

Understanding IP Phone Inline Power Provisioning on the Catalyst 6500/6000 Switch

Document ID: 15256

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Introduction

In order to deploy inline powered phones on the Cisco Catalyst 6500/6000 series products, you need to plan ahead. You need to choose the correct power facilities and power supplies before you order equipment and power receptacles in the wiring closet. This document helps you understand the power management system in the Catalyst 6500/6000 Series Switches.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Power Management on the Catalyst 6500/6000 Switch

The Catalyst 6500/6000 Switch has an intelligent power management system that grants or denies power to various system components based on power availability in the system. The Catalyst 6500/6000 Switch has two power supply bays that can be filled with one or two power supplies of different sizes. Currently, the available options are 1300-watt (W) and 2500W.

The Catalyst 6500/6000 Switch can operate in redundant or nonredundant modes. The mode of operation is user-selectable. In redundant mode, the switch only allows cards and attached devices to draw as much power as the smallest power supply in the system can supply. So, if a switch has a 1300W supply and a 2500W supply and operates in redundant mode, the switch does not allow devices to draw more power than the 1300W supply can handle by itself.

Redundancy is enabled by default. In order to enable redundancy, issue the **power redundancy-mode {combined | redundant}** command in global configuration mode. You can change the configuration of the power supplies to redundant or nonredundant at any time. When you add new devices such as IP phones or wireless access points, you may get an error message that states `Inline power denied`. This error can occur because insufficient power is available. In order to resolve this issue, change the redundancy mode to **combined**.

In nonredundant mode, the available power from both supplies is added up. The sum is available to the system to power components. In this scenario, a single power supply failure forces the switch to selectively power down certain components. This action ensures that the switch does not exceed the capacity of the remaining power supply. For more information on power management, refer to Power Management and Environmental Monitoring.

Available Power Supply Capacities

In order to see the available Catalyst 6500 models and the corresponding supported power supplies, refer to Cisco Catalyst 6500 Series Switches Models Comparison.

You can also see the detailed power supply specifications for the Catalyst 6500 Switches. Refer to the Power Supply Specifications (Catalyst 6500 Series Switch Installation Guide).

IP Phone Power Consumption

Cisco IP phones that are capable of accepting inline power (the 79xx series) can tell the switch to which they are attached how much power they need. The Catalyst 6500/6000 Switch can allocate the correct amount of power to the phone, but does not overallocate or underallocate. Initially, the switch does not know how much power a phone will need. Therefore, the switch assumes that the phone needs the user-configured default allocation. After the phone boots, it sends a Cisco Discovery Protocol (CDP) message to the switch. The CDP message has a type, length, value (TLV) object that contains information about how much power the phone needs. At that point, the switch adjusts its original allocation and returns any remaining power to the system for use on other ports.

This table shows power requirements for each IP phone:

Phone Model	Amps Requested	Watts at 42V
Cisco 7960	0.15A	6.30W
Cisco 7940	0.15A	6.30W
Cisco 7910	0.15A	6.30W

In order to see the detailed specifications of all the available Cisco 7900 Series IP Phones, refer to the Cisco 7900 Series Unified IP Phones Data Sheets.

Note: Before the P003P301 load, the Cisco 7960 phones only requested 5.04W of power, although the phones can draw up to 6.30W of power. Issues arose with customers who had just enough power available before the upgrade to P003P301. Some phones did not come up after the upgrade because there was not enough power available.

Inline Power Line Card (WS–X6348) Power Consumption

The WS–X6348–RJ45 requires 100.38W (2.39A) of power, regardless of the device that is plugged into it. The switch must allocate this amount for each inline power card in the chassis. The inline power daughter card does not impose any additional power requirements on the switch. The 2.39A requirement does not include any of the power that is required to power the attached phones. This power must be accounted for separately, with use of the information in the IP Phone Power Consumption section of this document.

Refer to Power Over Ethernet on the Cisco Catalyst 6500 Series Switch for information on:

- Catalyst 6500 series Power over Ethernet (PoE) line card options
- Power requirements for the Catalyst 6500 series PoE modules
- The maximum possible densities of IP phones for different Catalyst 6500 chassis

Put It All Together

Now that you understand the individual requirements for each component and the amount of available power in the system, you can use simple math to determine the size power supply that you need to achieve the desired configuration.

Note: You must also take into account the power that the Supervisor Engine consumes.

Note: If slot 2 is empty, the Network Management Processor (NMP) still allocates enough power. The purpose is to supply enough power in the case that a standby Supervisor Engine with power requirements that are equal to the primary Supervisor Engine is inserted in this slot.

Refer to the Cisco Power Calculator [↗](#) (registered customers only) in order to calculate the power supply requirements for a specific PoE configuration.

Sample Configurations

This section contains sample configurations and the power requirements for various scenarios. Since most wiring closets do not need Multilayer Switch Feature Cards (MSFCs), but likely have Policy Feature Cards (PFCs) for QoS purposes, the configurations in this section have two redundant Supervisor Engine 1As with PFCs in the chassis.

Redundant Supervisor Engines and 240 Inline Powered 10/100 Ethernet Ports

The total power consumption is 52.95A.

Slot	Card	Card Power	Phone Power
1	Supervisor Engine 1A and	2.5A	0

	PFC		
2	Supervisor Engine 1A and PFC	2.5A	0
3	WS-X6348 and inline power	2.39A	7.2A
4	WS-X6348 and inline power	2.39A	7.2A
5	WS-X6348 and inline power	2.39A	7.2A
6	WS-X6348 and inline power	2.39A	7.2A
7	WS-X6348 and inline power	2.39A	7.2A
8	Empty		
9	Empty		
2500W for redundant or single PS ¹			
1300W for nonredundant		2500W for redundant	

1300W for nonredundant

¹ PS = power supply.

Redundant Supervisor Engines, 96 Inline Powered 10/100 Ports, and 48 Nonpowered 10/100 Ports

The total power consumption is 26.56A.

Note: You can use a 6006 or 6506 chassis for this configuration.

Slot	Card	Card Power	Phone Power
1	Supervisor Engine 1A and PFC	2.5A	0
2	Supervisor Engine 1A and PFC	2.5A	0
3	WS-X6348 and inline power	2.39A	7.2A
4	WS-X6348 and inline power	2.39A	7.2A
5	WS-X6348	2.39A	0
6	Empty		
7	Empty		
8	Empty		
9	Empty		
1300W		1300W	

Troubleshoot Inline Power Issues

Often, you cannot do much to troubleshoot inline power issues. However, the Catalyst 6500/6000 Switch offers the most troubleshooting tools. The Catalyst 6500/6000 has the most complex power management system of all the platforms that support inline power. The inline-power patch panel does not have any troubleshooting tools available. The inline-power patch panel is simply a piece of hardware with no software

interface. Also, the inline–power patch panel is able to supply power to all its 48 ports. Therefore, it does not need any kind of power management system in order to ensure that the power supply does not get oversubscribed.

Unable to Turn On Third–Party IP Phones

Catalyst switches provide comprehensive support for PoE for both Cisco prestandard and the IEEE 802.3af standard. Third–party phones do not power up when they are plugged into Catalyst 6500 Switches that run in the default inline–power discovery mode of "cisco". Change the inline–power discovery mode to "ieee" with use of the **set port inlinpower mod/port discovery ieee** hidden command.

"Partial–deny" Line Card Module Status

The **show module** command displays one or more line cards status as **partial–deny**:

```
Switch> (enable) show module
Mod Slot Ports Module-Type Model Sub Status
-----
1 1 2 1000BaseX Supervisor WS-X6K-SUP2-2GE yes ok
3 3 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
4 4 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
5 5 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
6 6 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
7 7 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes ok
8 8 48 10/100BaseTX Ethernet WS-X6348-RJ-45 yes partial-deny
```

Issue the **show environment** command in order to verify the power supply status. If the status of PS1 or PS2 is F, reseal the power supply and verify the AC input power supply.

```
Switch> (enable) show environment
Environmental Status (. = Pass, F = Fail, U = Unknown, N = Not Present)
PS1: . PS2: . PS1 Fan: . PS2 Fan: .
Chassis-Ser-EEPROM: . Fan: .
Clock(A/B): A Clock A: . Clock B: .
VTT1: . VTT2: . VTT3: .
```

If there is not enough power for all previously powered up modules, the system powers down some modules. These modules are marked as **power–deny** in the show module status field. Issue the **show environment power** command in order to verify the power supply redundancy configuration, allocated power and the available power.

```
Switch> (enable) show environment power

PS1 Capacity: 5771.64 Watts (137.42 Amps @42V)
PS2 Capacity: 5771.64 Watts (137.42 Amps @42V)

PS Configuration : PS1 and PS2 in Redundant Configuration.

Total Power Available : 5771.64 Watts (137.42 Amps @42V)
Total Power Chassis Limit : 14700.00 Watts (350.00 Amps @42V)
Total Power Chassis Recommended : 14700.00 Watts (350.00 Amps @42V)
Total Power Available for Line Card Usage : 5771.64 Watts (137.42 Amps @42V)
Total Power Drawn From the System : 2240.28 Watts (53.34 Amps @42V)
```

Total Power Drawn by the Chassis : 0.00 Watt

Total Power Drawn by the modules : 808.50 Watts (19.25 Amps @42V)

Total Inline Power Drawn From the System : 1187.61 Watts (28.28 Amps @42V)

Total Power Reserved as localpool for modules: 244.02 Watts (5.81 Amps @42V)

Remaining Power in the System : 3531.36 Watts (84.08 Amps @42V)

Configured Default Inline Power allocation per port: 9.00 Watts (0.21 Amps @42V)

Slot power Requirement/Usage :

Slot	Model	PowerRequested Watts	PowerAllocated A @42V	CardStatus
1	WS-X6K-SUP2-2GE	128.52	3.06	ok
2	WS-X6148-45AF	100.38	2.39	ok
3	WS-X6148-45AF	100.38	2.39	ok
4	WS-X6148-45AF	100.38	2.39	ok
5	WS-X6148-45AF	100.38	2.39	ok
6	WS-X6148-45AF	100.38	2.39	ok
8	WS-X6148A-45AF	49.56	1.18	ok
9	WS-X6148-45AF	100.38	2.39	ok

Slot Inline Power Requirement/Usage :

Slot	Sub-Model	Total Allocated To Module (Watts)	Max H/W Supported Per Module (Watts)	Max H/W Supported Per Port (Watts)
2	WS-F6K-FE48-AF	291.005	840.00	15.400
3	WS-F6K-FE48-AF	306.735	840.00	15.400
4	WS-F6K-FE48-AF	267.410	840.00	15.400
5	WS-F6K-FE48-AF	259.545	840.00	15.400
6	WS-F6K-FE48-AF	55.055	840.00	15.400
8	WS-F6K-GE48-AF	0.000	850.08	15.400
9	WS-F6K-FE48-AF	7.865	840.00	15.400

If the redundant power configuration is not enough to supply the power to all the modules, upgrade the power supply. You can also issue the **set power redundancy disable** command in order to disable the power supply redundancy mode. The recommended solution is to upgrade the power supply.

Catalyst 6500/6000 Switch show Commands

The commands in this section can provide you with information about the current status of inline power on the Catalyst 6500/6000 Switch.

First, you can issue the **show port inlinepower** command in order to:

- Check the administrative mode and operational mode in order to determine the inline power on each port.
- Check the amount of power that has been allocated to the port.
- Determine if any ports are in a faulty inline power status.

Here are the command syntax and output:

- **Command:** `show port inlinepower mod | mod/port`
- **Output:**

```
Default Inline Power allocation per port: 10.00 Watts (0.23 Amps @42V)
Port      InlinePowered      PowerAllocated
-----
Admin Oper   Detected mWatt   mA @42V
-----
7/1  auto  off   no     0     0
7/2  auto  on    yes    5040  120
7/3  auto  faulty yes    12600 300
7/4  auto  deny  yes     0     0
7/5  off   off   no     0     0
```

The definitions of each field are provided here:

- **off** No power is applied to the port.
- **on** Power is applied successfully to the port.
- **faulty** An overcurrent or other error condition has been detected, which prevents inline power of the port.
- **deny** There is not enough power available in the system to honor the power request on the port. When power becomes available, the port will be powered.

Also, if you indicate a module or port number, the command output indicates the total power that is allocated to devices on that module. Here is an example:

```
vdt1-Catalyst 6000-PBX1> show port inlinepower 2
Default Inline Power allocation per port: 10.00 Watts (0.23 Amps @42V)

Total inline power drawn by module 2: 40.32 Watts ( 0.96 Amps @42V)

!--- Output suppressed.
```

Note: The value for Total inline power drawn only indicates the power that is allocated to devices that are attached to the module. The value does not include the amount of power that is necessary to run the module itself.

In order to determine the overall system power status, issue this command:

- **Command:** `show environment power`
- **Output:**

```
PS1 Capacity: 1153.32 Watts (27.46 Amps @42V)
PS2 Capacity: none
PS Configuration : PS1 and PS2 in Redundant Configuration.

Total Power Available: 1153.32 Watts (27.46 Amps @42V)

Total Power Available for Line Card Usage: 1153.32 Watts (27.46 Amps @42V)

Total Power Drawn From the System: 493.08 Watts (11.74 Amps @42V)

Remaining Power in the System: 660.24 Watts (15.72 Amps @42V)

Default Inline Power allocation per port: 10.00 Watts (0.23 Amps @42V)
```

Slot power Requirement/Usage :

Slot	Card Type	PowerRequested Watts	PowerAllocated A @42V	CardStatus
1	WS-X6K-SUP1-2GE	71.40	1.70	ok
2	WS-X6348-RJ-45	100.38	2.39	ok
3	WS-X6624-FXS	84.00	2.00	ok
5	WS-X6608-T1	84.00	2.00	ok
6	WS-X6248-RJ-45	112.98	2.69	ok

The output of the command is self-explanatory. If the CardStatus field shows partial-deny or deny, the system has no additional power available. In this case, the Remaining Power in the System line indicates a relatively low value. In order to determine what has been denied in a partial-deny state, check the output of the **show port inlinpower** command for that module. The output shows the ports that are denied power.

Syslog Messages

This section provides a list of potential syslog messages that relate to inline power. You can encounter these messages on the Catalyst 6500/6000 Switch.

- `%SYS-3-PORT_NOPOWERAVAIL:Device on port 5/12 will remain unpowered`

This message indicates that the system has no power available to power the port on which an inline power-capable device has been detected. The output of the **show port inlinpower mod/port** command for this port indicates an operational status of deny. If another port returns power to the system, the port is granted power.

- `%SYS-3-PORT_DEVICENOLINK:Device on port 5/26 powered but no link up`

This message indicates that an inline power-capable device was detected on the port that is indicated, but the switch did not get a link up on the port within 5 seconds of application of power to the port. This problem can happen if there is a phone on the port that malfunctions. Power is not supplied up to a point where the PHY can be enabled and the phone can be powered up.

- `%SYS-6-PORT_INLINEPWRFLTY:Port 5/7 reporting inline power as faulty`

This message indicates that there has been a fault and the port is powered off. First, remove the cable that is plugged in to the port and see if the error goes away. Check the cabling in order to ensure that there are no shorts. If the cables go to punchdown blocks, ensure that the cables are correctly punched down.

Related Information

- **WS-X6348-RJ45: 48 Port IP Phone Ethernet In-Line Power Blade for Catalyst 6500/6000 Series Switches**
- **Understanding the Cisco IP Phone 10/100 Ethernet In-Line Power Detection Algorithm**
- **Power Management and Environmental Monitoring**
- **Voice Technology Support**
- **Voice and Unified Communications Product Support**
- **Recommended Reading: Troubleshooting Cisco IP Telephony**
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Updated: Dec 07, 2007

Document ID: 15256
