11

Power Over Ethernet (PoE) Operation for the Series 5300xl Switches

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PoE Operation on the Series 5300xl Switches

The Power Over Ethernet (PoE) features described in this chapter operate on ProCurve Switch Series 5300xl devices running software release E.08.20 (or greater), with one or more ProCurve Switch xl PoE (J8161A) modules installed. Each PoE module must be connected to either of the following:

- ProCurve 600 Redundant and External Power (J8168A) Supply (HP 600 RPS/EPS)
- ProCurve 610 External Power (J8169A) Supply (HP 610 EPS)

(The ProCurve 3400cl/6400cl switches do not include PoE operation.)

Introduction

PoE technology allows IP telephones, wireless LAN access points, and other appliances to receive power and transfer data over existing LAN cabling. (For more on this topic, refer to edition 2 or later of the *ProCurve xl Modules Installation Guide* shipped with your optional J8161A Switch xl PoE Module (beginning in April, 2004).

PoE Terminology

Term	Use in this Manual
active PoE port	A PoE-enabled port connected to a PD requesting power.
priority class	Refers to the type of power prioritization where an xl PoE module uses **Low** (the default), **High**, and **Critical** priority assignments to determine which groups of ports will receive power. Note that power priority rules apply on a per-module basis, and only if PoE provisioning on a given module becomes oversubscribed.
EPS	External Power Supply; for example, an HP 600 ProCurve RPS/EPS or a ProCurve 610 EPS. An EPS device provides power to provision PoE ports on a module. See also "RPS", below.
MPS	Maintenance Power Signature; the signal a PD sends to the switch to indicate that the PD is connected and requires power. Refer to figure 11-11-4 on page 11-18.
Over-Subscribe	The state of a J8161A xl PoE module where there are more PDs requesting PoE power than the module has power to accommodate.
PD	Powered Device. This is an IEEE 802.3af-compliant device that receives its power through a direct connection to a 10/100Base-TX PoE RJ-45 port in an xl PoE module. Examples of PDs include Voice-over-IP (VoIP) telephones, wireless access points, and remote video cameras.
port-number priority	Refers to the type of power prioritization where, within a priority class, an xl PoE module assigns the highest priority to the lowest-numbered port in the module, the second-highest priority to the second lowest-numbered port in the module, and so-on. Note that power priority rules apply only if PoE provisioning on the module becomes oversubscribed.
PoE	Power-Over-Ethernet; the method by which PDs receive power from an xl PoE module (in compliance with the IEEE 802.3AF standard).
PSE	Power-Sourcing Equipment. A PSE, such as a J8161A xl PoE module installed in a Series 5300xl switch, provides power to IEEE 802.3AF-compliant PDs directly connected to the ports on the module. The xl PoE module is an *endpoint* PSE.
RPS	Redundant Power Supply; for example, the non-EPS operation of an HP 600 RPS/EPS. An RPS device provides power to a switch if the switch's internal power supply fails. RPS power does not provision PoE ports in modules installed in the 5300xl switches. See also "EPS", above.
RPS/EPS	A device that delivers redundant power to run a switch and external power to support PoE operation on a switch.
xl PoE Module	Refers to a ProCurve Switch xl PoE Module (J8161A).

Overview of Operation

A J8161A xl PoE module is a PSE device that receives PoE power from an external EPS device and distributes this power to the PDs connected to the xl PoE module's RJ-45 ports. The xl PoE module receives either 204 watts or 408 watts from the EPS, depending on whether the EPS is supporting one or two PSE devices.

Note

You can connect either a PoE device (PD) or a non-PoE device to a port configured for PoE operation on a J8161A xl PoE module.

Regarding Cat-5 cabling for PoE, the 802.3af standard allows either the spare pin/wire pairs or the data pin/wire pairs for PoE power transmission. A PoE module installed in a series 5300xl device supplies PoE power over the data pin/wire pairs. For more on this topic, refer to the *PoE Planning and Implementation Guide* (p/n 5990-6045, Nov. 2003 or later) available on the ProCurve Networking web site. (See "Getting Documentation From the Web" on page 1-6.)

Using the commands described in this chapter, you can:

- Configure a non-default power threshold for SNMP and Event Log reporting of PoE consumption on either all PoE ports on the switch or on all PoE ports in one or more PoE modules.
- Specify the port priority you want each xl PoE module to use for provisioning PoE power in the event that a given module's PoE resources become oversubscribed.
- Enable or disable PoE operation on individual ports. (In the default configuration, and with software release E.08.20 or greater installed, each xl PoE module installed in the switch enables PoE power on all 10/100-TX ports in the module, subject to PoE priority if the PoE resources on a given PoE xl module are oversubscribed.)
- Monitor PoE status and performance per module.

Related Publications

This chapter introduces general PoE operation, PoE configuration and monitoring commands, and Event Log messages related to PoE operation on a ProCurve Switch Series 5300xl device with one or more PoE modules installed and supported by the necessary external power supplies. The following two manuals provide further information:

- For information on installing a ProCurve Switch xl PoE Module (J8161A), refer to the *ProCurve Switch xl Modules Installation Guide* provided with the module.
- To help you plan and implement a PoE system in your network, refer to edition 2 or later of the *PoE Planning and Implementation Guide*, which is available from either of the following sources:
  - The Documentation CD-ROM (version 3.6 or greater) shipped with your Switch Series 5300xl device after April, 2004.
  - The ProCurve Networking web site at **www.procurve.com**. (Click on **technical support**, then **Product manuals (all)**.)

The latest version of any ProCurve product guide is always on the ProCurve Networking web site. See to "Getting Documentation From the Web" on page 1-6.

General PoE Operation

Configuration Options

In the default configuration, all 10/100Base-TX ports on an xl PoE module installed in the switch are configured to support PoE operation. You can:

- Disable or re-enable per-port PoE operation on individual ports to help control power usage and avoid oversubscribing PoE resources.
- Configure per-port priority for allocating power in case a PoE module becomes oversubscribed and must drop power for some lower-priority ports to support the demand on other, higher-priority ports.
- Configure one of the following:
  - A global power threshold that applies to all modules on the switch. This setting acts as a trigger for sending a notice when the PoE power consumption on any xl PoE module installed in the switch crosses the configured global threshold level. (Crossing the threshold level in either direction—PoE power usage either increasing or decreasing—triggers the notice.) The default setting is 80%.
  - A per-slot power threshold that applies to an individual xl PoE module installed in the designated slot. This setting acts as a trigger for sending a notice when the module in the specified slot exceeds or goes below a specific level of PoE power consumption.

Note

The ports on a PoE module support standard networking links and PoE links. Thus, you can connect either a non-PoE device or a PD to a PoE-enabled port without reconfiguring the port.

PD Support

An xl PoE module must have a minimum of 15.4 watts of unused PoE power available when you connect an 802.3af-compliant PD, regardless of how much power the PD actually uses. Depending on the amount of power the EPS device delivers to a specific xl PoE module, there may or may not always be enough power available to connect and support 802.3af PoE operation on all 24 10/100-TX ports. For example, if an EPS device is supporting only one xl PoE module and no other PSEs, then there will be sufficient power available for all ports on the module. However, if the same EPS is supporting both an xl PoE module and another ProCurve PSE device then, depending on the power demand placed on the module by the PDs you connect, it is possible to oversubscribe the available PoE power on the module. In this case, one or more PDs connected to the module will not have power. That is:

- **Sufficient PoE Power Available:** When a new PD connects to an xl PoE module in the switch, and if the module has a minimum of 15.4 watts of unused PoE power available, the module supplies power to the port for that PD.
- **Insufficient PoE Power Available:** When a new PD connects to an xl PoE module, and if the module does not have a minimum of 15.4 watts of unused PoE power already available:
  - If the new PD connects to a port "X" having a *higher* PoE priority than another port "Y" that is already supporting another PD on the same module, then the module removes PoE power from port "Y" and delivers it to port "X". In this case the PD on port "Y" loses power and the PD on port "X" receives power.
  - If the new PD connects to a port "X" having a *lower* priority than all other PoE ports currently providing power to PDs on the same module, then the module does not deliver PoE power to port "X" until one or more PDs using higher priority ports are removed.

Note that once a PD connects to a PoE port and begins operating, the port retains only enough PoE power to support the PD's operation. Unneeded power becomes available for supporting other PD connections. Thus, while 15.4 watts must be available for an xl PoE module on the switch to begin supplying power to a port with a PD connected, 15.4 watts per port is not continually required if the connected PD requires less power. For example,

with 20 watts of PoE power remaining available on a module, you can connect one new PD without losing power to any currently connected PDs on that module. If that PD draws only 3 watts, then 17 watts remain available and you can connect at least one more PD to that module without interrupting power to any other PoE devices connected to the same module. If the next PD you connect draws 5 watts, then only 12 watts remain unused. With only 12 unused watts available, if you then connect yet another PD to a higher-priority PoE port, then the lowest-priority port on the module loses PoE power and remains unpowered until the module once again has 15.4 or more watts available. (For information on power priority, refer to "Power Priority Operation" on page 11-8.)

Disconnecting a PD from a PoE port causes the module to stop providing PoE power to that port and makes the power available to any other PoE ports on the module that have PDs connected and waiting for power. If the PD demand for power on a module becomes greater than the PoE power available on the module, then the module transfers power from its lower-priority ports to its higher-priority ports. (Ports not currently providing power to PDs are not affected.)

Note

15.4 watts of available power is required for an xl PoE module on a switch to begin delivering power to a port, such as when a newly connected PD is detected or when power is released from higher-priority ports. Depending on power demands, lower-priority ports on a module with high PoE power demand may occasionally lose power due to the demands of higher-priority ports on the same module. (Refer to "Power Priority Operation" on page 11-8.)

Table 11-1. xl PoE Module Maximum Power Allocations

Power-Sourcing Equipment (PSE) Load on the EPS	Power to PoE Module from External EPS[1]	PoE Power Available for the xl PoE (J8161A) Module
One xl PoE Module Only	408 Watts	Maximum (15.4 W) available to all ports on the module.
Two PSE Devices (Two xl PoE Modules, or one xl PoE Module and One ProCurve PoE Stackable Switch)	204 Watts	Depending on the power demand from the PDs, lower priority ports may not be provisioned. Refer to "Calculating the Maximum Load for an xl PoE Module" on page 11-21.

[1]If a ProCurve EPS device is supplying PoE power to two PSE devices, then both PSE devices receive 204 watts. If a ProCurve EPS device is delivering PoE power to only one PSE device, then that device receives 408 watts.

Power Priority Operation

When Does an xl PoE Module Prioritize Power Allocations? If an xl PoE module can provide power for all connected PD demand, it does not use its power priority settings to allocate power. However, if the PD power demand oversubscribes the available power, then the module prioritizes the power allocation to the ports that present a PD power demand. This causes the module to remove power from one or more lower-priority ports to meet the power demand on other, higher-priority ports. (This operation occurs, regardless of the order in which PDs connect to the module's PoE-enabled ports.) Note that each PoE xl module is a stand-alone priority domain. The switch does not prioritize one PoE module over another.

How Does an xl PoE Module Prioritize Power Allocations? xl PoE modules apply the following priority scheme:

- Using a *priority class* method, the module assigns a power priority of **Low** (the default), **High**, or **Critical** to each enabled PoE port.
- Using a *port-number priority* method, the module gives a lower-numbered port priority over a higher-numbered port within the same configured priority class.

Suppose, for example, that you configure the PoE priority for a module in slot C as shown in table 11-2.

Table 11-2. Example of PoE Priority Operation on an xl PoE Module

Port	Priority Setting	Configuration Command[1] and Resulting Operation with PDs connected to Ports C3 Through C24
C3 - C17	**Critical**	In this example, the following CLI command sets ports C3-C17 to **Critical**: `ProCurve(config)# interface c3-c17 power critical` The **Critical** priority class always receives power. If there is not enough power to provision PDs on all of the ports configured for this class, then no power goes to ports configured for **High** and **Low** priority. If there is enough power to provision PDs on only some of the critical-priority ports, then power is allocated to these ports in ascending order, beginning with the lowest-numbered port in the class, which, in this case, is port 3.
C18 - C21	**High**	In this example, the following CLI command sets ports C19-C22 to **High**: `ProCurve(config)# interface c19-c22 power high` The **High** priority class receives power only if all PDs on ports with a **Critical** priority setting are receiving power. If there is not enough power to provision PDs on all ports with a high priority, then no power goes to ports with a low priority. If there is enough power to provision PDs on only some of the high-priority ports, then power is allocated to these ports in ascending order, beginning, in this example, with port 18, until all available power is in use.
C22 - C24	**Low**	In this example, the CLI command sets ports C23-C24 to **Low**[2]: `ProCurve(config)# interface c23-c24 power low` This priority class receives power only if all PDs on ports with **High** and **Critical** priority settings are receiving power. If there is enough power to provision PDs on only some low-priority ports, then power is allocated to the ports in ascending order, beginning with the lowest-numbered port in the class (port 22, in this case), until all available power is in use.
C1 - C2	*- n/a -*	In this example, the CLI command disables PoE power on ports C1-C2: `ProCurve(config)# no interface c1-c2 power` There is no priority setting for the ports in this example.

[1] For a listing of PoE configuration commands, with descriptions, refer to "Configuring PoE Operation" on page 11-10.
[2] In the default PoE configuration, the ports are already set to the **low** priority. In this case, the command is not necessary.

Configuring PoE Operation

In the default configuration, PoE support is enabled on the 10/100Base-TX ports in an xl PoE (J8161A) module installed on the switch. The default priority for all ports is **Low** and the default power notification threshold is **80** (%). Using the CLI, you can:

- Change the PoE priority level on individual PoE ports
- Disable or re-enable PoE operation on individual PoE ports
- Change the threshold for generating a power level notice

Changing the PoE Port Priority Level

Syntax: interface < *port-list* > power [critical | high | low]

Reconfigures the PoE priority level on < *port-list* >*. For a given level, the module automatically prioritizes ports by port number (in ascending order). If there is not enough power available to provision all active PoE ports at a given priority level, then the lowest-numbered port at that level will be provisioned on a specific module first, and so on. An xl PoE module invokes configured PoE priorities only when it cannot provision all active PoE ports on that module.*

- **Critical:** *Specifies the highest-priority PoE support for* < *port-list* >*. The module provisions active PoE ports at this level before provisioning PoE ports at any other level.*
- **High**: *Specifies the second priority PoE support for* < *port-list* >*. The module provisions active PoE ports at this level before provisioning Low priority PoE ports.*
- **Low** *(the default): Specifies the third priority PoE support for* < *port-list* >*. The module provisions active PoE ports at this level only if there is power available after provisioning any active PoE ports at the higher priority levels.*

You can use one command to set the same priority level on PoE ports in multiple modules. For example, to configure the priority to **High** *for ports c5-c10, C23-C24, D1-D10, and D12, you could use this command:*

```
ProCurve(config)# interface c5-c10,c23-c24,d1-
d10,d12
```

Disabling or Re-Enabling PoE Port Operation

Syntax: [no] interface [e] < *port-list* > power

Re-enables PoE operation on < *port-list* > *and restores the priority setting in effect when PoE was disabled on* < *port-list* >. *The* **[no]** *form of the command disables PoE operation on* < *port-list* >. *(Default: All xl PoE ports on the module are enabled for PoE operation at* **Low** *priority.)*

Changing the Threshold for Generating a Power Notice

Syntax: power [slot < *slot-identifier* >] threshold < 1 - 99 >

This command specifies the PoE usage level (as a percentage of the PoE power available on a module) at which the switch generates a power usage notice. This notice appears as an SNMP trap and a corresponding Event Log message, and occurs when an xl PoE module's power consumption crosses the configured threshold value. That is, the switch generates a notice whenever the power consumption on a module either exceeds or drops below the specified percentage of the total PoE power available on the module.

This command configures the notification threshold for PoE power usage on either a global or per-module (slot) basis.

Without the **[slot < *slot-identifier* >]** *option, the switch applies one power threshold setting on all PoE modules installed in the switch. For example, suppose slots A, B, and C each have an xl PoE module installed. In this case, executing the following command sets the global notification threshold to 70% of available PoE power.*

```
ProCurve(config)# power threshold 70
```

With this setting, if an increasing PoE power demand crosses this threshold on the module in slot B, the switch sends an SNMP trap and generates this Event Log message:

```
Slot B POE usage has exceeded threshold of 70 %.
```

If the switch is configured for debug logging, it also sends the Event Log message to the configured debug destination(s).

On any PoE module, if an increasing PoE power load (1) exceeds the configured power threshold (which triggers the log message and SNMP trap), and then (2) later decreases and drops below the threshold again, the switch generates another SNMP trap, plus a message to the Event Log and any configured Debug destinations.

— Continued —

Syntax: power [slot < *slot-identifier* >] threshold < 1 - 99 > ***(Continued)***

To continue the preceding example, if the PoE power usage on the xl PoE module in slot B drops below 70%, another SNMP trap is generated and you will see this message in the Event Log:

```
Slot B POE usage is below threshold of 70 %.
```

For a message listing, refer to "PoE Event Log Messages" on page 11-23. (Default Global PoE Power Threshold: **80***)By using the* **[slot < *slot-identifier* >]** *option, you can specify different notification thresholds for different xl PoE modules installed in the switch. For example, you could set the power threshold for a PoE module in slot "A" to 75% and the threshold for the module in slot "B" to 68% by executing the following two commands:*

```
ProCurve(config)# power slot a threshold 75
ProCurve(config)# power slot b threshold 68
```

Note that the last **threshold** *command affecting a given slot supersedes the previous threshold command affecting the same slot. Thus, executing the following two commands in the order shown sets the threshold for the PoE module in slot "D" to 75%, but leaves the thresholds for any PoE modules in the other slots at 90%.*

```
ProCurve(config)# power threshold 90
ProCurve(config)# power slot d threshold 75
```

(If you reverse the order of the above two commands, all PoE modules in the switch will have a threshold of 90%.)

Configuring Optional PoE Port Identifiers

The **Configured Type** field enables you to configure a unique identifier for PoE ports that helps to identify the intended use for a given PoE port. Such identifiers are useful when viewing PoE status with the following commands:

show power-management brief (page 11-16)

show power-management < *port-list* > (page 11-17)

To configure a unique identifier for one or more PoE ports, use the switch's **setmib** command to change the identifier setting in the switch's MIB (Management Information Base), as described in the following steps.

1. Use the **walkmib pethPsePortType.< slot-# >** command to determine the MIB-based port number for the port to which you want to assign a **Configured Type** identifier. On the 5300xl switches the slot numbering is as follows:

Slot	Slot Number Used in the MIB
A	1
B	2
C	3
D	4
E*	5
F*	6
G*	7
H*	8

*5308xl only.

   Note that in the MIB, 26 port numbers are assigned to each slot designation. Thus, for example, with PoE modules in slots "A" and "B", the actual, corresponding port numbers will be 1-24 and 27-50, respectively. (The port numbers "25", "26", "51", and "52" are reserved.)

2. Use the **setmib pethPsePortType.*< slot-# >.< port-# >* -D *< identifier-string >*** command to configure the identifier you want for a specific port.

For example, suppose that you have a PoE xl Module installed in slot B and want to assign the identifier "Wireless-1" to port 1 in this slot. To do so, you would use the following commands:

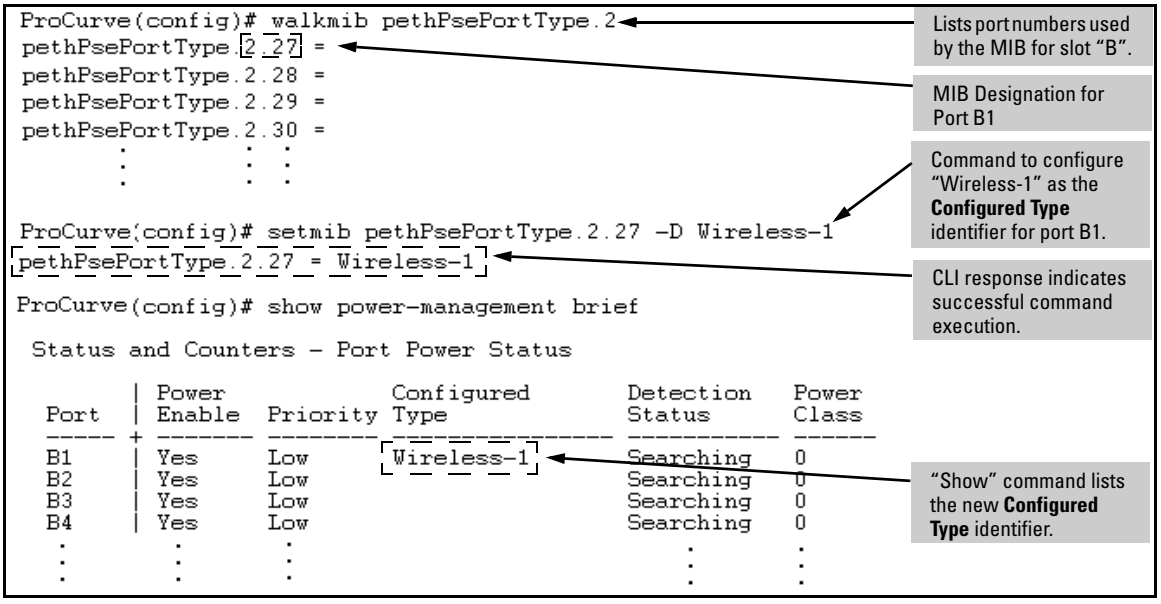

Figure 11-1.Example of using the MIB To Configure a "Configured Type" Identifier for a Port

To remove a Configured Type identifier, use the setmib command with a blank space enclosed in quotes. For example, to return port B2 in the above figure to a null setting, use this command:

```
ProCurve(config)# setmib pethPsePortType.2.27 -D " "
```

For more on displaying PoE configuration and status, refer to "Viewing PoE Configuration and Status" on page 11-15.

Viewing PoE Configuration and Status

Displaying the Switch's Global PoE Power Status

Syntax: show power-management

Displays the switch's global PoE power status, including:

- **Maximum Power:** *Lists the maximum PoE wattage available to provision active PoE ports on the switch.*
- **Power In Use:** *Lists the amount of PoE power presently in use.*
- **Operational Status:** *Indicates whether PoE power is available on the switch. (Default:* **On** *; shows* **Off** *if PoE power is not available. Shows* **Faulty** *if internal or external PoE power is oversubscribed or faulty.)*
- **Usage Threshold (%)***: Lists the configured percentage of available PoE power provisioning the switch must exceed to generate a usage notice in the form of an Event Log message and an SNMP trap. If this event is followed by a drop in power provisioning below the threshold, the switch generates another SNMP trap and Event Log message. Event Log messages are also sent to any optionally configured debug destinations. (Default:* **80%***)*

For example, in the default PoE configuration, when the switch is running with several ports on the xl PoE modules in slots C and D supporting PD loads, **show power-management** displays data similar to the following:

```
ProCurve(config)# show power-management

 Status and Counters - System Power Status for slot C

  Maximum Power  : 204 W           Operational Status  : On
  Power In Use   :  46 W +/- 6 W   Usage Threshold (%) : 80


 Status and Counters - System Power Status for slot D

  Maximum Power  : 204 W           Operational Status  : On
  Power In Use   :  34 W +/- 6 W   Usage Threshold (%) : 80
```

Figure 11-2. Example of Show Power-Management Output

Displaying an Overview of PoE Status on All Ports

Syntax: show power-management brief

Displays the following port power status:

- **Port:** *Lists all PoE-capable ports on the switch.*
- **Power Enable:** *Shows* **Yes** *for ports enabled to support PoE (the default) and* **No** *for ports on which PoE is disabled.*
- **Priority:** *Lists the power priority (***Low**, **High**, and **Critical***) configured on ports enabled for PoE. (For more on this topic, refer to the power command description under "Configuring PoE Operation" on page 11-10.)*
- **Configured Type:** *If configured, shows the user-specified identifier for the port. If not configured, the field is empty. Refer to "Configuring Optional PoE Port Identifiers" on page 11-12.*
- **Detection Status:**
  - **Searching:** *The port is trying to detect a PD connection.*
  - **Delivering:** *The port is delivering power to a PD.*
  - **Disabled:** *On the indicated port, either PoE support is disabled or PoE power is enabled but the xl PoE module does not have enough power available to supply the port's power needs.*
  - **Fault:** *The switch detects a problem with the connected PD.*
- **Power Class:** *Shows the 802.3af power class of the PD detected on the indicated port. Classes include:*

  0: *0.44w to 12.95w*
  1: *0.44w to 3.84w*
  2: *3.84w to 6.49w*
  3: *6.49w to 12.95w*
  4: *reserved*

For example, **show power-management brief** displays this output:

```
ProCurve(config)# show power-management brief

 Status and Counters - Port Power Status

        | Power            Configured       Detection   Power
 Port   | Enable  Priority Type             Status      Class
 ------ + ------- -------- ---------------- ----------- -------
 C1     | Yes     Critical Telephone        Delivering  1
 C2     | Yes     Critical Telephone        Delivering  1
 C3     | Yes     High     Wireless         Delivering  3
 C4     | Yes     High     Wireless         Delivering  3
 C5     | Yes     Low                       Searching   0
 C6     | Yes     Low                       Searching   0
 C7     | Yes     Low                       Searching   0
 C8     | Yes     Low                       Searching   0
  .       .        .            .              .        .
  .       .        .            .              .        .
  .       .        .            .              .        .
```

Ports C1 through C4 are delivering power. The remaining ports are available to supply power, but currently do not detect a connected PD.

Figure 11-3. Example of Show Power-Management Brief Output

Displaying the PoE Status on Specific Ports

Syntax: show power-management < *port-list* >

Displays the following PoE status and statistics (since the last reboot) for each port in < *port-list* >:

- **Power Enable:** *Shows* **Yes** *for ports enabled to support PoE (the default) and* **No** *for ports on which PoE is disabled. Note that for ports on which power is disabled, this is the only field displayed by* **show power-management** ***< port-list >***.
- **Priority:** *Lists the power priority (***Low**, **High**, and **Critical***) configured on ports enabled for PoE. (For more on this topic, refer to the power command description under "Configuring PoE Operation" on page 11-10.)*
- **Detection Status:**
  - **Searching:** *The port is available to support a PD.*
  - **Delivering:** *The port is delivering power to a PD.*
  - **Disabled:** *PoE power is enabled on the port but the xl PoE module does not have enough power available to supply the port's power needs.*
- **Fault:** *The switch detects a problem with the connected PD.*
- **Over Current Cnt:** *Shows the number of times a connected PD has attempted to draw more than 15.4 watts. Each occurrence generates an Event Log message.*

— Continued —

Syntax: show power-management < *port-list* > ***(Continued)***

- **Power Denied Cnt:** *Shows the number of times PDs requesting power on the port have been denied due to insufficient power available. Each occurrence generates an Event Log message.*
- **Voltage:** The total voltage, in dV, being delivered to PDs.
- **Power:** The total power, in mW, being delivered to PDs.
- **Configured Type:** *If configured, shows the user-specified identifier for the port. If not configured, the field is empty. Refer to "Configuring Optional PoE Port Identifiers" on page 11-12.*
- **Power Class:** *Shows the power class of the PD detected on the indicated port. Classes include:*

  0: *0.44w to 12.95w* **2**: *3.84w to 6.49w* **4:** *reserved*
  1: *0.44w to 3.84w* **3**: *6.49w to 12.95w*

- **MPS Absent Cnt:** *This value shows the number of times a detected PD has no longer requested power from the port. Each occurrence generates an Event Log message. ("MPS" refers to the "Maintenance Power Signature". Refer to "PoE Terminology" on page 11-3.)*
- **Short Cnt:** *Shows the number of times the switch provided insufficient current to a connected PD.*
- **Current:** *The total current, in mA, being delivered to PDs.*

For example, if you wanted to view the PoE status of ports C1 and D5, you would use **show power-management c1,d5** to display the data:

```
ProCurve(config)# show power-management d4-d5

 Status and Counters - Port Power Status for port D4

  Power Enable      : Yes

  Priority          : Low               Configured Type   :
  Detection  Status : Delivering        Power Class       : 0

  Over Current Cnt  : 0                 MPS Absent Cnt    : 0
  Power Denied Cnt  : 0                 Short Cnt         : 0

  Voltage           : 492 dV            Current           : 52 mA
  Power             : 14210 mW

 Status and Counters - Port Power Status for port D5

  Power Enable      : No
```

Example of command output for a port on which power is enabled.

Example of command output for a port on which power is disabled.

Figure 11-4. Example of Show Power-Management < *port-list* > Output

Planning and Implementing a PoE Configuration

This section provides an overview of some considerations for planning a PoE application. For additional information on this topic, refer to the *ProCurve PoE Planning and Implementation Guide*.

Some of the elements you may want to consider for a PoE installation include:

- Port assignments to VLANs
- Use of security features
- Power requirements

This section can help you to plan your PoE installation. If you use multiple VLANs in your network, or if you have concerns about network security, you should read the first two topics. If your PoE installation comes close to (or is likely to exceed) the system's ability to supply power to all devices that may request it, then you should also read the third topic. (If it is unlikely that your installation will even approach a full utilization of the PoE power available, then you may find it unnecessary to spend much time on calculating PoE power scenarios.)

Assigning PoE Ports to VLANs

If your network includes VLANs, you may want to assign various PoE-configured ports to specific VLANs. For example, if you are using PoE telephones in your network, you may want to assign ports used for telephone access to a VLAN reserved for telephone traffic.

Applying Security Features to PoE Configurations

You can utilize security features built into the switch to control device or user access to the network through PoE ports in the same way as non-PoE ports.

- **MAC Address Security:** Using Port Security, you can configure each switch port with a unique list of MAC addresses for devices that are authorized to access the network through that port. For more information, refer to the chapter titled "Configuring and Monitoring Port Security" in the *Access Security Guide* for your switch.
- **Username/Password Security:** If you are connecting a device that allows you to enter a username and password that is forwarded to a networked server for authentication, then you can also configure the following security features:
  - Local username and password
  - TACACS+
  - RADIUS Authentication and Accounting
  - 802.1X Authentication

For more information on security options, refer to the latest edition of the *Access Security Guide* for your switch. (The ProCurve Networking web site offers the latest version of all ProCurve product publications. Refer to “Getting Documentation from the Web” in chapter 1, “Getting Started”.)

Assigning Priority Policies to PoE Traffic

You can use the configurable QoS (Quality of Service) features in the switch to create prioritization policies for traffic moving through PoE ports. Table 11-3 lists the available classifiers and their order of precedence.

Table 11-3. Classifiers for Prioritizing Outbound Packets

Priority	QoS Classifier
1	UDP/TCP Application Type (port)
2	Device Priority (destination or source IP address)
3	IP Type of Service (ToS) field (IP packets only)
4	Protocol Priority (IP, IPX, ARP, DEC LAT, AppleTalk, SNA, and NetBeui)
5	VLAN Priority
6	Incoming source-port on the switch
7	Incoming 802.1p priority (present in tagged VLAN environments)

For more on this topic, refer to the chapter titled "Quality of Service: Managing Bandwidth More Effectively" in the *Advanced Traffic Management Guide* for your switch.

Calculating the Maximum Load for an xl PoE Module

Since the full PoE load on an xl PoE module receiving 408 watts (from an EPS supporting only that module) cannot exceed 369.6 watts (24 ports with a maximum of 15.4 watts per port), there is no concern for overloading the module's PoE capacity. However, for xl PoE modules receiving 204 watts due to EPS power-sharing with another PoE device, it is possible to exceed the maximum supportable load. Also, when planning the PoE load, the following factors apply per-module:

- When first connecting an appliance to a PoE port, the xl PoE module must have a minimum of 15.4 watts of available PoE power. PoE power is "available" if it is either not currently in use or can be acquired by (automatically) removing PoE power from another, lower-priority port on the module. (See to "PD Support" on page 11-6.)
- After an appliance is connected to a PoE port, the switch reduces the power requirement for that port from the initial 15.4 watts to the actual power level the appliance requires.

Thus, after you have connected all but the last planned appliance to a PoE module, there must be a minimum of 15.4 watts of unused PoE power available on the module to support adding the final appliance. That is, where:

n = the total number of appliances you want to connect to one xl PoE module

and

w = the total PoE power required to operate (n - 1) appliances

then, the following must be true:

$$w + 15.4 \leq 204$$

or

$$(204 - 15.4) \geq w$$

For example, suppose you have 24 identical appliances to connect to an xl PoE module receiving 204 watts of PoE power. For this example, each appliance requires 8.3 watts to operate. In this case, the module would support only 23 of these appliances at any given time because there would not be

enough unused power to meet the minimum of 15.4 watts required to support the initial bring-up of the 24th appliance. That is, 204 - (23 x 8.3) = 13.1. Because the module provisions power on the basis of the priority scheme described on page 11-10 (under the **interface < *port-list* > power [critical | high | low]** syntax), you can still fully populate the module with appliances. In this case, the lowest-priority port will not receive power unless an appliance in a higher-priority port is disconnected.

There is also a scenario where a device on a lower-priority port can experience a power cycle (temporarily lose power) while a higher-priority port is bringing up a PoE device. Suppose, for example, that:

1. An xl PoE module in slot B, with all ports configured at the default **Low** priority, is receiving 204 watts of power from an EPS.
2. The 21 PoE devices on ports B2 - B22 draw 9.0 watts of power each (9 x 21 = 189), leaving 15.0 watts unused, which is less than the 15.4 watt minimum needed to add another PoE device to the module. (Refer to "PD Support" on page 11-6.)
3. The system operator plugs a 7.0-watt PoE device into port B1, which is the highest-priority port in slot B.

In the above scenario, there is less than 15.4 watts available to support the initial bringup of the newly installed device on port B1. As a result, port B22 (the lowest-priority port on the module) temporarily loses power so that there is enough power to add the new device on port B1. After the new device begins operation, the power demand on port B1 drops to 7 watts. At this point, there are 20 devices consuming 9 watts each, and 1 device consuming 7 watts, for a total of 187 watts, and the module now has 17 watts of unused power available. Since this exceeds the minimum of 15.4 watts required to bring up any PoE device, there is now enough power available to bring back up the device on port B22.

PoE Operating Notes

- Simply disabling a PoE port does *not* affect power delivery through that port. To cycle the power on a PD receiving power from a PoE port on the switch, disable, then re-enable the power to that port. For example, to cycle the power on a PoE device connected to port 1 on an xl PoE module installed in slot D:

```
ProCurve(config)# no interface d1 power
ProCurve(config)# interface d1 power
```

PoE Event Log Messages

PoE operation generates these Event Log messages. You can also configure the switch to send these messages to a configured debug destination (terminal device or SyslogD server).

"Informational" PoE Event-Log Messages

I <*MM*/*DD*/*YY*> <*HH*:*MM*:*SS*> <chassis|ports>:

*Message header, with severity, date, system time, and system module type (*chassis *or* ports*). For more information on Event Log operation, including severity indicators, refer to "Using the Event Log To Identify Problem Sources" on page C-27.*

Slot <*slot-id*> Ext Power Supply connected, supplying <*actual-power*> W of <*avail-power*> W max.

The switch detected an EPS (External Power Supply) on the indicated slot and began receiving the wattage indicated by <*actual-power*>. The <*avail-power*> *field indicates the maximum power (wattage) the detected EPS is capable of delivering.*

Slot <*slot-id*> Ext Power Supply disconnected

The indicated slot has lost contact with an external power supply.

`Slot <` *slot-id* `> POE usage is below configured threshold of <` 1 - 99 `> %`

Indicates that POE usage on the module in the indicated slot has decreased below the threshold specified by the last execution of the **power threshold** *command affecting that module. This message occurs if, after the last reboot, the PoE demand on the module exceeded the power threshold and then later dropped below the threshold value.*

`port <` *port-id* `> applying power to PD.`

A PoE device is connected to the indicated port and receiving power.

`port <` *port-id* `> PD detected.`

The switch has detected a PoE device connected to the indicated port.

"Warning" PoE Event-Log Messages

`W <MM/DD/YY> <HH:MM:SS> chassis:`

Message header, with severity, date, system time, and system module type. For more information on Event Log operation, including severity indicators, refer to "Using the Event Log To Identify Problem Sources" on page C-27".

`Slot <slot-id> Ext Power Supply connected but not responding.`

The switch detects an external power supply on the module in the indicated slot, but is not receiving power from the device.

`Slot <slot-id> Ext Power Supply failure: <fault-type> Failures:`

Indicates an external power supply failure for the module in the indicated slot, where <fault-type> is one of the following:

- *Over Current fault: The external power supply reported a fault condition. Contact your ProCurve support representative.*
- *Fan fault: A fan in an external power supply has failed.*
- *Temperature fault: The operating temperature in an external power supply has exceeded the normal operating range.*
- *50V fault: The external power supply reported a fault condition. Contact your ProCurve support representative.*
- *12V fault: The external power supply reported a fault condition. Contact your ProCurve support representative.*

`Slot <slot-id> POE usage has exceeded threshold of <1 - 99> %`

Indicates that POE usage in the indicated slot has exceeded the configured threshold for the module, as specified by the last execution of the **power threshold** *or* **power slot** ***<slot-id>*** **threshold** *command. (Note that the switch also generates an SNMP trap for this event.)*

`Port <port-id> PD Denied power due to insufficient power allocation.`

There is insufficient power available to power the PD on the indicated port and the port does not have sufficient PoE priority to take power from another active PoE port.

`Port <port-id> PD Invalid Signature indication.`

The switch has detected a non-802.3af-compliant device on the indicated port. This message appears for all non-802.3af devices connected to the port, such as other switches, PC-NICs, etc.

`Port <port-id> PD MPS Absent indication.`

The switch no longer detects a device on <port-id>. The device may have been disconnected, powered down, or stopped functioning.

`Port <port-id> PD Other Fault indication.`

There is a problem with the PD connected to the port.

`Port <port-id> PD Over Current indication.`

The PD connected to <port-id> has requested more than 15.4 watts of power. This may indicate a short-circuit or other problem in the PD.