

# Overview

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The 2900 XL series switches are workgroup Ethernet switches that supply autosensing 10BaseT or 100BaseT connections on all ports. Expansion slots on Catalyst 2912MF XL and 2924M XL switches supply Gigabit Ethernet and ATM connections. The 2900 XL switches can be deployed as backbone switches aggregating 10/100BaseT traffic from other switches and hubs or in mixed configurations connecting hubs, switches, servers, and desktops.

This chapter is a functional overview of 2900 XL switches. The following topics briefly describe the components and features that are shared by all switches in the series:

- Switch features
- Descriptions of the front and rear panels
- Management options
- Examples of the 2900 XL switches in different network topologies

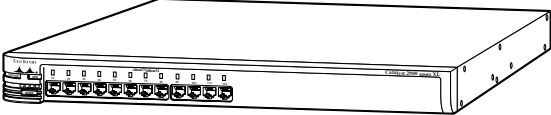
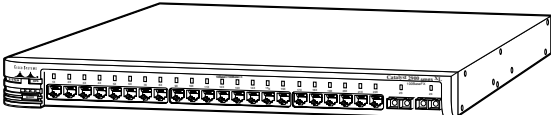
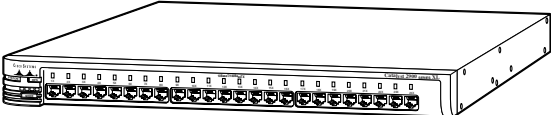
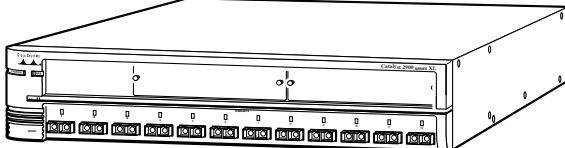
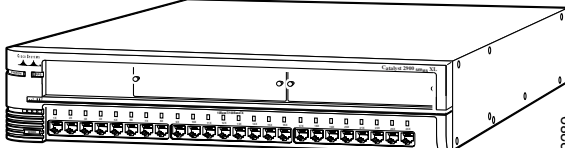
## Switch Features

The 2900 XL switches are members of an extended network system of stackable, modular LAN and WAN products that increase LAN performance, connect remote offices and users, and provide secure access.

Figure 1-1 shows the five versions of the 2900 XL switch and lists their key features. Switches running standard software are designated by the letter A, and switches running Enterprise Edition Software are designated by the letters EN.

## Switch Features

**Figure 1-1 Catalyst 2900 Series XL Switches**

Version Number	Description	Switch
WS-C2912-XL-A WS-C2912-XL-EN	12 fixed autosensing 10/100 ports	
WS-C2924C-XL-A WS-C2924C-XL-EN	22 fixed autosensing 10/100 ports 2 100BaseFX ports	
WS-C2924-XL-A WS-C2924-XL-EN	24 fixed autosensing 10/100 ports	
WS-C2912MF-XL	12 100BaseFX ports 2 high-speed expansion slots	
WS-C2924M-XL-A WS-C2924M-XL-EN	24 fixed autosensing 10/100 ports 2 high-speed expansion slots	

22289

Table 1-1 Features List

Feature	Description
<b>Performance and Configuration</b>	<ul style="list-style-type: none"> <li>• Autonegotiation of speed and half- or full-duplex operation on 10/100 ports</li> <li>• Support for up to 250 port-based virtual LANs (VLANs) on Catalyst 2912MF and 2924M switches and up to 64 VLANs on other models</li> <li>• On Catalyst 2924M XL and Catalyst 2912MF XL, two expansion slots for 10BaseT/100BaseTX, 100BaseFX, Gigabit Ethernet, and ATM modules</li> <li>• Inter-Switch Link (ISL) and IEEE 802.1Q trunking support on all ports (Enterprise Edition software only)</li> <li>• High-speed EtherChannel connections between switches and servers</li> <li>• Support for 2048 MAC addresses on Catalyst 2924 XL, 2924C XL, and 2912 XL</li> <li>• Support for 8192 MAC addresses on Catalyst 2924M XL and 2912MF XL</li> <li>• IEEE 802.1d Spanning-Tree Protocol support on a per-VLAN basis</li> <li>• Supported by Cisco IOS Release 11.2(8)SA6</li> <li>• Cisco Group Management Protocol (CGMP) to limit the flooding of IP multicast traffic</li> <li>• Full-duplex operation on all 100BaseFX ports</li> <li>• Port security to prevent unauthorized access to the network</li> <li>• Broadcast storm control to prevent performance degradation</li> <li>• Switched Port Analyzer (SPAN) port monitoring on any port</li> <li>• Four groups of embedded Remote Monitoring (RMON)</li> </ul>

## Front-Panel Description

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**Table 1-1**      **Features List (Continued)**

<b>Feature</b>	<b>Description</b>
<b>Management</b>	<ul style="list-style-type: none"><li>• Cisco Visual Switch Manager (CVSM) and Cisco Switch Network View, web-based tools for managing individual switches and viewing the network</li><li>• Cluster management, a web-based tool for managing switch clusters through a single IP address</li><li>• Cisco IOS command-line interface (CLI) via the console port or Telnet</li><li>• CiscoView device-management application</li><li>• Simple Network Management Protocol</li></ul>
<b>Redundancy</b>	<ul style="list-style-type: none"><li>• Connection for an optional Cisco 600W Redundant Power System (RPS) that uses AC input and supplies DC output to the switch.</li></ul>

## Front-Panel Description

The front panel of a 2900 XL switch contains the ports, any expansion slots, and the LEDs (see Figure 1-1). This section describes these features.

### 10/100 Ports

The 10/100 ports on a 2900 XL switch are internally switched to all other switch ports and use RJ-45 connectors and Category 5 cabling. They operate at either 10 or 100 Mbps in full or half duplex. For autonegotiation with other devices, the ports are IEEE 802.3u-compliant.

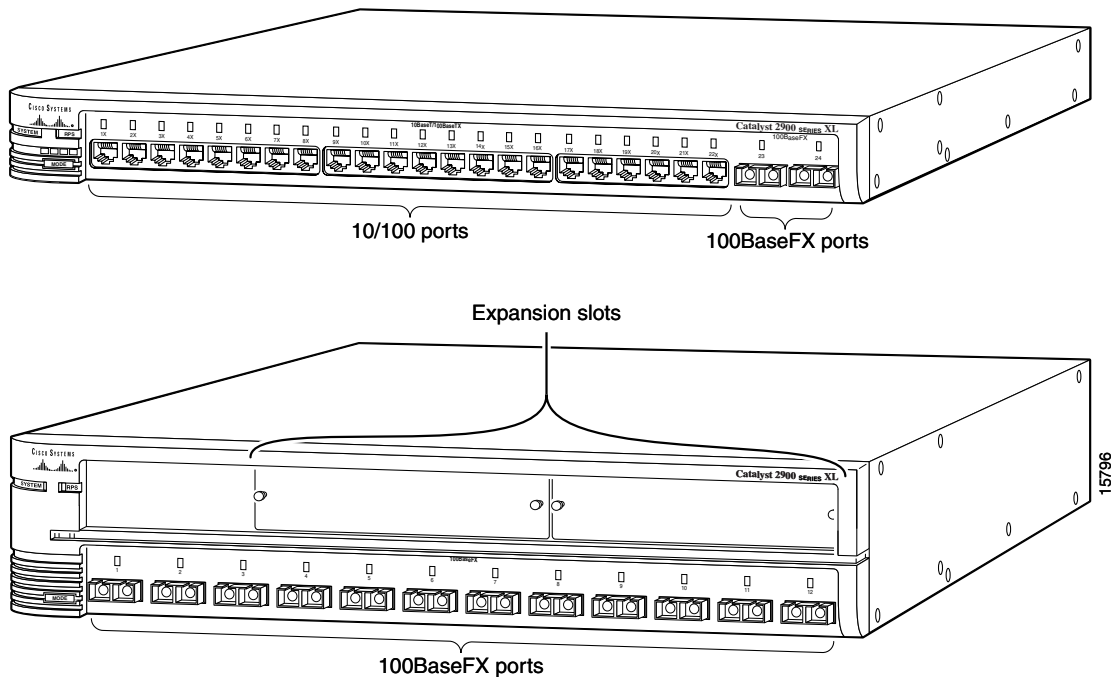
When connected to another device, a port senses the speed and duplex settings of the attached device and advertises its own capabilities. If the attached device also supports autonegotiation, the switch port negotiates the best connection (that is, the fastest line speed that both devices support and full duplex transmission, if the attached device supports it) and configures itself accordingly. Ports can also be explicitly set to operate in any combination of half duplex, full duplex, 10 Mbps, or 100 Mbps. In all cases, the attached device must be within 100 meters of the switch.

## 100BaseFX Ports

The Catalyst 2924C XL switch has 2 100BaseFX ports, and the Catalyst 2912MF XL switch has 12 100BaseFX ports (see Figure 1-2). These ports use 10/125- or 62.5/125-micron multimode fiber-optic cabling. In full-duplex mode (the default), these ports connect to other 100BaseFX devices over distances of up to 2 kilometers. In half-duplex mode, the ports connect to devices up to 412 meters from the switch.

The 100BaseFX ports default to full-duplex operation and do not autonegotiate.

**Figure 1-2** Catalyst 2924C XL and 2912MF XL 100BaseFX Ports



## High-Speed Expansion Slots

The Catalyst 2912MF XL switch (see Figure 1-2) and the Catalyst 2924M XL (see Figure 1-3) have two high-speed expansion slots for the 2900 XL hot-swappable modules. Each module port is internally switched to other switch ports and is managed through the switch management interfaces.

Table 1-2 lists the modules that the expansion slots support.

**Table 1-2      Expansion Modules**

<b>Module Type</b>	<b>Model Number</b>
10/100 Ethernet	WS-X2914-XL
	WS-X2914-XL-V
	WS-X2922-XL
100 BaseFX	WS-X2922-XL-V
	WS-X2924-XL-V
<sup>1</sup> Gigabit Ethernet	WS-X2931-XL
ATM	WS-X2971-XL
	WS-X2972-XL
	WS-X2951-XL
	WS-X2961-XL

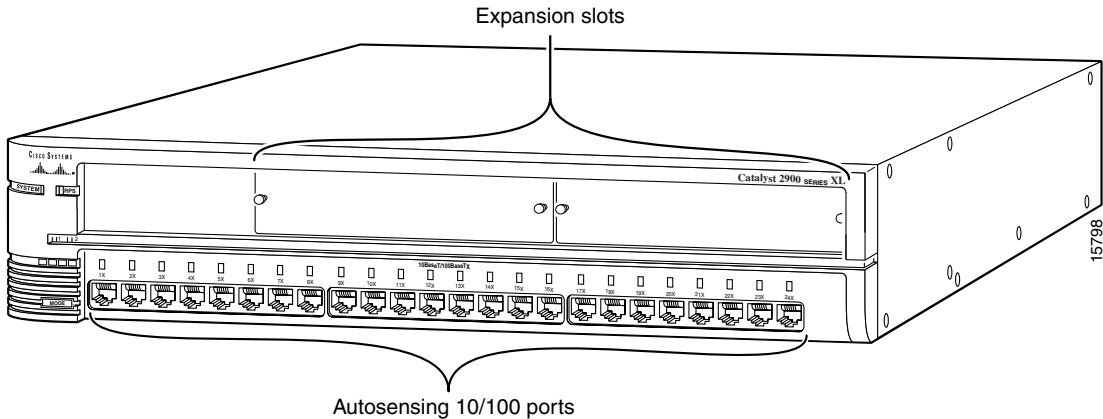
<sup>1</sup> Accommodates modules WS-G5484 =, WS-G5486 =, and WS-X3500-XL=

These modules automatically configure themselves when you insert them in expansion slots and tighten the thumb screws. A power-on self-test (POST) verifies that the module is working properly before it starts forwarding packets.

Modules WS-X2914-XL and WS-X2922-XL support 2048 MAC addresses. If you install one of these modules in a 2924M XL or Catalyst 2912MF XL switch (both of which support 8192 MAC addresses) the module fails POST. You can start the module by restarting the switch with the module installed. After the restart, the addressing capacity of the switch is reduced to 2048 MAC addresses.

See the *Catalyst 2900 Series XL Modules Installation Guide* and the *Catalyst 2900 XL ATM Modules Installation Guide* for detailed information on expansion modules for Catalyst 2900 series XL switches.

**Figure 1-3 Catalyst 2924M XL**



## LEDs

You can use the switch LEDs to monitor switch activity and its performance. Figure 1-4 and Figure 1-5 show the location of the LEDs and the Mode button you use to select one of the port modes. Changing a port mode changes the information provided by each port status LED.

All of the LEDs described in this section except the utilization meter (UTL) are visible on the Cisco Visual Switch Manager (CVSM) home page and on the Cisco Cluster Manager page if the switch is a cluster member. The *Cisco IOS Desktop Switching Software Configuration Guide* describes how to use CVSM to manage individual switches and how to use cluster management software to manage multiple switches in a cluster.

Figure 1-4 Catalyst 2912 XL, Catalyst 2924 XL, and Catalyst 2924C XL LEDs

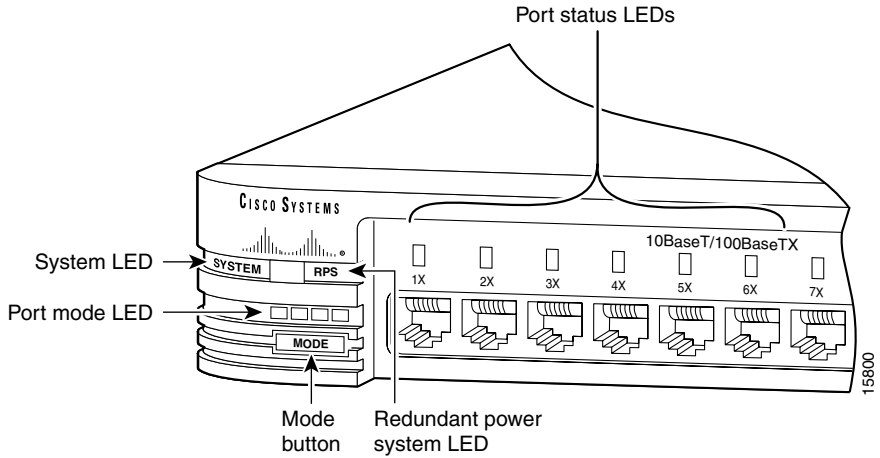
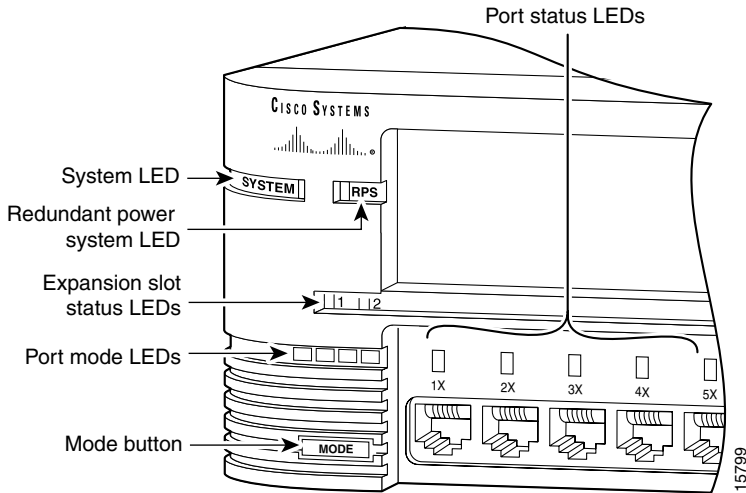


Figure 1-5 Catalyst 2912MF XL and Catalyst 2924M XL LEDs



## System LED

The system LED shows whether the system is receiving power and functioning properly. Table 1-3 lists the LED colors and their meanings.

**Table 1-3 System LED**

Color	System Status
Off	System is not powered up.
Green	System is operating normally.
Amber	System is receiving power but is not functioning properly.

## RPS LED

The RPS LED shows the RPS status. Table 1-4 lists the LED colors and their meanings.

**Table 1-4 RPS LED**

Color	RPS Status
Off	RPS is off or is not installed.
Green	RPS is operational.
Blinking green	<p>The RPS and the switch AC power supply are both powered up. If the switch power supply fails, the switch powers down and after 15 seconds restarts, using power from the RPS. The switch goes through its normal boot sequence when it restarts.</p> <p><b>Note</b> This is not a recommended configuration.</p>
Amber	RPS is connected but not functioning properly. One of the power supplies in the RPS could be powered down, or a fan on the RPS could have failed.

### Port Mode and Port Status LEDs

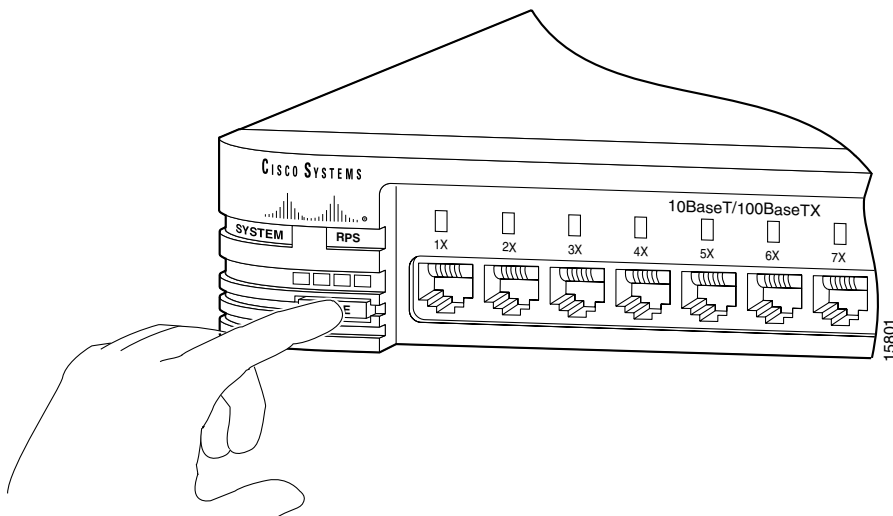
Catalyst series switches have four LED modes, each of which provides different information about a particular port or the switch itself. The Mode button (shown in Figure 1-4 and Figure 1-5) highlights each mode in sequence. LED modes provide the following information:

STAT	The port status. This is the default mode.
UTL	The current bandwidth in use by the switch.
FDUP	The port duplex mode: full duplex or half duplex.
100	The port operating speed: 10 or 100 Mbps.

### Changing the Port Mode

To change the port mode, press the Mode button (see Figure 1-6) to highlight the mode that you want. Release the button to enable the highlighted function.

**Figure 1-6** Changing the Port Mode



## Interpreting LEDs after a Mode Change

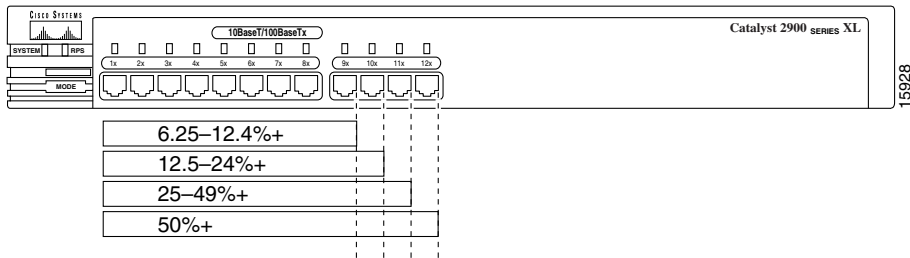
When you change the port mode, the meaning of the LED colors changes. Table 1-5 explains how to interpret LED colors.

**Table 1-5**      **Meaning of LED Colors in Different Modes**

Port Mode	Color	Meaning
STAT (port status)	Off	No link.
	Solid green	Link present.
	Flashing green	Activity; port is transmitting or receiving data.
	Alternating green-amber	Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication.
	Solid amber	Port is not forwarding. Port was disabled by management or an address violation or blocked by Spanning-Tree Protocol (STP).  <b>Note</b> After a port is reconfigured, the port status LED can remain amber for up to 30 seconds as STP checks the switch for possible loops.
UTL (utilization)	Green	The LEDs display backplane utilization on a logarithmic scale.  If all port status LEDs are green, the switch is using 50% or more of its total bandwidth. If the right-most LED is off, the switch is using less than 50% of its total bandwidth. If the LED to the left of the right-most LED is off, the switch is using less than 25% of its total capacity, and so on.  See Figure 1-7 for details.
FDUP (full or half duplex)	Off	Port is operating in half duplex.
	Green	Port is operating in full duplex.
SPD (speed)	Off	Port is operating at 10 Mbps.
	Green	Port is operating at 100 Mbps.

Figure 1-7 shows bandwidth utilization percentages displayed by the right-most LEDs.

**Figure 1-7 Bandwidth Utilization**



### Expansion Slot LEDs

Expansion slot LEDs (illustrated in Figure 1-5) show the status of installed modules. The LEDs are numbered 1 (left slot) and 2 (right slot). Table 1-6 lists LED colors and their meanings.

**Table 1-6 Expansion Slot LEDs**

Color	Expansion Slot Status
Off	No module is installed.
Green	Module is operating normally.
Amber	Module failed POST and should be replaced.

## Rear-Panel Description

Switch rear panels have an AC power connector, a Redundant Power System (RPS) connector, an RJ-45 console port, and fans (see Figure 1-8 and Figure 1-9). These components are described in this section.

### Power Connectors

You can provide power to the switch either by connecting the Cisco RPS to the RPS connector on the switch or by using the internal power supply. The internal power supply is an autoranging unit that supports input voltages between 100 and 240 VAC. If you plan to use the internal power supply, use the supplied AC power cord to connect the AC power connector to an AC power outlet.

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**Note** Do not connect the switch power cord to an AC outlet if the switch is also connected to a powered-up RPS. The switches do not support the fully-redundant or redundant-with-reboot configurations that are described in the *Cisco RPS Hardware Installation Guide*.

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**Warning** Attach only the Cisco RPS (model PWR600-AC-RPS) to the RPS connector.

The RPS can provide a quasi-redundant power source for four external devices that use up to 150W DC each. You can use a one-to-one cable (one connector at each cable end) to connect four external devices to the four DC output power modules. The power source is quasi-redundant because there are two AC input power modules for the Cisco RPS and one DC output power module for each external device. The AC input to the Cisco RPS is fully redundant, but the DC output to the external devices is not.

For more information on the Cisco RPS, refer to the Cisco RPS documentation.

### Console Port

You can use the console port and the supplied rollover cable to connect a 2900 XL switch to a PC or terminal. For the data characteristics of the console port, see the “Connecting a Terminal or PC to the Console Port” section on page 2-21.

**Figure 1-8** Rear Panel: Catalyst 2912 XL, Catalyst 2924 XL, and Catalyst 2924C XL

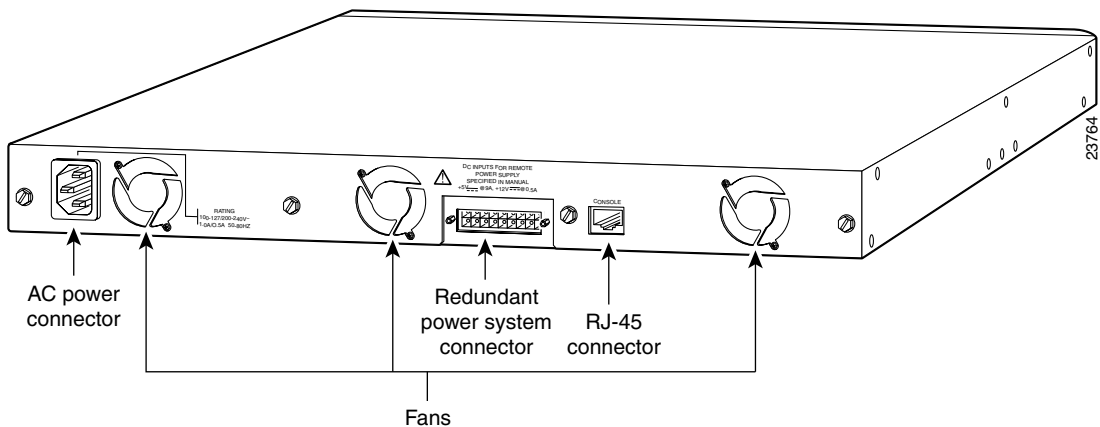
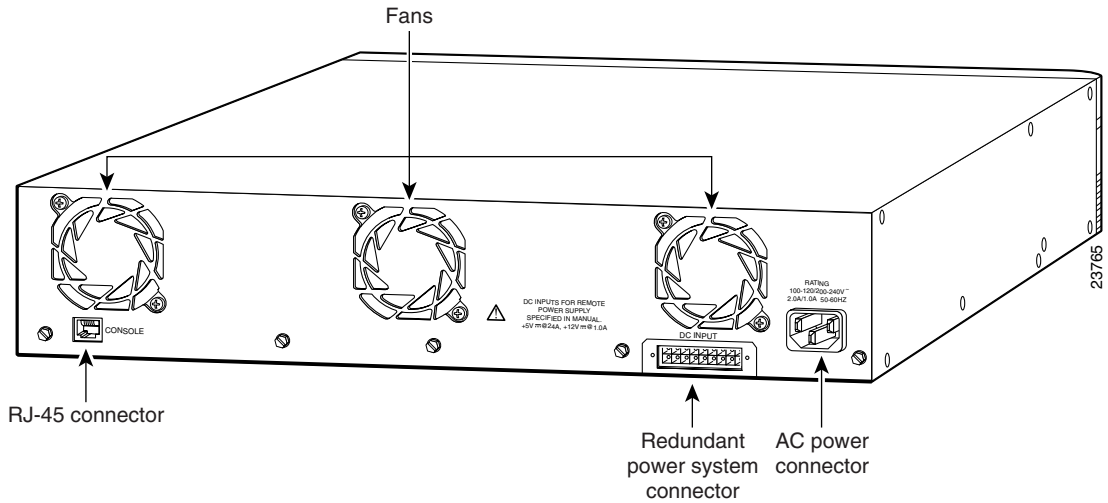


Figure 1-9 Rear Panel: Catalyst 2924M XL and Catalyst 2912MF XL



# Management Options

Catalyst switches offer several management options:

- Cisco Visual Switch Manager software

Using CVSM, you can use a Web browser to manage a single switch, display network maps, and monitor the network. See the *Cisco IOS Desktop Switching Software Configuration Guide* and the online help in the CVSM application for information about this software.

- Cluster management software

All 2900 XL switches shown in Figure 1-1 can be a member of a cluster and can be managed by using a Web browser and cluster management software. These switches can also be the command switch of a cluster if you install the software upgrade (see the *Release Notes for the Catalyst 2900 Series XL and 3500 Series XL Cisco IOS Release 11.2 (8) SA6* for upgrade procedures).

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**Note** Other 2900 XL switches can also be upgraded to be a member or a command switch in a cluster. See the *Release Notes for the Catalyst 2900 Series XL and 3500 Series XL Cisco IOS Release 11.2(8) SA6* for procedures.

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- Cisco IOS Command-Line Interface (CLI)

With the Cisco IOS CLI, you can manage 2900 XL switches using traditional command entries. You can access the CLI by connecting a PC or terminal directly to the console port on the rear panel of the switch. If the switch is attached to your network, you can use a Telnet connection to manage the switch from a remote location. See the *Cisco IOS Desktop Switching Software Configuration Guide* for information.

- CiscoView application

The CiscoView application is a device-management application that you can use to click on a switch image to set configuration parameters and to view switch status and performance information. The CiscoView application, which you purchase separately, can be a standalone application or part of an Simple Network Management Protocol (SNMP) network-management platform. See the documentation that came with your CiscoView application for information.

- SNMP network management platforms

You can manage switches by using an SNMP-compatible management station running platforms such as HP OpenView and SunNet Manager. The switch supports a comprehensive set of MIB extensions and MIB II, the IEEE 802.1D bridge MIB, and four Remote Monitoring (RMON) groups. See the documentation that came with your SNMP application for information.

## Deployment Strategies

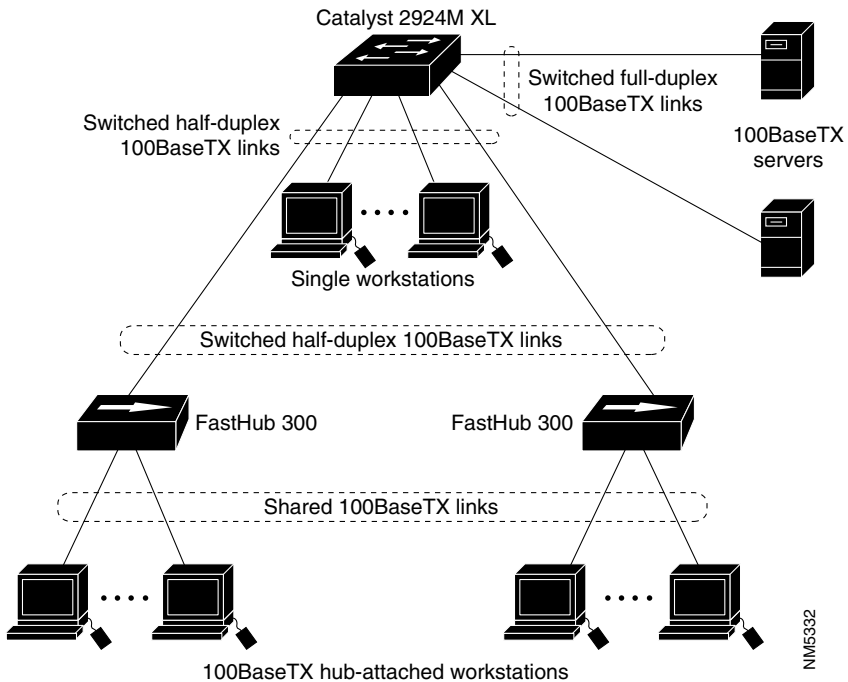
The examples in this section show ways in which you might deploy 2900 XL switches in your network.

- High-performance client/server workgroup
- Wiring closet aggregator
- Power workgroup
- Star topology stack

## High-Performance Client/Server Workgroup

Figure 1-10 shows a Catalyst 2924M XL switch connecting workstations, 100BaseTX hubs, and servers in a topology for client/server applications. The links to the 100BaseTX servers and workstations can be full duplex. A repeater does not support full-duplex transmission, so the links to the 100BaseTX repeaters are always half duplex.

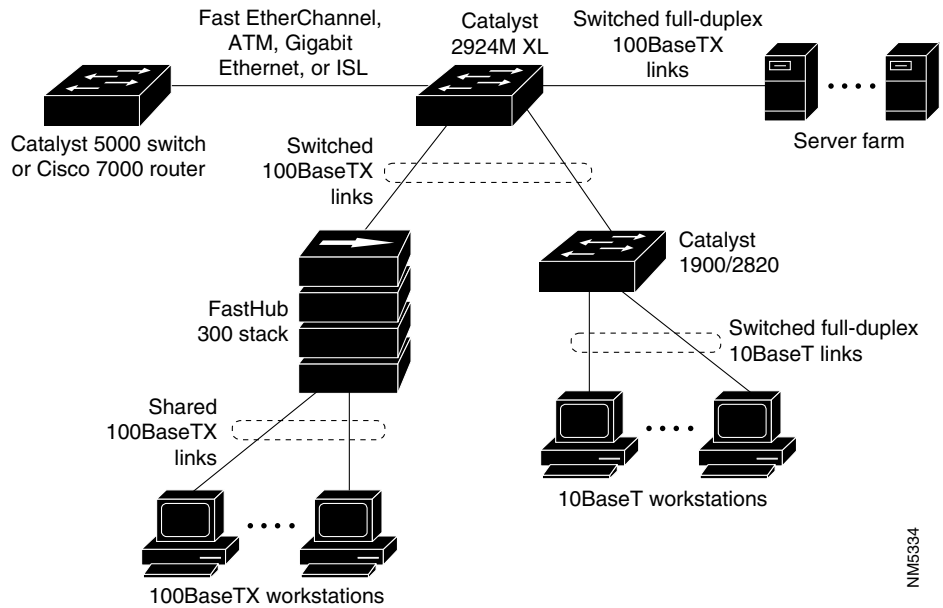
**Figure 1-10 Catalyst 2924M XL in a High-Performance Client/Server Workgroup**



# Wiring Closet Aggregator

Figure 1-11 shows a Catalyst 2924M XL switch connecting 100BaseTX and 10BaseT devices. In this topology, the switch is in the middle of the network and can provide connectivity to a mixture of hubs, switches, and servers.

**Figure 1-11 Catalyst 2924M XL in a Wiring Closet**

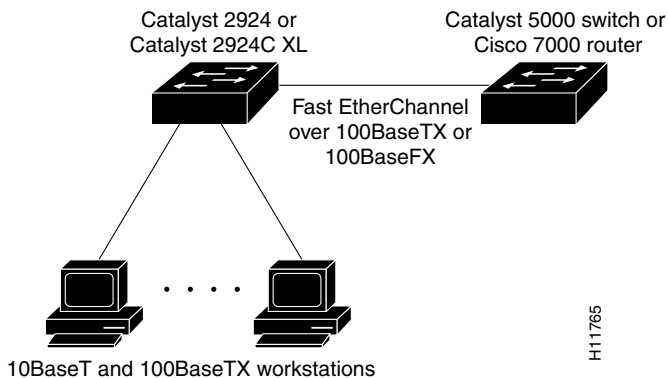


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## Power Workgroup

Figure 1-12 shows a Catalyst 2924C XL or 2924 XL with a 100BaseT uplink and 10/100 connections to individual workstations.

**Figure 1-12 Catalyst 2924C XL or Catalyst 2924 XL in a Power Workgroup Configuration**



# Star Topology Stack

Figure 1-13 shows four 2900 XL switches in a star topology. You could manage these switches by using CVSM and Cisco Switch Network View. Figure 1-13 shows a Cisco router, a Catalyst 5000 series switch, and four 2900 XL switches connecting desktops. For information on managing a cluster of switches, see the *Cisco IOS Desktop Switching Software Configuration Guide*.

**Figure 1-13 Catalyst 2924M XL in a Star Topology Stack**

