts)
---------- --------------- --------------------

Gi7/1                15.4                  15.4

Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int gi 7/1
Switch(config-if)# power inline consumption 5000
Switch(config-if)# exit
Switch(config)# exit
```

The following output displays the power consumption after entering the **power inline consumption**
command on the interface:

```
Switch# show power inline gi 7/1
Available:627(w)  Used:265(w)  Remaining:362(w)

Interface Admin  Oper           Power(Watts)    Device             Class
                           From PS    To Device
--------- ------ ---------- ---------- ---------- ------------------ -----

Gi7/1     auto   on         5.6        5.0        Ieee PD            3

Interface  AdminPowerMax   AdminConsumption
           (Watts)         (Watts)
---------- --------------- --------------------

Gi7/1                15.4                   5.0
```

Displaying the Operational Status for an Interface

Each interface has an operational status which reflects the PoE status for an interface. The operational
status for an interface is defined as one of the following:

- on—Power is supplied by the port.
- off—Power is not supplied by the port. If a powered device is connected to an interface with external
  power, the switch does not recognize the powered device. The "Device" column in the **show power
  inline** command displays as n/a.
- Power-deny—The supervisor engine does not have enough power to allocate to the port, or the
  power that is configured for the port is less than the power required by the port; power is not being
  supplied by the port.
- err-disable—The port is unable to provide power to the connected device that is configured in static
  mode.
- faulty—The port failed diagnostics tests.

To view the operational status for an interface, use the **show power inline** command.

This example shows how to display the operational status for all interfaces on module 3:

```
Switch# show power inline module 3
Available:677(w)  Used:117(w)  Remaining:560(w)

Interface Admin  Oper           Power(Watts)    Device             Class
                           From PS    To Device
--------- ------ ---------- ---------- ---------- ------------------ -----
```

```
Fa3/1      auto   on         17.3       15.4       Ieee PD            0
Fa3/2      auto   on         4.5        4.0        Ieee PD            1
Fa3/3      auto   on         7.1        6.3        Cisco IP Phone 7960 0
Fa3/4      auto   on         7.1        6.3        Cisco IP Phone 7960 n/a
Fa3/5      auto   on         17.3       15.4       Ieee PD            0
Fa3/6      auto   on         17.3       15.4       Ieee PD            0
Fa3/7      auto   on         4.5        4.0        Ieee PD            1
Fa3/8      auto   on         7.9        7.0        Ieee PD            2
Fa3/9      auto   on         17.3       15.4       Ieee PD            3
Fa3/10     auto   on         17.3       15.4       Ieee PD            4
Fa3/11     auto   off        0          0          n/a                n/a
Fa3/12     auto   off        0          0          n/a                n/a
Fa3/13     auto   off        0          0          n/a                n/a
Fa3/14     auto   off        0          0          n/a                n/a
Fa3/15     auto   off        0          0          n/a                n/a
Fa3/16     auto   off        0          0          n/a                n/a
Fa3/17     auto   off        0          0          n/a                n/a
Fa3/18     auto   off        0          0          n/a                n/a


--------- ------ ---------- ---------- ---------- ------------------ -----


Totals:          10   on    117.5      104.6
Switch#
```

This example shows how to display the operational status for Fast Ethernet interface 4/1:

```
Switch# show power inline fa4/1
Available:677(w)  Used:11(w)  Remaining:666(w)

Interface Admin  Oper           Power(Watts)    Device             Class
                               From PS   To Device
--------- ------ ---------- ---------- ---------- ------------------ -----


Fa4/1      auto   on         11.2       10.0       Ieee PD            0

Interface  AdminPowerMax   AdminConsumption
           (Watts)         (Watts)
---------- --------------- --------------------


Fa4/1               15.4              10.0
Switch#
```

Displaying the PoE Consumed by a Module

A Catalyst 4500 series switch can measure the actual PoE consumption for an 802.3af-compliant PoE module. You can observe this consumption by using **show power module** and **show power detail** commands. For all PoE calculations, presume that the PoE consumption on the WS-X4148-RJ45V module equals its administrative PoE.

The 802.3af-compliant PoE modules can consume up to 20 W of PoE to power FPGAs and other hardware components on the module. To ensure that the system has sufficient power for the PDs connected to the switch, add at least 20 W to your PoE requirements for each 802.3af-compliant PoE module.

The following example uses the **show power module** command to display the PoE consumption for an 802.3af-compliant module:

```
Switch# show power module

Watts Used of System Power (12V)
Mod   Model              currently  out of reset  in reset
----  -----------------  ---------  ------------  --------
  1   WS-X4013+TS            330        330           330
  2   WS-X4548-GB-RJ45V       60         60            20
  3   WS-X4548-GB-RJ45V       60         60            20
 --   Fan Tray               30         --            --
----------------------  ---------  ------------  -------
       Total                480        450           370

                        Watts used of Chassis Inline Power (-50V)
                        Inline Power Admin   Inline Power Oper
Mod   Model              PS      Device       PS      Device      Efficiency
----  -----------------  ----------------  ----------------  ----------
  2   WS-X4548-GB-RJ45V  138       123        73        65          89
  3   WS-X4548-GB-RJ45V    0         0        22        20          89
----------------------  ----------------  ----------------  ----------
       Total            138       123        95        85

                        Watts used of Module Inline Power (12V -> -50V)
                        Inline Power Admin   Inline Power Oper
Mod   Model              PS      Device       PS      Device      Efficiency
----  -----------------  ----------------  ----------------  ----------
  1   WS-X4013+TS        128       128        63        63         100
----------------------  ----------------  ----------------  ----------

Switch#
```

The Inline Power Oper column displays the amount of PoE consumed by the powered devices that are attached to the module, in addition to the PoE consumed by the FPGAs and other hardware components on the module.

The Inline Power Admin column displays only the amount of PoE allocated by the powered devices attached to the module.

Note   The operating PoE consumption for an 802.3af-compliant module can be non-zero, even when no powered devices are attached to the module, because of the PoE consumed by FPGAs and other hardware components on the module. In addition, the operating PoE can vary because of fluctuations in the PoE consumed by the hardware components.

The following example uses the **show power detail** and **show power inline** commands to display the PoE consumption for an 802.3af-compliant module:

```
Switch# show power detail

Power                                        Fan      Inline
Supply  Model No          Type      Status   Sensor   Status
------  ----------------  --------  -------  -------  -------
PS1     PWR-C45-1300ACV   AC 1300W  good     good     good
PS2     none              --        --       --       --

Power supplies needed by system    : 1
Power supplies currently available : 1
```

```
Power Summary                      Maximum
  (in Watts)            Used     Available
---------------------   ----     ---------
System Power (12V)      480        1000
Inline Power (-50V)     138         800
Backplane Power (3.3V)    0           0
---------------------   ----     ---------
Total                   618 (not to exceed Total Maximum Available = 1300)

Module Inline Power Summary (Watts)
(12V -> -48V on board conversion)
---------------------------------
               Maximum
Mod     Used    Available
---     ----    ---------
1       128       158
---     ----    ---------


                        Watts Used of System Power (12V)
Mod   Model             currently  out of reset  in reset
----  ----------------  ---------  ------------  --------
 1    WS-X4013+TS          330        330          330
 2    WS-X4548-GB-RJ45V     60         60           20
 3    WS-X4548-GB-RJ45V     60         60           20
 --   Fan Tray             30         --           --
---------------------    ---------  ------------  -------
       Total              480        450          370


                   Watts used of Chassis Inline Power (-50V)
                   Inline Power Admin   Inline Power Oper
Mod   Model             PS    Device       PS    Device    Efficiency
----  ----------------  ----------------  ----------------  ----------
 2    WS-X4548-GB-RJ45V    138    123         73     65        89
 3    WS-X4548-GB-RJ45V      0      0         22     20        89
---------------------    ----------------  ----------------  ----------
       Total              138    123         95     85


                   Watts used of Module Inline Power (12V -> -50V)
                   Inline Power Admin   Inline Power Oper
Mod   Model             PS    Device       PS    Device    Efficiency
----  ----------------  ----------------  ----------------  ----------
 1    WS-X4013+TS          128    128         64     64       100
---------------------    ----------------  ----------------  ----------
```

Switch# **show power inline g1/1**
Module 1 Inline Power Supply: Available:158(w) Used:128(w) Remaining:30(w)

```
Interface Admin  Oper            Power(Watts)    Device              Class
                                 From PS   To Device
--------- ------ ----------  ---------- ---------- ------------------- -----

Gi1/1     auto   on          10.3       10.3       CNU Platform         3


Interface  AdminPowerMax   AdminConsumption
            (Watts)          (Watts)
---------- --------------  --------------------

Gi1/1              15.4                 15.4
```

```
switch# show power inline g2/1
Chassis Inline Power Supply: Available:800(w)  Used:138(w)  Remaining:662(w)

Interface Admin  Oper          Power(Watts)    Device              Class
                              From PS   To Device
--------- ------ ---------- ---------- ---------- ------------------ -----

Gi2/1     auto   on         11.5       10.2       CNU Platform       n/a

Interface  AdminPowerMax   AdminConsumption
           (Watts)         (Watts)
---------- --------------- --------------------

Gi2/1             15.4                15.4

Switch# show power inline module 1
Module 1 Inline Power Supply: Available:158(w)  Used:128(w)  Remaining:30(w)

Interface Admin  Oper          Power(Watts)    Device              Class
                              From PS   To Device
--------- ------ ---------- ---------- ---------- ------------------ -----

Gi1/1     auto   on         10.3       10.3       CNU Platform       3
Gi1/2     auto   on         10.3       10.3       CNU Platform       3
Gi1/3     auto   on         10.3       10.3       CNU Platform       3
Gi1/4     auto   on         10.3       10.3       CNU Platform       3
Gi1/5     auto   on         10.3       10.3       CNU Platform       3
Gi1/6     auto   on         10.3       10.3       CNU Platform       3
Gi1/7     auto   on         10.3       10.3       CNU Platform       3
Gi1/8     auto   on         10.3       10.3       CNU Platform       3
Gi1/9     auto   on         10.3       10.3       CNU Platform       3
Gi1/10    auto   on         15.4       15.4       Cisco/Ieee PD      3
Gi1/11    auto   on         10.3       10.3       CNU Platform       3
Gi1/12    auto   on         10.3       10.3       CNU Platform       3
--------- ------ ---------- ---------- ---------- ------------------ -----

Totals:          12   on    128.2      128.2
switch#

switch# show power inline module 2
Chassis Inline Power Supply: Available:800(w)  Used:138(w)  Remaining:662(w)
Interface Admin  Oper          Power(Watts)    Device              Class
                              From PS   To Device
--------- ------ ---------- ---------- ---------- ------------------ -----

Gi2/1     auto   on         11.5       10.2       CNU Platform       n/a
Gi2/2     auto   on         11.5       10.2       CNU Platform       n/a
Gi2/3     auto   on         11.5       10.2       CNU Platform       n/a
Gi2/4     auto   on         11.5       10.2       CNU Platform       n/a
Gi2/5     auto   off        0.0        0.0        n/a                n/a
Gi2/6     auto   off        0.0        0.0        n/a                n/a
Gi2/7     auto   off        0.0        0.0        n/a                n/a
Gi2/8     auto   off        0.0        0.0        n/a                n/a
Gi2/9     auto   on         11.5       10.2       CNU Platform       3
Gi2/10    auto   on         11.5       10.2       CNU Platform       n/a
Gi2/11    auto   on         11.5       10.2       CNU Platform       n/a
Gi2/12    auto   on         11.5       10.2       CNU Platform       n/a
Gi2/13    auto   on         11.5       10.2       CNU Platform       3
Gi2/14    auto   on         11.5       10.2       CNU Platform       3
Gi2/15    auto   on         11.5       10.2       CNU Platform       3
```

```
Gi2/16    auto   on          11.5        10.2        CNU Platform          3
Gi2/17    auto   off         0.0         0.0         n/a                   n/a
Gi2/18    auto   off         0.0         0.0         n/a                   n/a
Interface Admin  Oper            Power(Watts)     Device                Class
                            From PS     To Device

--------- ------ ---------- ---------- ---------- ------------------- -----


Gi2/19    auto   off         0.0         0.0         n/a                   n/a
Gi2/20    auto   off         0.0         0.0         n/a                   n/a
Gi2/21    auto   off         0.0         0.0         n/a                   n/a
Gi2/22    auto   off         0.0         0.0         n/a                   n/a
Gi2/23    auto   off         0.0         0.0         n/a                   n/a
Gi2/24    auto   off         0.0         0.0         n/a                   n/a
Gi2/25    auto   off         0.0         0.0         n/a                   n/a
Gi2/26    auto   off         0.0         0.0         n/a                   n/a
Gi2/27    auto   off         0.0         0.0         n/a                   n/a
Gi2/28    auto   off         0.0         0.0         n/a                   n/a
Gi2/29    auto   off         0.0         0.0         n/a                   n/a
Gi2/30    auto   off         0.0         0.0         n/a                   n/a
Gi2/31    auto   off         0.0         0.0         n/a                   n/a
Gi2/32    auto   off         0.0         0.0         n/a                   n/a
Gi2/33    auto   off         0.0         0.0         n/a                   n/a
Gi2/34    auto   off         0.0         0.0         n/a                   n/a
Gi2/35    auto   off         0.0         0.0         n/a                   n/a
Gi2/36    auto   off         0.0         0.0         n/a                   n/a
Gi2/37    auto   off         0.0         0.0         n/a                   n/a
Gi2/38    auto   off         0.0         0.0         n/a                   n/a
Gi2/39    auto   off         0.0         0.0         n/a                   n/a
Gi2/40    auto   off         0.0         0.0         n/a                   n/a
Interface Admin  Oper            Power(Watts)     Device                Class
                            From PS     To Device

--------- ------ ---------- ---------- ---------- ------------------- -----


Gi2/41    auto   off         0.0         0.0         n/a                   n/a
Gi2/42    auto   off         0.0         0.0         n/a                   n/a
Gi2/43    auto   off         0.0         0.0         n/a                   n/a
Gi2/44    auto   off         0.0         0.0         n/a                   n/a
Gi2/45    auto   off         0.0         0.0         n/a                   n/a
Gi2/46    auto   off         0.0         0.0         n/a                   n/a
Gi2/47    auto   off         0.0         0.0         n/a                   n/a
Gi2/48    auto   off         0.0         0.0         n/a                   n/a
--------- ------ ---------- ---------- ---------- ------------------- -----


Totals:           12    on    138.2       123.0
Switch#
```

PoE Policing and Monitoring

Note   This functionality is supported on the WS-X4548-RJ45V+, WS-X4648-RJ45V-E, and WS-X4648-RJ45V+E line cards.

PoE policing protects a switch from faulty inline powered devices that may draw more current than they were designed for. When a device is connected to a port, a line card detects the type of device connected and allocates the appropriate amount of power. It sets a PoE policing threshold to a value 5 percent greater than the allocated power. If the device consumes more power than specified by the policing threshold for a more than 1 second, the port shuts down. Depending on the policing action configured, the port may then be error-disabled, or a message might be logged to the console and the port restarted.

PoE monitoring lets you display the true power consumption of inline powered devices attached to the switch, allowing you determine your actual power consumption.

This section includes these topics:

- PoE Policing Modes, page 11-12
- Configuring Power Policing on an Interface, page 11-12
- Displaying Power Policing on an Interface, page 11-13
- Configuring Errdisable Recovery, page 11-14

PoE Policing Modes

PoE policing comprises two modes, which determine the action to take on the interface after a port shuts down because of an inline-power policing violation:

- **Logging** — An error message is logged to the console and the interface restarts; the device powers up.
- **Errdisable** (Default) — In addition to logging an error message to the console, the interface is placed in an errdisable state so that the device attached to the port does not receive inline-power until you restart the port or configure an errdisable autorecovery mechanism.

Note   After an inline-power policing violation occurs and the port shuts down, PoE policing automatically turns on again when the port restarts. If the connected device exceeds its allocated power again, the port once again shuts down.

Configuring Power Policing on an Interface

The default policing levels are determined by the discovery and power allocation methods (listed in order of priority):

- Configured consumption values, in case any exist
- CDP allocated values (for Cisco devices using CDP)
- Allocated power from IEEE discovery (for devices using this mechanism)

To activate default PoE policing, enter the following:

```
Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int g2/1
Switch(config-if)# power inline police
Switch(config-if)# end
Switch# show power inline police g2/1
Available:800(w)  Used:32(w)  Remaining:768(w)


Interface Admin  Oper      Admin      Oper       Cutoff Oper
          State  State     Police     Police     Power  Power
--------- ------ --------- ---------- ---------- ------ -----
Gi2/1     auto   on        errdisable ok         17.2   16.7
```

The default action for power policing is to set the port to errdisable; the **power inline police** command is equivalent to the **power inline police action errdisable** command, as the above example illustrates. The following example illustrates how to configure the logging policing action:

```
Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int g2/1
Switch(config-if)# power inline police action log
Switch(config-if)# end
Switch# show power inline police g2/1
Available:800(w)  Used:32(w)  Remaining:768(w)


Interface Admin  Oper        Admin       Oper        Cutoff Oper
          State  State       Police      Police      Power  Power
--------- ------ ----------  ----------  ----------  ------ -----
Gi2/1     auto   on          log         ok          17.2   16.7
```

When a PD consumes more than its allocated power, the port shuts down and a warning message similar to the following appears on the console.

For the WS-X4648-GB-RJ45V and WS-X4648-GB-RJ45V+:

```
*Sep 12 09:15:28.583: %C4K_ETHPORTMAN-3-INLINEPOWEROVERDRAWN: Inline powered device
connected on port Gi3/25 exceeded its policed threshold.
```

For the WS-X4548-RJ45V+:

```
*Sep 26 09:23:21.355: %C4K_SWITCHMANAGER-3-INLINEPOWEROVERDRAWN: Inline powered device
connected on port Gi2/1 exceeded its policed threshold
```

For actions of Log type, the port restarts itself and the device reboots. In contrast, when the action is to set the port in an errdisable state, a log message similar to the following appears:

```
*Sep 26 09:30:20.463: %PM-4-ERR_DISABLE: inline-power error detected on Gi2/1, putting
Gi2/1 in err-disable state

Switch# show power inline police g2/1
Available:800(w)  Used:16(w)  Remaining:784(w)


Interface Admin  Oper        Admin       Oper        Cutoff Oper
          State  State       Police      Police      Power  Power
--------- ------ ----------  ----------  ----------  ------ -----
Gi2/1     auto   errdisable  errdisable  overdrawn   0.0    0.0
```

Displaying Power Policing on an Interface

You can display power policing on an interface, on a module, or for all the PoE-capable line cards in a chassis.

The following example shows output for the **show power inline police** command:

```
Switch# show power inline police
Available:623(w)  Used:6(w)  Remaining:617(w)


Interface Admin  Oper        Admin       Oper        Cutoff Oper
          State  State       Police      Police      Power  Power
--------- ------ ----------  ----------  ----------  ------ -----
Gi2/1     auto   off         none        n/a         n/a    0.0
Gi2/2     auto   on          none        n/a         n/a    16.7
Gi2/3     auto   off         errdisable  n/a         0.0    0.0
Gi2/4     auto   on          errdisable  ok          16.6   11.4
Gi2/5     auto   on          log         ok          16.6   11.2
Gi2/6     auto   on          errdisable  overdrawn   0.0    0.0
```

The following table lists the interface and the status.

Interface Configuration	State
Gi2/1	No PD connected, no policing configured.
Gi2/2	PD connected, no policing configured.
Gi2/3	No PD connected, policing configured (is enabled when PD is connected). Policing action is errdisable.
Gi2/4	PD connected, policing configured. Configured policing action is errdisable. Port is currently operating within policing limits.
Gi2/5	PD connected, policing configured. Configured policing action is log. Port is currently operating within policing limits.
Gi2/6	PD connected, policing configured. Configured policing action is errdisable. Port is currently in errdisable state as it has overdrawn its policed power level.

If you enter the **show power inline** command at the global level (**show power inline police**), the last line of the output under the Oper Power field displays the total of true inline power consumption of all devices connected to the switch.

Configuring Errdisable Recovery

By default, errdisable auto recovery for inline-power is disabled; when an interface is placed in an errdisable state because of an inline-power policing violation, it remains in that state. You must enter **shut** and then **no shut** on the affected interface to revive it.

The errdisable autorecovery mechanism allows you to configure a timer for errdisable recovery so that when an interface enters errdisable state (after the timer expires), the interface returns from the errdisable state.

errdisable detection

By default, errdisable detection for inline-power is enabled, as the following example illustrates:

```
Switch# show errdisable detect
ErrDisable Reason    Detection    Mode
----------------     ---------    ----
inline-power         Enabled      port
```

Note If detection is disabled (through the **errdisable detect cause inline-power** command), the port is not placed in errdisable state when it exceeds its power policing threshold.

errdisable recovery

By default, errdisable recovery for inline-power is disabled. To enable errdisable recovery, enter the **errdisable detect cause line-power** command:

```
Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# errdisable detect cause inline-power
Switch(config)# end
```

```
Switch# show errdisable recovery
ErrDisable Reason        Timer Status
-----------------        --------------
-----------              ----------
inline-power             Enabled
```

Enhanced Power PoE Support on the E-Series Chassis

The WS-X4648-RJ45V-E, WS-X4648-RJ45V+E, and WS-X4548-RJ45V+ switching modules support IEEE 802.3af PoE as well as the Cisco proprietary Inline Power standard. With Cisco IOS Release 12.2(44)SG, the WS-X4648-RJ45V+E line card can also support the IEEE 802.3at standard with up to 30 W available per-port. The WS-X4648-RJ45V-E line card also supports up to 20 W. The WS-X4548-RJ45V+ switching module is supported with Cisco IOS Release 12.2(50)SG and can provide up to 30 W of inline power per-port.

For these switching modules, the valid milliwatt ranges for the **power inline** command have been increased appropriately for the module, as the following table illustrates:

Line card	Standard	Max Power/Port	Cisco IOS Release
WS-X4648-RJ45V-E	IEEE 802.3af IEEE 802.3at	20 W	12.2(44)SG
WS-X4648-RJ45V+E	IEEE 802.3af IEEE 802.3at	30 W	12.2(44)SG
WS-X4548-RJ45V+	IEEE 802.3af IEEE 802.3at	30 W	12.2(50)SG

The default power inline configurations usually are sifficient; no additional configuration is required even for high-power-consumption Cisco powered devices (for example, a Cisco AP1250 Wireless Access Point). When a high-power consumption device is attached to a port on a WS-X4648-RJ45V-E or WS-X4648-RJ45V+E line card, the switch and device negotiate power using CDP packets to automatically determine the extended amount of power needed by the device.

Depending on the deployment requirements and design, you specify a specific configuration with the **power inline** command.

The following example shows how to pre-allocate PoE allocation to 16500 mW for Gi 2/1, regardless of what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# power inline static max 16500
Switch(config-if)# end
Switch#
```