Administering the Switch

This chapter describes how to perform administrative tasks on the Catalyst enterprise LAN switches.

Note For complete syntax and usage information for the commands used in this chapter, refer to the *Command Reference—Catalyst 4000 Family, Catalyst 2948G, and Catalyst 2980G Switches*.

This chapter consists of these major sections:

Setting the System Name and System Prompt

The system name on the switch is a user-configurable string that identifies the device. The default configuration has no system name configured.

If you do not manually configure a system name, the switch obtains the system name through a Domain Name System (DNS) lookup. To configure the switch manually, complete the following:

- Assign the sc0 interface an IP address that is mapped to the switch name on the DNS server
- Enable DNS on the switch
- Specify at least one valid DNS server on the switch

If the DNS lookup is successful, the DNS host name of the switch is configured as the system name of the switch and is saved in NVRAM (the domain name is removed).

If you have not configured a system prompt, the first 20 characters of the system name are used as the system prompt (a greater-than symbol [>] is appended). The prompt is updated whenever the system name changes, unless you have manually configured the prompt using the **set prompt** command.

The switch performs a DNS lookup for the system name whenever one of the following occurs:

- When the switch is initialized (power on or reset)
- When you configure the IP address on the sc0 interface using the CLI or Simple Network Management Protocol (SNMP)
- When you configure a route using the **set ip route** command
- When you clear the system name using the **set system name** command
- When you enable DNS or specify DNS servers

If you configured the system name, no DNS lookup is performed.

Configuring a System Name and Prompt

The following sections describe how to configure the system name and prompt.

Setting a System Name

To set the system name, perform this task in privileged mode:

Task	Command
Set the system name.	**set system name** *name_string*

Note When you set the system name, the system name is used as the system prompt; you can override this with the **set prompt** command.

This example shows how to set the system name on the switch:

```
Console> (enable) set system name Catalyst 4003
System name set.
Catalyst 4003> (enable)
```

Setting a System Prompt

To set the system prompt, perform this task in privileged mode:

Task	Command
Set the system prompt.	**set prompt** *prompt_string*

This example shows how to set the system prompt for the switch:

```
Console> (enable) set prompt Catalyst4012>
Catalyst4012> (enable)
```

Clearing the System Name

To clear the system name, perform this task in privileged mode:

Task	Command
Clear the system name.	**set system name**

This example shows how to clear the system name:

```
Console> (enable) set system name
System name cleared.
Console> (enable)
```

Setting the System Contact and Location

You can set the contact name and location to help you with resource management tasks. To set the system contact and location, perform this task in privileged mode:

	Task	Command
Step 1	Set the system contact.	**set system contact** [*contact_string*]
Step 2	Set the system location.	**set system location** [*location_string*]
Step 3	Verify the global system information.	**show system**

This example shows how to set the system contact to sysadmin@corp.com and location to Sunnyvale, CA:

```
Console> (enable) set system contact sysadmin@corp.com
System contact set.
Console> (enable) set system location Sunnyvale CA
System location set.
```

This example shows how to verify the configuration:

```
Console> (enable) show system
PS1-Status PS2-Status PS3-Status PEM Installed PEM Powered
---------- ---------- ---------- ------------- -----------
ok         ok         ok         yes           no

Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s Logout
---------- ---------- ---------- -------------- ---------
ok         off        ok         0,18:24:41     none

PS1-Type           PS2-Type           PS3-Type
------------------ ------------------ ------------------
WS-X4008-DC-650W  WS-X4008           WS-X4008

Modem   Baud  Traffic Peak Peak-Time
------- ----- ------- ---- -------------------------
```

```
disable  9600   0%      0% Wed Apr 24 2002, 15:46:01

Power Capacity of the Chassis:2 supplies

WARNING:Power supplies of different values have been inserted

System Name              System Location          System Contact           CC
------------------------ ------------------------ ------------------------ ---
                         Sunnyvale CA             sysadmin@corp.com        4006
Console> (enable)
```

Setting the System Clock

Note You can configure the switch to obtain the time and date using the Network Time Protocol (NTP). For information on configuring NTP, see Chapter 36, "Configuring NTP."

To set the system clock, perform this task in privileged mode:

	Task	Command
Step 1	Set the system clock.	**set time** [*day_of_week*] [*mm/dd/yy*] [*hh:mm:ss*]
Step 2	Display the current date and time.	**show time**

This example shows how to set the system clock and display the current date and time:

```
Console> (enable) set time Fri 06/15/01 12:30:00
Fri Jun 15 2001, 12:30:00
Console> (enable) show time
Fri Jun 15 2001, 12:30:02
Console> (enable)
```

Creating a Login Banner

You can create a single or multiline message-of-the-day (MOTD) banner that appears on the screen when someone logs in to the switch. The first character following the **motd** keyword is used to delimit the beginning and end of the banner text. Characters following the ending delimiter are discarded. After entering the ending delimiter, press **Return**. The banner must be fewer than 3070 characters.

Configuring a Login Banner

To configure a login banner, perform this task in privileged mode:

	Task	Command
Step 1	Set the message of the day.	**set banner motd** *c message_of_the_day c*
Step 2	Display the login banner by logging out and logging back in to the switch.	—

This example shows how to set the login banner for the switch. The # symbol indicates the beginning and ending delimiter, but you can use any character for the delimiter.

```
Console> (enable) set banner motd #
Welcome to the Catalyst 4012 Switch!
Unauthorized access prohibited.
Contact sysadmin@corp.com for access.
#
MOTD banner set
Console> (enable)
```

Clearing the Login Banner

To clear the login banner, perform this task in privileged mode:

Task	Command
Clear the message of the day.	**set banner motd** *cc*

This example shows how to clear the login banner:

```
Console> (enable) set banner motd ##
MOTD banner cleared
Console> (enable)
```

Enabling or Disabling the "Cisco Systems Console" Telnet Login Banner

By default, the Cisco Systems Console Telnet login banner is enabled.

To enable or disable the "Cisco Systems Console" Telnet login banner, perform this task in privileged mode:

	Task	Command
Step 1	Display or suppress the Cisco Systems Console Telnet login banner.	**set banner telnet** {**enable** | **disable**}
Step 2	Display the Cisco Systems Console Telnet login banner setting.	**show banner**

This example shows how to enable the Cisco Systems Console Telnet login banner:

```
Console> (enable) set banner telnet enable
Cisco Systems Console banner will be printed at telnet.
Console> (enable)
```

This example shows how to disable the Cisco Systems Console Telnet login banner:

```
Console> (enable) set banner telnet disable
Cisco Systems Console banner will not be printed at telnet.
Console> (enable)
```

This example shows how to display the Cisco Systems Console Telnet login banner content:

```
Console> (enable) show banner
MOTD banner:
Welcome to the Catalyst 4012 Switch!
Unauthorized access prohibited.
Contact sysadmin@corp.com for access.

LCD config:

Telnet Banner:
disabled
Console> (enable)
```

Defining and Using Command Aliases

You can use the **set alias** command to define command aliases (short versions of command names) for frequently used or long and complex commands. Using command aliases can save you time and help prevent typing errors when you are configuring or monitoring the switch.

For the *name* argument, specify a name for the command alias. The *parameter* argument is the text the user types at the command line to activate the command.

To define a command alias on the switch, perform this task in privileged mode:

	Task	Command
Step 1	Define a command alias on the switch.	**set alias** *name command* [*parameter*] [*parameter*]
Step 2	Verify the currently defined command aliases.	**show alias** [*name*]

This example shows how to define two command aliases:

- **sm3**, which executes the **show module 3/1** command
- **sp3**, which executes the **show port 3** command.

```
Console> (enable) set alias sm3 show module 3
Command alias added.
Console> (enable) set alias sp3 show port 3/1
Command alias added.
Console> (enable)
```

This example shows how to verify the currently defined command aliases:

```
Console> (enable) show alias
sm8             show module 3
sp8             show port 3
```

These examples show what happens when you enter the command aliases at the command line:

```
Console> (enable) sm3
Mod Slot Ports Module-Type               Model               Sub Status
--- ---- ----- ------------------------- ------------------- --- --------
3   3    6     1000BaseX Ethernet        WS-X4306            no  ok

Mod Module-Name         Serial-Num
--- ------------------- --------------------
3                       JAB024000YY

Mod MAC-Address(es)                         Hw     Fw         Sw
```

```
--- ------------------------------------ ------ ---------- -----------------
3   00-10-7b-f6-b2-1a to 00-10-7b-f6-b2-1f 0.2
Console> (enable) sp3
Port  Name               Status     Vlan       Level  Duplex Speed Type
----- ------------------ ---------- ---------- ------ ------ ----- ------------
 3/1                     notconnect 1          normal   full  1000 1000BaseSX

Port  Security Violation Shutdown-Time Age-Time Max-Addr Trap     IfIndex
----- -------- --------- ------------- -------- -------- -------- -------
 3/1  disabled  shutdown              0        0        1 disabled       9

Port  Num-Addr Secure-Src-Addr   Age-Left Last-Src-Addr     Shutdown/Time-Left
----- -------- ----------------- -------- ----------------- ------------------
 3/1         0                 -        -                 -        -         -

Port   Send FlowControl    Receive FlowControl   RxPause TxPause Unsupported
       admin    oper       admin    oper                        opcodes
-----  -------- ---------  -------- ---------     ------- ------- -----------
 3/1   desired  off        off      off           0       0       0

Port  Status     Channel              Admin Ch
                 Mode                 Group Id
----- ---------- -------------------- ----- -----
 3/1  notconnect auto silent             29     0

Port  Align-Err  FCS-Err    Xmit-Err   Rcv-Err    UnderSize
----- ---------- ---------- ---------- ---------- ---------
 3/1           -          0          0          0         0

Port  Single-Col Multi-Coll Late-Coll  Excess-Col Carri-Sen Runts     Giants
----- ---------- ---------- ---------- ---------- --------- --------- ---------
 3/1           0          0          0          0         0         0         0

Last-Time-Cleared
-------------------------
Mon Jun 26 2000, 08:53:49
Console> (enable)
```

Defining and Using IP Aliases

You can use the **set ip alias** command to define aliases for IP addresses. IP aliases can make it easier to refer to other network devices when you use **ping**, **telnet**, and other commands, even when DNS is not enabled.

For the *name* argument, specify a name for your IP alias. For the *ip_addr* argument, specify the IP address to which the name refers.

To define an IP alias on the switch, perform this task in privileged mode:

	Task	Command
Step 1	Define an IP alias on the switch.	**set ip alias** *name ip_addr*
Step 2	Verify the currently defined IP aliases.	**show ip alias** [*name*]

This example shows how to define two IP aliases, **sparc**, which refers to IP address 172.20.52.3, and **cat4003**, which refers to IP address 172.20.52.71. This example also shows how to verify the currently defined IP aliases:

```
Console> (enable) set ip alias sparc 172.20.52.3
IP alias added.
Console> (enable) set ip alias cat4003 172.20.52.71
IP alias added.
```

This example shows what happens when you use the IP aliases with the **ping** command:

```
Console> (enable) show ip alias
default         0.0.0.0
sparc           172.20.52.3
cat5509         172.20.52.71
Console> (enable) ping sparc
sparc is alive
Console> (enable) ping cat4003
cat4003 is alive
Console> (enable)
```

Configuring Permanent and Static ARP Entries

To enable your Catalyst LAN switch to communicate with devices that do not respond to Address Resolution Protocol (ARP) requests, you can configure a static or permanent ARP entry that maps the IP addresses of those devices to their MAC addresses. You can configure an ARP entry so that it does not age out, by configuring it as either static or permanent. When you configure a static ARP entry using the **set arp static** command, the entry is removed from the ARP cache after a system reset. When you configure a permanent ARP by using the **set arp permanent** command, the ARP entry is retained even after a system reset.

Because most hosts support dynamic resolution, you usually do not need to specify static or permanent ARP cache entries. When a device does not respond to ARP requests, you can configure an ARP entry to be statically or permanently entered into the ARP cache so that those devices can still be reached.

To configure a static or permanent ARP entry, perform this task in privileged mode:

	Task	Command
Step 1	Configure a static or permanent ARP entry.	**set arp** [**dynamic** | **permanent** | **static**] {*ip_addr hw_addr*}
Step 2	(Optional) Specify the ARP aging time.	**set arp agingtime** *seconds*
Step 3	Verify the ARP configuration.	**show arp**

This example shows how to define a static ARP entry:

```
Console> (enable) set arp static 20.1.1.1 00-80-1c-93-80-40
Static ARP entry added as 20.1.1.1 at 00-80-1c-93-80-40 on vlan 1
Console> (enable)
```

This example shows how to define a permanent ARP entry:

```
Console> (enable) set arp permanent 10.1.1.1 00-80-1c-93-80-60
Permanent ARP entry added as
10.1.1.1                                 at 00-80-1c-93-80-60 on vlan 1
Console> (enable)
```

This example sets the ARP aging time:

```
Console> (enable) set arp agingtime 300
ARP aging time set to 300 seconds.
Console> (enable)
```

This example shows how to display the ARP cache:

```
Console> (enable) show arp
ARP Aging time = 300 sec
+ - Permanent Arp Entries
* - Static Arp Entries
* 20.1.1.1 at 00-80-1c-93-80-40 on vlan 1
172.20.52.35 at 00-80-1c-93-80-40 on vlan 1
172.20.52.35 at 00-80-1c-93-80-40 on vlan 1
Console> (enable)
```

To clear ARP entries, perform this task in privileged mode:

	Task	Command
Step 1	Clear a dynamic, static, or permanent ARP entry.	**clear arp** [**dynamic** | **permanent** | **static**] {*ip_addr hw_addr*}
Step 2	Verify the ARP configuration.	**show arp**

This example shows how to clear all permanent ARP entries and verify the configuration:

```
Console> (enable) clear arp permanent
Permanent ARP entries cleared.

Console> (enable) show arp
ARP Aging time = 300 sec
+ - Permanent Arp Entries
* - Static Arp Entries
+ 10.1.1.1                                 at 00-80-1c-93-80-60 on vlan 1
* 20.1.1.1                                 at 00-80-1c-93-80-40 on vlan 1
Console> (enable)
```

Configuring Static Routes

Note For information on configuring a default gateway (default route), see the "Configuring Default Gateways" section on page 3-7.

In some situations, you might need to add a static routing table entry for one or more destination networks. Static route entries consist of the destination IP network address, the IP address of the next-hop router, and the metric (hop count) for the route.

In software release 5.1 and later releases, you can configure Classless InterDomain Routing (CIDR) routes, such as IP supernets, in the switch IP routing table. You can specify the subnet mask for a destination network using the number of subnet bits or using the subnet mask in dotted decimal format. If no subnet mask is specified, the default (classful) mask is used.

The switch uses the longest-match network address in the IP routing table to determine which gateway to use to forward IP traffic. In releases prior to software release 5.1, the switch always uses the classful subnet mask for IP routing table entries.

The switch forwards IP traffic that is generated by the switch using the longest address match in the IP routing table. The switch does not use the IP routing table to forward traffic from connected devices. The IP routing table is used by the switch only to forward IP traffic that is generated by the switch itself (for example, Telnet, TFTP, and ping).

In software releases prior to software release 5.1, the classful subnet mask is always used (you cannot specify the subnet mask for the destination network).

To configure a static route, perform this task in privileged mode:

	Task	Command
Step 1	Configure a static route to the remote network.	**set ip route** *destination*[*/netmask*] *gateway* [*metric*]
Step 2	Verify that the static route appears correctly in the IP routing table.	**show ip route**

This example shows how to configure a static route on the switch and how to verify that the route is configured properly in the routing table:

```
Console> (enable) set ip route 172.16.16.0/20 172.20.52.127
Route added.
Console> (enable) show ip route
Fragmentation   Redirect   Unreachable
-------------   --------   -----------
enabled         enabled    enabled

The primary gateway: 172.20.52.121
Destination      Gateway          RouteMask    Flags   Use        Interface
---------------  ---------------  ----------   -----   --------   ---------
172.16.16.0      172.20.52.127    0xfffff000   UG      0            sc0
default          172.20.52.121    0x0          UG      0            sc0
172.20.52.120    172.20.52.124    0xffffffff8  U       1            sc0
default          default          0xff000000   UH      0            sl0
Console> (enable)
```

Scheduling a System Reset

You can use the **reset at** command to schedule a system to reset at a future time. This feature allows you to upgrade software during business hours and schedule the system upgrade after business hours to avoid a major impact on users.

You can also use the schedule reset feature when trying out new features on a switch. To avoid misconfiguration or the possibility of losing network connectivity to the device, you can set up the startup configuration feature and schedule a reset to occur in 30 minutes. You can then change the configuration, and if connectivity is lost, the system will reset in 30 minutes and return to the previous configuration.

Scheduling a Reset at a Specific Time

You can specify an absolute time and date at which the reset will take place, using the **reset at** command. The month and day argument is optional. If you do not specify a month and day, the reset will take place on the current day if the time that is specified is later than the current time. If the time that is scheduled for reset is earlier than the current time, the reset will take place on the following day.

Note The maximum scheduled reset time is 24 days.

To schedule a reset at a specific time, perform this task in privileged mode:

	Task	Command
Step 1	Schedule the reset time at a specific time.	**reset** [**mindown**] **at** {*hh:mm*} [*mm/dd*] [*reason*]
Step 2	Verify the scheduled reset.	**show reset**

This example shows how to schedule a reset at a specific time:

```
Console> (enable) reset at 20:00
Reset scheduled at 20:00:00, Sat Aug 18 2001.
Proceed with scheduled reset? (y/n) [n]? y
Reset scheduled for 20:00:00, Sat Aug 18 2001 (in 0 day 5 hours 40 minutes).
Console> (enable)
```

This example shows how to schedule a reset at a specific time and include a reason for the reset:

```
Console> (enable) reset at 23:00 08/18 Software upgrade to 5.3(1)
Reset scheduled at 23:00:00, Sat Aug 18 2001.
Reset reason: Software upgrade to 6.3(1).
Proceed with scheduled reset? (y/n) [n]? y
Reset scheduled for 23:00:00, Sat Aug 18 2001 (in 0 day 8 hours 39 minutes).
Console> (enable)
```

This example shows how to schedule a reset with a minimum of downtime:

```
Console> (enable) reset mindown at 23:00 08/18 Software upgrade to 6.3(1)
Reset scheduled at 23:00:00, Sat Aug 18 2001.
Reset reason: Software upgrade to 6.3(1).
Proceed with scheduled reset? (y/n) [n]? y
Reset mindown scheduled for 23:00:00, Sat Aug 18 2001 (in 0 day 8 hours 39 minutes).
Console> (enable)
```

Scheduling a Reset Within a Specified Amount of Time

You can schedule a reset within a specified time with the **reset in** command. For instance, if the current system time is 9:00 a.m. and the reset is scheduled to take place in one hour, the scheduled reset will take place at 10:00 a.m. If you or NTP advances the system clock to 10:00 a.m., the reset will take place at 11:00 a.m. If the clock is advanced ahead of the scheduled reset time, the reset will take place 5 minutes after the command is issued.

To schedule a reset within a specified time, perform this task in privileged mode:

	Task	Command
Step 1	Schedule the reset time within a specific amount of time.	**reset** [**mindown**] **in** [*hh*] {*mm*} [*reason*]
Step 2	Verify that the scheduled reset time is correct.	**show reset**

Note The minimum downtime argument is valid only if the system has a redundant supervisor engine.

This example shows how to schedule a reset in a specified time:

```
Console> (enable) reset in 5:20 Configuration update
Reset scheduled in 5 hours 20 minutes.
Reset reason: Configuration update
Proceed with scheduled reset? (y/n) [n]? y
Reset scheduled for 19:56:01, Wed Aug 18 1999 (in 5 hours 20 minutes).
Reset reason: Configuration update
Console> (enable)
```

Power Management

The next three sections describes the power management feature in the Catalyst 4000 family switches.

Managing Power on the Catalyst 4500 Series Switches

You can select from several different power supplies to ensure that you have enough power for the modules installed in your switch. The Catalyst 4500 series switches support the following power supplies:

- Fixed wattage—The power supply always delivers a fixed amount of inline and system power.
  - 1000W AC
  - 2800W AC
- Variable wattage—The power supply automatically adjusts the wattage to accommodate inline and system power requirements.
  - 1300W AC
  - 1400W DC

When you insert power supplies in your switch, use power supplies that are of the same wattage. If you mix power supplies, the switch will use the one in power supply bay 1 (PS1); the power supply in power supply bay 2 (PS2) is ignored.

The power supply status is displayed as err-disable in the output for the **show system** command. This example shows the output for the **show system** command for mixed power supplies:

```
Switch# show system
PS1-Status PS2-Status
---------- ----------
ok         err-disable

Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s Logout
---------- ---------- ---------- -------------- ---------
ok         off        ok         74,23:42:50    20 min

PS1-Type          PS2-Type
----------------- -----------------
PWR-C45-2800AC    PWR-C45-1000AC

Modem   Baud  Traffic Peak Peak-Time
------- ----- ------- ---- -------------------------
disable  9600   0%      0% Fri May 31 2002, 10:24:04

Power Capacity of the Chassis: 1 supply

System Name              System Location          System Contact           CC
------------------------ ------------------------ ------------------------ ---
Switch#
```

Power Management Modes

The Catalyst 4500 series switches support two power management modes:

- Redundant mode—Redundant mode uses one power supply as a primary power supply and the second power supply as a backup. If the primary power supply fails, the second power supply immediately supports the switch without any disruption in the network. Both power supplies must be the same wattage. A single power supply must have enough power to support the switch configuration.
- Combined mode—Combined mode uses the power from all installed power supplies to support the switch configuration power requirements. However, combined mode has no power redundancy. If a power supply fails, one or more modules might shut down. Combined mode requires that your switch have two power supplies.

Selecting a Power Management Mode

By default, a switch is set to redundant mode. In the **show environment power** command, if the power budget is 1, the switch is in redundant mode; if the power budget is 2, the switch is in combined mode.

Your switch hardware configuration will dictate which power supply or supplies you should use. For example, if your switch configuration requires more power than a single power supply provides, use the combined mode. In combined mode, however, the switch has no power redundancy. Consider the following possibilities:

- The supervisor engine consumes 110W, the fan boxes for the Catalyst 4503 switch consume 30W each, the fan boxes for the Catalyst 4506 switches consume 50W each, and the backplane for the Catalyst 4503 and Catalyst 4506 switches consumes 10W.
- 1000W can support a fully loaded Catalyst 4506 switch with no IP phone support.
- 1300W can support a fully loaded Catalyst 4503 switch with Cisco IP phones.
- 2800W can support a fully loaded Catalyst 4503 with Cisco IP phones or a fully loaded Catalyst 4506 switch.
- Each inline power port on a WS-X4148-RJ45V module requires 6.3W. Five fully loaded WS-X4148-RJ45V modules in a switch comprises 240 ports. This configuration will require 1512W of inline power plus 300W for the modules.

See Table 27-2 on page 27-20 for the power requirements of Catalyst enterprise LAN switches modules.

Power Management Limitations in Catalyst 4500 Series Switches

It is possible that you can configure a switch that requires more power than the power supplies provide. The two ways you could configure a switch to exceed the power capabilities are as follows:

- The power requirements for the installed modules exceed the power provided by the power supplies.

  If you insert a single power supply and then set the switch to combined mode, the switch displays this error message: `Insufficient power supplies present for specified configuration`. This error message is also displayed in the output for the **show environment power** command. This error message is displayed because combined mode requires two working power supplies in the switch. If you have only one power supply in the switch, and the switch is set to combined mode, the switch will place each module in reset mode.

If the power requirements for the installed modules exceed the power that is provided by the power supplies, the switch displays this error message: `Insufficient power available for the current chassis configuration`. This error message also appears in the **show environment power** command output.

If you attempt to insert additional modules into the switch and exceed the power that the power supplies provide, the switch immediately places the newly inserted module into reset mode and the switch displays these error messages: `Module has been inserted` and `Insufficient power supplies operating.` If you power down a functioning switch, and you insert an additional module or change the module configuration so that the power requirements exceed the available power, once you power on the switch again one or more modules are placed in reset mode.

- The power requirements for the inline power exceed the inline power that is provided by the power supplies.

  If you have too many IP phones drawing power from the system, power to IP phones is cut and some phones may be powered down to reduce the power requirements to match the power supplies.

A module in reset mode continues to draw power as long as it is installed in the chassis.

To compute the power requirements for your system and verify that your system has enough power, add the power consumed by the supervisor engine module(s), the fan box(es), and the installed modules (including inline power). For inline power, multiply the number of IP phones by 6.3W. See the "Power Consumption for Modules" section on page 27-20 for more information on the power consumption for the various components of your switch.

Configuring Redundant Mode on a Catalyst 4500 Series Switch

By default, the power supplies in a Catalyst 4500 series switch are set to operate in redundant mode. To effectively use redundant mode, follow these guidelines:

- The two power supplies must be the same type.
- If you have the power management mode set to redundant mode and only one power supply is installed, the switch will accept the configuration but operate without redundancy.

Caution If you have power supplies with different types or wattages installed in the switch, the switch will not recognize one of the power supplies. The switch will not have power redundancy.

- For fixed power supplies, choose a power supply that by itself is powerful enough to support the switch configuration.
- For variable power supplies, choose a power supply that supplies enough power so that the chassis and inline power requirements are less than the maximum available power for the chassis and inline power for the power supply. Variable power supplies automatically adjust the power resources to accommodate the chassis and inline power requirements when a system is booted up. Modules are brought up first, followed by IP phones.
- The maximum available power for chassis and inline power for each power supply is listed in Table 27-1 on page 27-16.

To configure redundant mode on the Catalyst 4500 series switch, perform this task in privileged mode:

	Task	Command
Step 1	Set the power management mode to redundant mode.	**set power budget 1**
Step 2	Verify the power management mode and the current power usage for the switch.	**show environment power**

Configuring Combined Mode on a Catalyst 4500 Series Switch

If your switch configuration requires more power than a single power supply can provide, set the power management mode to combined mode. Combined mode utilizes the available power for both power supplies; however, the switch will have no power redundancy.

To effectively use combined mode, follow these guidelines:

- The two power supplies must be the same type.
- If you use power supplies with different types or wattages, the switch will utilize only one of the power supplies.
- If you have the power management mode set to combined mode and only one power supply is installed, the switch will continue to operate in combined mode.
- For variable power supplies, choose a power supply that supplies enough power so that the chassis and inline power requirements are less than the maximum available power for the chassis and inline power for the power supply. Variable power supplies automatically adjust the power resources to accommodate the chassis and inline power requirements.
- When the switch is configured to combined mode, the total available power is not the mathematical sum of the individual power supplies. The power supplies have a predetermined current sharing ratio. See Table 27-1 on page 27-16 for more information.
- The 1400W DC power supply does not support Combined mode. If you set the power budget to 2, the switch disregards this setting.
- If you set your switch to Combined mode using 1400W DC power supplies, the power supplies do not load share inline power. Only system power increases with combined mode.
- The maximum available power for chassis and inline power for each power supply is listed in Table 27-1 on page 27-16.

To configure combined mode on the Catalyst 4500 series switch, perform this task in privileged mode:

	Task	Command
Step 1	Set the power management mode to combined mode.	**set power budget 2**
Step 2	Verify the power management mode and the current power usage for the switch.	**show environment power**

Available Power for Catalyst 4500 Series Switches Power Supplies

Table 27-1 lists the power that is provided by the Catalyst 4500 series switches power supplies. When the switch is configured to combined mode, the total available power is not the mathematical sum of the individual power supplies. The power supplies have a predetermined current sharing ratio. The total power available is P + (P * ratio).

Table 27-1 Available Power

Power Supply	Redundant Mode (W)	Combined Mode (W)
1000W AC	Chassis[1] = 1000 Inline = 0	Chassis = 1667 Inline = 0
1300W AC[2]	Chassis (max) = 1000 Inline (max) = 800 Chassis + Inline + Backplane ≤ 1300	Chassis (min) = 767 Chassis (max) = 1667 Inline (min) = 433 Inline (max) = 1333 Chassis + Inline + Backplane ≤ 2166
1400W DC[3]	Chassis (min) = 200 Chassis (max) = 1360 Inline = DC Input[4] - [Chassis (min) + Backplane] / 0.75[5]	N/A
2800W AC	Chassis = 1360 In-line = 1400	Chassis = 2473 In-line = 2545

1. Chassis power includes power for the supervisor(s), all line cards, and the fan tray.
2. Backplane consumes 10 W in both Redundant and Combined mode.
3. Backplane consumes 10 W in Redundant mode.
4. The DC Input can vary for the 1400W DC power supply and is configurable. For more information, see Special Considerations for the 1400W DC Power Supply, page 27-16.
5. 0.75 is the efficiency for the 1400W DC power supply.

Special Considerations for the 1400W DC Power Supply

Caution Do not mix the 1400W DC power supply with any other power supply, even for a hot swap or other short-term emergency. Doing so can seriously damage your switch.

Keep in mind the following guidelines when using a 1400W DC power supply with your Catalyst 4500 series switch.

- The 1400W DC power supply works with a variety of DC sources. The DC input can vary from 300W to 7500W. Refer to the power supply documentation for additional information.
- A Supervisor Engine II cannot detect the DC source plugged into the 1400W DC power supply. If you are using the 1400W DC power supply with a Supervisor Engine II, use the **set power dcinput** command to set the DC input power. For more information on this command, refer to the *Command Reference—Catalyst 4000 Family, Catalyst 2948G, and Catalyst 2980G Switches*.

- The 1400W DC power supply does not support Combined mode. If you set the power budget to 2 (Combined mode), the switch disregards the setting, and remains in Redundant mode.
- Software automatically adjusts between system power (for modules, backplane, and fans) and inline power. Although inline power is 100 percent efficient, system power has only 75 percent efficiency. For example, each 120W of system power requires 160W from the DC input.
- The 1400W DC power supply has a seperate power on/off switch for inline power. The power supply fan status was tied to the power supply status so that the status of the inline power switch can be reported to software. Therefore, if the power supply fan fails, the display shows the power as faulty, even though the main power is working properly.

Power Management for the Catalyst 4006 Switch

The power management feature for the Catalyst 4000 series switch can support an optimized Catalyst 4006 chassis with a limited module configuration on a reduced number of power supplies.

The Catalyst 4000 series switch chassis supports only the 400W AC, 400W DC, and 650W DC power supplies and allows you to mix AC-input and DC-input power supplies in the same chassis. In systems with redundant power supplies, both power supplies should be of the same wattage. If you mix a 400W power supply and a 650W power supply, the switch performs as if there were two 400W power supplies. For detailed information on supported power supply configurations for each chassis, refer to the *Catalyst 4000 Family Switch Installation Guide*.

Catalyst 4000 family modules have different power requirements; some switch configurations require more power than 1+1 redundancy mode (a single power supply) can provide. In those configurations, redundancy requires three power supplies. Redundant and nonredundant power configurations are discussed in the following sections.

Power Redundancy

The Catalyst 4006 switch contains holding bays for up to three power supplies. You need two primary power supplies to operate a fully loaded Catalyst 4006 chassis. You can set the power redundancy to two primary plus one redundant power supply (2+1 redundancy mode) or to one primary plus one redundant power supply (1+1 redundancy mode). The 1+1 redundancy mode might not support a fully loaded chassis.

If the switch has only two power supplies and is in 2+1 redundancy mode (the default mode), there is no redundancy. You can create redundancy with only two power supplies by setting the power redundancy to operate in 1+1 redundancy mode (one primary plus one redundant power supply). However, 1+1 redundancy will not support all configurations.

The 1+1 redundancy mode is designed and optimized for the following hardware configurations:

- One Catalyst 4006 chassis with a WS-X4013 supervisor engine with two 400W power supplies (in 1+1 redundancy mode) and four WS-X4148-RJ or WS-X4148-RJ21 modules
- One Catalyst 4006 chassis with a WS-X4013 supervisor engine with two 650W power supplies (in 1+1 redundancy mode) and five WS-X4148-RJ or WS-X4148-RJ21 modules

Although other configurations are possible, we do not recommend that you use them without carefully considering the power usage of the system. For example, other similar and possible configurations may consist of four modules that consume less power, and the total module power usage does not exceed the absolute maximum power usage for the system.

The supervisor engine uses 110W and the fan box uses 25W. The total load for the modules plus supervisor plus fan cannot total more than the power supplied by the power supply. The 1+1 redundancy mode might not support a fully loaded chassis and, therefore, one slot of the chassis *might be empty.* An attempt to use five modules risks an oversubscription of available power.

If you opt to use the 1+1 redundancy mode, the type and number of modules supported are limited by the power available from a single power supply. To determine the power consumption for each module in your chassis, see the "Power Consumption for Modules" section on page 27-20.

To choose a 1+1 redundancy configuration, you must change the system configuration from the default 2+1redundancy mode to 1+1 redundancy mode by using the **set power budget** command. The **set power budget 1** command sets the power budget to accommodate a 1+1 redundancy mode. In the 1+1 redundancy mode, the nonredundant power available to the system is the power of a single power supply. The second power supply installed in your switch provides full redundancy.

Limitations of the 1+1 Redundancy Mode

If you attempt to configure the system to operate in 1+1 redundancy mode, and you have more modules installed in the chassis than a single power supply can handle, the system displays the following error message: `Insufficient power supplies for the specified configuration.`

If you are already operating in 1+1 redundancy mode with a valid module configuration and you attempt to insert additional modules that require more power than the single power supply provides, the system immediately places the newly inserted module into reset mode and issues these error messages: `Module has been inserted` and `Insufficient power supplies operating`. If you power down a chassis that has been operating in 1+1 redundancy mode with a valid module configuration, and you insert a module or change the module configuration inappropriately and power on the switch again, the module(s) in the chassis (at boot up) that require more power than is available, are placed into reset mode.

Both of these scenarios initiate the five-minute evaluation countdown timer. When this timer runs out, the system attempts to resolve this power limitation by evaluating the type and number of modules installed. The evaluation process may require several cycles to stabilize the chassis' power usage.

During the evaluation cycle, the modules, are in effect, removed and reinserted, thus disrupting network connectivity; the switch reactivates only the modules it is able to support with the limited power available and leaves the remaining modules in reset mode. The supervisor engine always remains enabled. Modules placed into reset mode still consume some power. If the chassis module combination, including the modules in reset, still require more power than is available, the five-minute evaluation countdown timer starts for another evaluation cycle, and additional modules are placed into reset mode until the power usage is stable.

If the power requirement of the active modules, along with the modules in reset mode, does not exceed the available power, the system is stable and no more evaluation cycles are run until something again causes insufficient power usage. One or two cycles are required to stabilize the system. If you configure the chassis correctly, the system will not enter the evaluation cycle.

Note If you have all three power supplies installed and you still choose to operate in 1+1 redundancy mode but later add additional modules and thus exceed the power available, the five-minute evaluation timer starts again. The switch may require several evaluation cycles to stabilize the system. To correct this power situation caused by the additional modules, you can either remove the extra modules or change the power budget to 2+1 redundancy mode. If you choose to change to 2+1 redundancy mode, each module held in reset mode is brought up one-by-one to an operational state.

A module in reset continues to draw power as long as it is installed in the chassis; however, the module is not shown in the **show module** command output, because the system considers it removed.

To compute the power requirements for your system and verify that your system has enough power, add up the power consumed by the supervisor engine module, the fan box, and the installed modules. See the "Power Consumption for Modules" section on page 27-20 for more information on the power consumption for the various components of your switch.

A single power supply provides 400W or 650W. Two 400W power supplies provide 750W. Two 650W power supplies supply only 750W; this is a power supply cooling capacity restriction for the Catalyst 4000 family switches.

If you mix a 400W power supply and a 650W power supply, the switch performs as if there were two 400W power supplies. If you have one 400W power supply and one 650W power supply in 1+1 redundancy mode, and a second 650W power supply set as the backup, the system performs as if there were 400W. If the 400W power supply fails, the backup 650W power supply comes into service; however, the switch still has only 400W available. You need to remove the failed 400W power supply for the switch to make use of the 650W available.

he following examples are provided to further explain the use of power supplies. It requires less than the maximum that a single power supply can provide in 1+1 redundancy mode.

The following configuration requires a minimum of 395W:

- WS-X4013 supervisor engine—110W
- Four WS-X4148-RJ modules—65W each (260W total—the optimized module configuration)
- Fan box—25W

The following configuration requires more power than a single 400W power supply can provide. It requires 445W and cannot be used in 1+1 redundancy mode for a 400W power supply. A single 650W power supply provides enough power for 1+1 redundancy mode for this configuration.

- WS-X4013 supervisor engine—110W
- Two WS-X4148-RJ modules in slots 2 and 3—65W each (130W total)
- Two WS-X4448-GB-LX modules in slots 4 and 5—90W each (180W total)
- Fan box—25W

The following configuration requires more power than either a single 400W or 650W power supply can provide. It requires 735W and cannot be used in 1+1 redundancy mode for either a 400W or 650W power supply.

- WS-X4013 supervisor engine—110W
- Five 48-port 100BASE-FX modules in slots 2 through 6—120W each (600W total)
- Fan box—25W

Remember, when considering the 1+1 redundancy mode, you must carefully plan the configuration of the module power usage of your chassis. An incorrect configuration will momentarily disrupt your system during the evaluation cycle. To avoid this disruption, carefully plan your configuration to ensure it is within the power limits, or return to the default 2+1 redundancy configuration by installing a third power supply in your switch and set the power budget to 2+1 redundancy mode.

Use the **set power budget 2** command to set the power budget to the 2+1 redundancy mode.

Setting the Power Budget

To configure the power budget, perform this task in privileged mode:

	Task	Command
Step 1	Set the power budget.	**set power budget** {**1** | **2**}
Step 2	Verify the power budget and the current power usage for the switch.	**show environment power**

This example shows how to set the power budget to 1 (1+1 redundancy mode) and display the power budget and current power usage for the switch:

```
Console> (enable) set power budget 1
Warning:
Your power supply budget will be constrained to
the power available from only one power supply.
Do you want to continue? [confirm (y/n)]:y
Console> (enable) show environment power
Total Inline Power Available:0 Watt
Total Inline Power Drawn From the System:0 Watt
Remaining Inline Power in the System:0 Watt
Default Inline Power allocation per port:6.00 Watts (0.11 Amps @51V)

 Module          Inline Power Allocated(mA)
 ------          --------------------------
  1                 0
  2                 0
  3                 0

→ Power Budget is :2 supplies
Power Available to the System (excluding voice power):750 Watts (62.06 Amps
@12V)
Power Drawn from the System (excluding voice power):265 Watts (22.01 Amps
@12V)
Remaining Power (excluding voice power):485 Watts (40.05 Amps @12V)
Console> (enable)
```

Power Consumption for Modules

For power consumption of common Catalyst 4000 family components, see Table 27-2.

Enter the **show environment power** command to display the current power budget and the current system power usage.

Table 27-2 Power Consumption for Catalyst 4000 Family Components

Module	Power Consumed During Operation (W)	Power Consumed in Reset Mode (W)
Supervisor Engine II	110	110
Catalyst 4003 and 4006 fan tray	25	25
Catalyst 4503 fan tray	30	30
Catalyst 4506 fan tray	50	50
Catalyst 4003 and 4006 switch backplane	0	0

Table 27-2 Power Consumption for Catalyst 4000 Family Components (continued)

Module	Power Consumed During Operation (W)	Power Consumed in Reset Mode (W)
Catalyst 4503 switch backplane	10	10
Catalyst 4506 switch backplane	10	10
6-port 1000BASE-X (GBIC) Gigabit Ethernet WS-X4306-GB	35	30
32-port 10/100 Fast Ethernet RJ-45 WS-X4232-RJ-XX	50	35
Catalyst 4000 Access Gateway Module with IP/FW IOS WS-X4604-GWY	120	60
24-port 100BASE-FX Fast Ethernet switching module WS-X4124-FX-MT	90	75
32-port 10/100 Fast Ethernet RJ-45, plus 2-port 1000BASE-X (GBIC) Gigabit Ethernet WS-4232-GB-RJ	55	35
48-port 100BASE-FX Fast Ethernet switching module WS-4148-FX-MT	120	10
18-port server switching 1000BASE-X (GBIC) Gigabit Ethernet WS-4418-GB	80	50
Catalyst 4006 Backplane Channel Module WS-X4019	10	10
48-port 10/100 Fast Ethernet RJ-45 WS-X4148-RJ	65	40
Catalyst 4003 and 4006 Layer 3 Services Module WS-X4232-L3	120	70
12-port 1000BASE-T Gigabit Ethernet, plus 2-port 1000BASE-X (GBIC) Gigabit Ethernet WS-X4416	110	70
24-port 1000BASE-X Gigabit Ethernet WS-X4424-GB-RJ45	90	50
48-port 1000BASE-X Gigabit Ethernet WS-X4448-GB-RJ45	120	72
48-port 1000BASE-X Gigabit Ethernet WS-X4448-GB-LX	90	50
48-port Telco 10/100BASE-TX switching module WS-X4148-RJ21	65	40
48-port inline power 10/100BASE-TX switching module WS-X4148-RJ45V	60	50
4-port MT-RJ Uplink module WS-U4504-FX-MT	10	10

Migrating a Supervisor II from a Catalyst 4006 Switch to a Catalyst 4500 Series Switch

If you are migrating your Supervisor Engine II from a Catalyst 4006 switch to a Catalyst 4503 or 4506 switch, you can avoid any issues by saving your configuration and reloading the configuration file once the supervisor has been inserted into the Catalyst 4500 series chassis.

One of the big differences between the Catalyst 4006 switch and the Catalyst 4500 series switches is the number of MAC addresses. The Catalyst 4006 switch has 1024 MAC addresses that can be used as bridge identifiers, whereas the Catalyst 4500 series switches have 64. MAC address reduction is always enabled on the Catalyst 4500 series switches; however, it may or may not be enabled on a Catalyst 4006 switch. This might affect the selection of the root bridge after you migrate your supervisor engine. Here are two scenarios to consider:

- The Catalyst 4006 switch is not a root switch

  In this case, the spanning tree topology will not change. If you add to the network a Catalyst 4500 series switch with MAC-reduction enabled and its default spanning tree bridge ID priority set to 32,768, the bridge ID priority of the new switch becomes the bridge ID priority added to a system ID extension. The system ID extension is the VLAN number and can vary from 1 to 4094. So if the switch is in VLAN 1, the new bridge ID priority will be 32,789. Since 32,769 is greater than 32,768, this switch cannot become the root switch and poses no problems.

- The Catalyst 4006 is a root switch

  In this case, the spanning tree topology may change. If the other switches in the network are not running MAC-reduction, then the topology will change after you replace the chassis with a Catalyst 4500 series switch. The bridge ID priority of the new Catalyst 4500 series switch increments in the same manner as in the previous scenario (bridge ID priority + VLAN number). Therefore, if the switch is in VLAN 1, the new bridge ID will be 32,789. Since 32,769 is greater than 32,768, this switch cannot become the root switch. The network designates a new root switch; the spanning tree topology also changes to reflect the new root switch.

  If the bridge priority of the Catalyst 4006 has been lowered administratively and you use the same configuration in the new Catalyst 4500 series switch, then the switch remains the root switch and the spanning tree topology does not change.

To safely migrate your supervisor engine from a Catalyst 4006 switch to a Catalyst 4503 or 4506 switch, perform this task:

	Task	Command
Step 1	Change the nondefault configuration mode to text and specify the configuration file to use at boot up.	**set config mode text bootflash:switch.cfg**
Step 2	Save the current nondefault configuration to NVRAM.	**write memory**
Step 3	Save the configuration on the Catalyst 4006 switch.	**copy config flash**
Step 4	Remove the supervisor engine from the Catalyst 4006 switch and insert it into the Catalyst 4500 series switch.	
Step 5	Clear the current configuration.	**clear config all**

	Task	Command
Step 6	Load the saved configuration.	**configure bootflash:switch.cfg**
Step 7	If you have only one power supply in your Catalyst 4506 switch, set the power budget to 1.	**set power budget 1**

Generating System Status Reports for Tech Support

Using a single command, you can generate a report that contains status information about your switch. This command is a combination of several **show system status** commands. (Refer to the *Command Reference—Catalyst 4000 Family, Catalyst 2948G, and Catalyst 2980G Switches* for these commands.) You can upload the report to a TFTP server and send it to the Cisco Technical Assistance Center (TAC).

You can use keywords to limit the report, such as for specific modules, VLANs, and ports. If you do not specify any keywords, a report for the entire system is generated.

To write and send a report for TAC, perform this task in privileged mode:

Task	Command
Generate a system status report for TAC.	write tech-support **{***host***}** {*file*} [**module** *mod_num*] [**port** *mod_num*/*port_num*] [**vlan** *vlan_num*] [**memory**] [**config**]

This example shows a report sent to host 172.20.32.10 and to a filename **techsuport.txt**. No keywords are specified, so the complete status of the switch is included in the report.

```
Console> (enable) write tech-support 172.20.32.10 techsupport.txt
Upload tech-report to techsupport.txt on 172.20.32.10 (y/n) [n]? y
/
Finished network upload.  (67784 bytes)
Console> (enable)
```