Introduction

The Catalyst 2900 series XL switches are workgroup Ethernet switches that supply autosensing 10BaseT or 100BaseT connections on all ports. These switches–also referred to as Catalyst 2900 switches–can be deployed as backbone switches aggregating 100BaseT traffic from other switches and hubs or in mixed configurations connecting hubs, switches, servers, and desktops.

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

- Summary of key features

- Physical components on the front and rear panels of each switch

- Software and management options for the switches

- Examples of Catalyst 2900 series switches in different network topologies
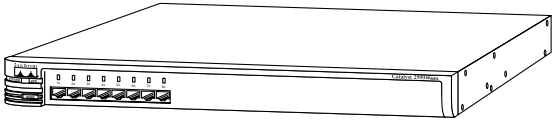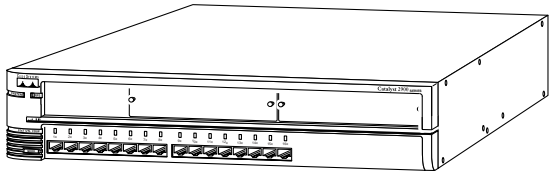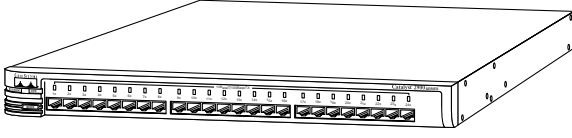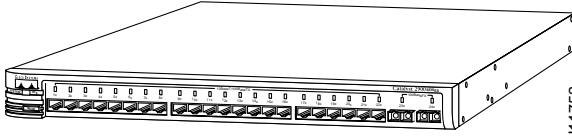
Summary of Key Features

The Catalyst 2900 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 four available versions of the Catalyst 2900 series XL switches, and Table 1-1 lists their key features.

Figure 1-1   Catalyst 2900 Series XL Switches

Model Number	Description	Switch
Catalyst 2908 XL	8 fixed autosensing 10/100 ports	
Catalyst 2916M XL	16 fixed autosensing 10/100 ports 2 high-speed expansion slots	
Catalyst 2924 XL	24 fixed autosensing 10/100 ports	
Catalyst 2924C XL	22 fixed autosensing 10/100 ports 2 100BaseFX ports	

Table 1-1   Summary of Key Features

Feature	Description
Performance and Configuration	• Autosensing transmission on 10/100 ports
	• Autonegotiation of half- and full-duplex operation on 10/100 ports
	• Full-duplex operation on 100BaseFX ports
	• Two high-speed expansion slots supporting 10BaseT/100BaseTX, 100BaseFX and future gigabit, asynchronous transfer mode (ATM) and Inter-Switch Link (ISL) modules (Catalyst 2916M XL only)
	• Fast EtherChannel support for connections of up to 800 Mbps between switches and servers
	• Support for 2048 MAC addresses
	• IEEE 802.1d Spanning-Tree Protocol support
	• 4 Mb shared-memory architecture
	• Cisco Group Management Protocol (CGMP) to limit the flooding of multicast traffic to predefined ports
	• Port security to prevent unauthorized access to the network
	• Broadcast storm control to prevent performance degradation from broadcast storms
	• Embedded RMON (four groups)
Management	• Embedded World Wide Web interface for most management tasks
	• Cisco IOS command-line interface (CLI) via the console port or Telnet
	• CiscoView device-management application
Redundancy	• Connection for optional Cisco 600W AC redundant power system (RPS) as a backup

Front Panel Description

This section describes the switch 10/100 and 100BaseFX ports, expansion slots and their associated modules, and the LEDs. All Ethernet ports and all LEDs are on the switch front panel.

10/100 Ports

Catalyst 2900 10/100 ports are internally switched to all other switch ports and use RJ-45 connectors and Category 5 cabling. They can operate at either 10 Mbps 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 connected device also supports autonegotiation, the Catalyst 2900 port negotiates the best connection it can 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 (see Figure 1-2) has two 100BaseFX ports on the front panel. These ports use 10/125- or 62.5/125-micron multimode fiber-optic cabling. In the default full-duplex mode, these ports can connect to other 100BaseFX devices over distances of up to 2 kilometers. In half-duplex mode, the ports support connections to devices up to 412 meters from the switch.

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

**Figure 1-2   Catalyst 2924C XL 100BaseFX Ports**
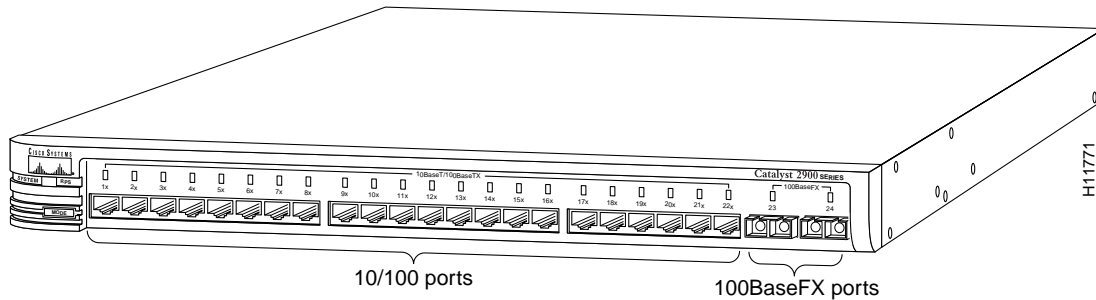
High-Speed Expansion Slots

The Catalyst 2916M XL switch (see Figure 1-3) has two high-speed expansion slots for the Catalyst 2916M XL hot-swappable modules. These modules provide a variety of possibilities for connecting backbones, servers, and other high-performance devices. Each module port is internally switched to all other Catalyst 2916M XL ports.

The Catalyst 2916M XL modules automatically configure themselves when you insert them in an expansion slot and tighten the thumb screws. The switch does not need to be reset, and a power-on self-test (POST) verifies that the module is working properly before it starts forwarding packets.

Figure 1-3   Catalyst 2916M XL
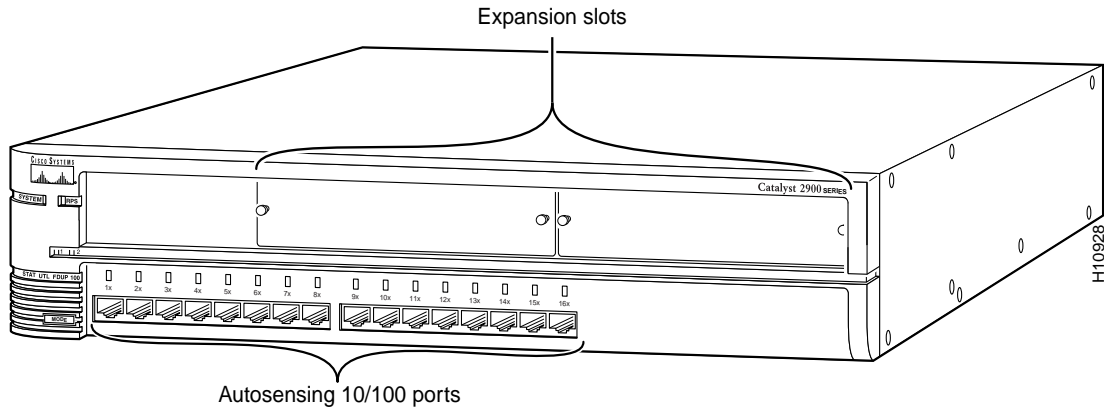
LEDs

Catalyst 2900 LEDs are indicators of switch activity and performance. Figure 1-4 and Figure 1-5 show the location of the LEDs and the Mode button. You can use the Mode button to select one of the port mode LEDs.

The switch LEDs are also displayed on the image of the switch available through the web-based Switch Manager. All of the LEDs described in this section, with the exception of the utilization meter (UTL), are visible on the Basic System Configuration page of Switch Manager. See the "Using Switch Manager" section in the "Web-Based Management" chapter for more information.

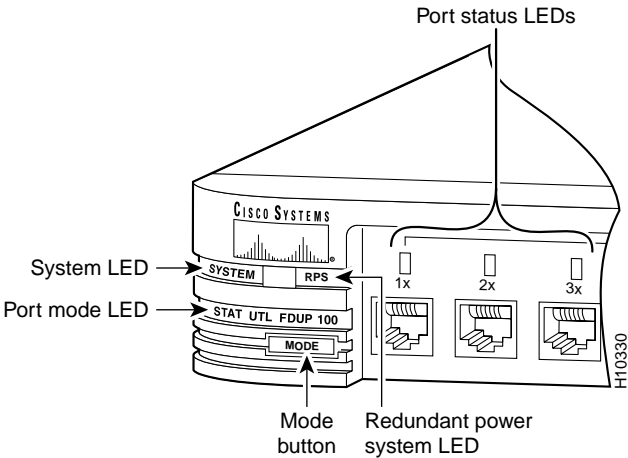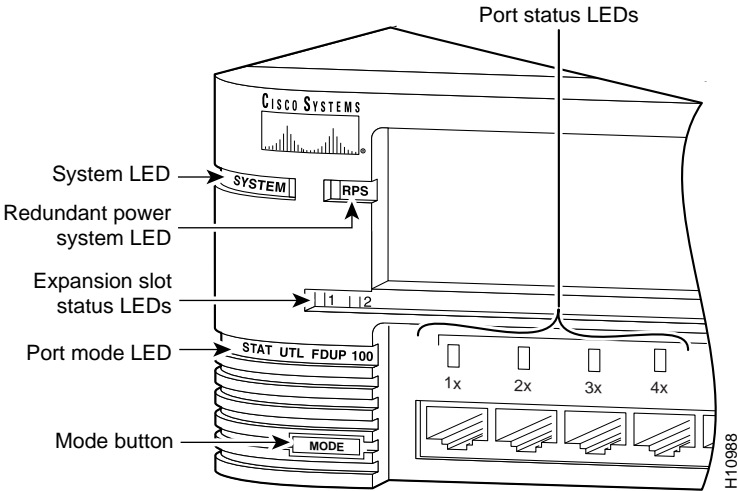**Figure 1-4**   **Catalyst 2908 XL, 2924 XL, and 2924C XL LEDs**

Figure 1-5   **Catalyst 2916M XL LEDs**

System LED

The system LED indicates whether the system is receiving power and functioning properly. Table 1-2 lists the LED colors and their meanings.

Table 1-2 **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 redundant power system (RPS) LED shows the RPS status. Table 1-3 lists the LED colors and their meanings.

Table 1-3 **RPS LED**

Color	RPS Status
Off	RPS is off or is not installed.
Green	RPS is operational.
Flashing green	The RPS and the switch AC power supply are *both* powered up. If the switch power supply fails, the switch powers down and restarts after 15 seconds using power from the RPS. The switch goes through its normal boot sequence when it restarts.
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

The port mode LED indicates the mode you selected using the Mode button. There are four possible modes:
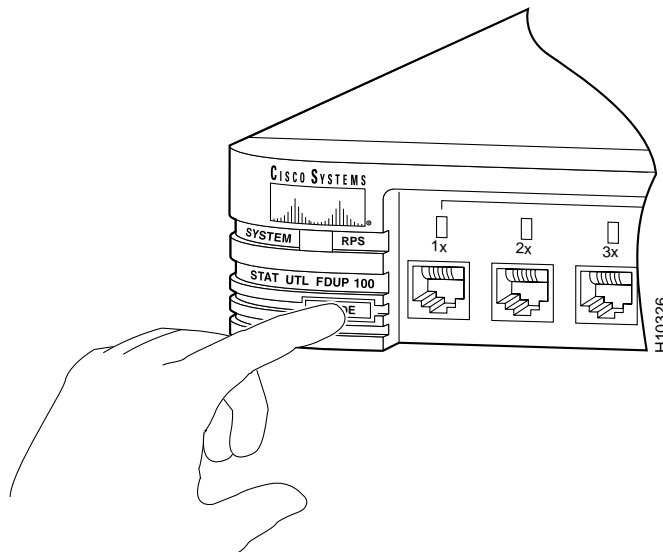
STAT   The port status. This is the default mode.

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 Mbps or 100 Mbps.

See Table 1-4 for a description of the LED colors and their meanings for the different modes.

Changing the Port Mode

To change the port mode, press the Mode button (see Figure 1-6) to highlight in sequence each of the possibilities. Release the button to enable the lit function.

Figure 1-6   Changing the Port Mode

Table 1-4   Port Status LEDs by Mode

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.
UTL (utilization)	Green	If all port status LEDs are green, the switch is using 50% or more of its total bandwidth capacity.
		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. If the next LED to the left is off, the switch is using 12.5% of its total bandwidth.
		Each subsequent LED to the left that is turned off indicates a further reduction of 50% in the amount of switch bandwidth in use.
FDUP (full duplex)	Off	Port is operating in half duplex.
	Green	Port is operating in full duplex.
100 (speed)	Off	Port is operating at 10 Mbps.
	Green	Port is operating at 100 Mbps.

Expansion Slot LEDs

The expansion slot LEDs indicate the status of installed modules. The LEDs are numbered 1 (left slot) and 2 (right slot). Table 1-5 lists the LED colors and their meanings.

Table 1-5   Expansion Slot LEDs

Color	Expansion Slot Status
Off	No module is installed.
Green	Module is operating normally.
Amber	Module failed power-on self-test and should be replaced.

Rear Panel Description

The rear panels of the Catalyst 2900 switches (see Figure 1-7, Figure 1-8, and Figure 1-9) contain an AC power receptacle, a redundant power system (RPS) receptacle, an RJ-45 console port, and fans.

Power Receptacles

You can provide power to the switch either by using the internal power supply or by connecting the Cisco RPS to the RPS receptacle on the switch. Only one power source can be supplying power to the switch at a time.

If you want to use the internal power supply, an autoranging unit supporting input voltages between 100 and 240 VAC, use the supplied AC power cord to connect the AC power receptacle to an AC power outlet.

If you want to use the RPS, the switch AC power cord must not be plugged in. See the Cisco RPS documentation for detailed information on connecting to the RPS.

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

Figure 1-7   Catalyst 2908 XL Rear Panel

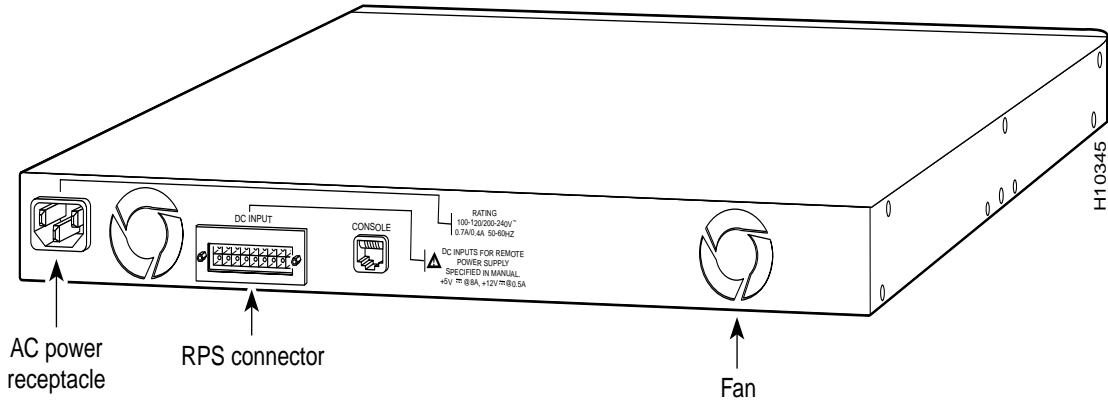AC power
receptacle

RPS connector

Fan

Figure 1-8   Catalyst 2924 XL and Catalyst 2924C XL Rear Panel

AC power
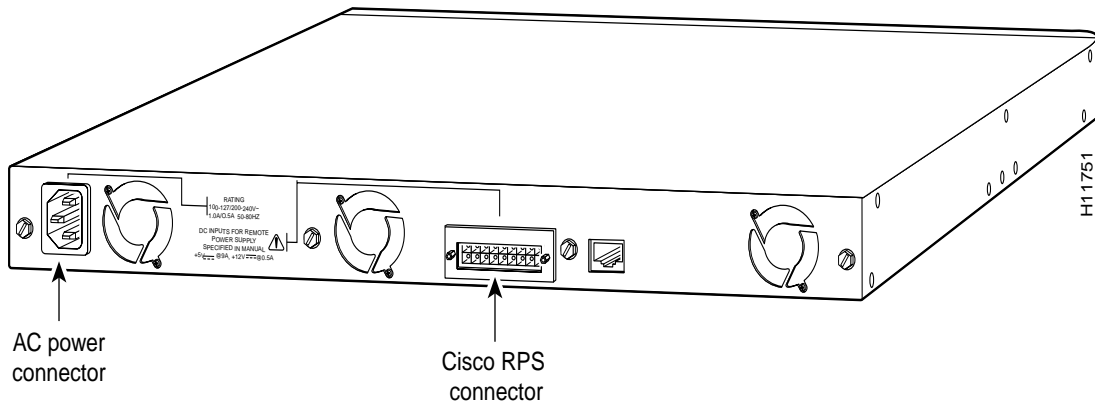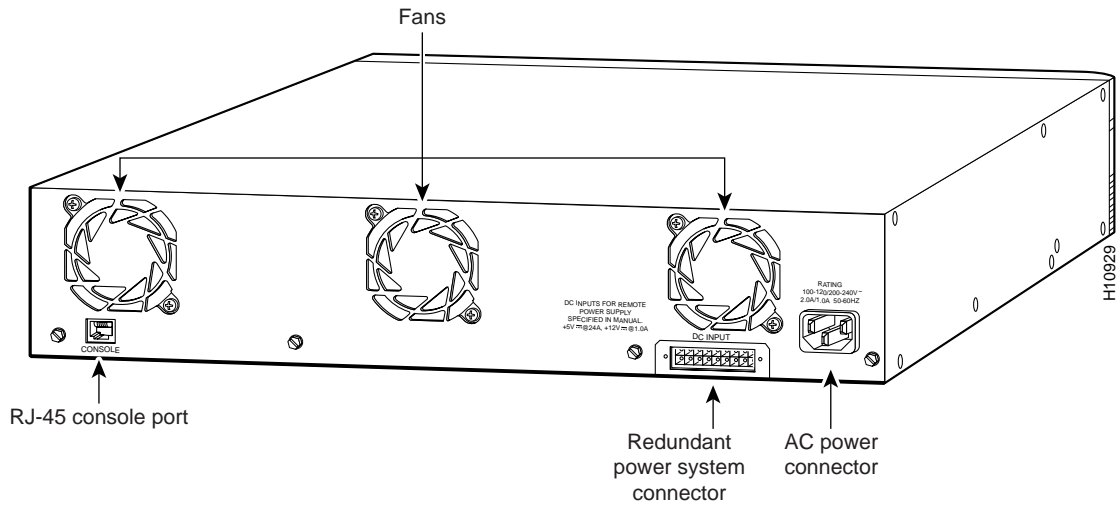connector

Cisco RPS
connector

Figure 1-9   Catalyst 2916M XL Rear Panel

Console Port

You can connect a Catalyst 2900 to a PC or terminal via the console port and the supplied rollover cable. For the data characteristics of the console port, see the "Connecting a Terminal or PC to the Console Port" section in the "Installation" chapter.

Catalyst 2900 Series XL Management Options

You can use the following techniques to manage Catalyst 2900 series switches:

- Catalyst 2900 series Switch Manager

    With JavaScript enabled on either Netscape Communicator 4.0 or Microsoft Internet Explorer 4.0, you can use the web-based Switch Manager to configure the switch, monitor a *live* image of the switch, and display statistics. If you are connected to the Internet, you can link directly from the switch home page to Cisco Systems for new software releases and the latest Catalyst 2900 series documentation.

- Cisco IOS command-line interface (CLI) via console or Telnet

    You can access the Cisco IOS CLI by connecting a PC or terminal to the console port on the rear panel or by using Telnet. Instructions for using the CLI are in the "Cisco IOS Management" chapter.

- CiscoView

    The CiscoView device-management application displays an image of the switch. You can point and click on the image to set configuration parameters and get statistics about the switch and its performance. CiscoView runs as a stand-alone application or as part of an SNMP network-management platform.

- SNMP network management platforms

    Catalyst 2900 series switches can be managed with an SNMP-compatible management station running such platforms as HP OpenView and SunNet Manager. The switch supports a comprehensive set of MIB extensions along with MIB II, the 802.1d bridge MIB, and four Remote Monitoring (RMON) groups.
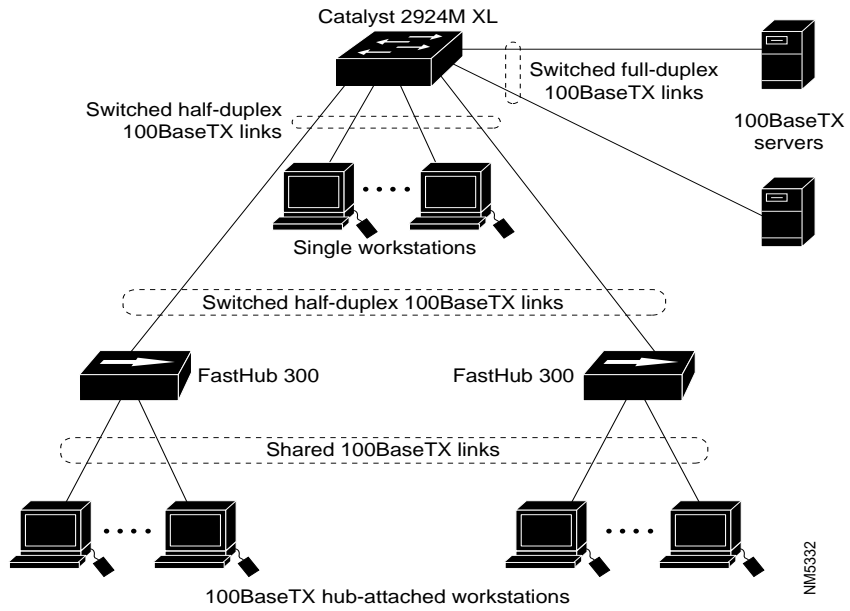
Deployment Strategies

This section describes three examples of how you could deploy the Catalyst 2900 in your network.

- High-performance client/server workgroup

- Wiring closet aggregator

- Power workgroup

High-Performance Client/Server Workgroup

Figure 1-10 shows a Catalyst 2916M XL connecting workstations, 100BaseTX hubs, and servers in a topology suited to 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 2916M XL in a High-Performance Client/Server Workgroup

Catalyst 2924M XL

Switched full-duplex
100BaseTX links

100BaseTX
servers

Switched half-duplex
100BaseTX links

Single workstations

Switched half-duplex 100BaseTX links

FastHub 300

FastHub 300

Shared 100BaseTX links

NM5332

100BaseTX hub-attached workstations

Wiring Closet Aggregator

Figure 1-11 shows a Catalyst 2916M XL connecting 100BaseTX and 10BaseT devices. In this topology, the switch is in the middle of the network and can provide connectivity to any mixture of hubs, switches, and servers.

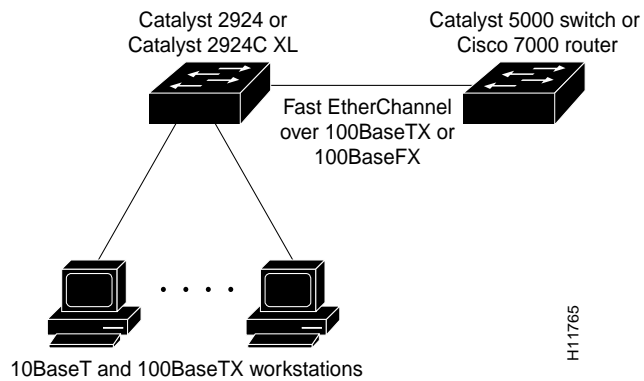**Figure 1-11   Catalyst 2916M XL in a Wiring Closet**
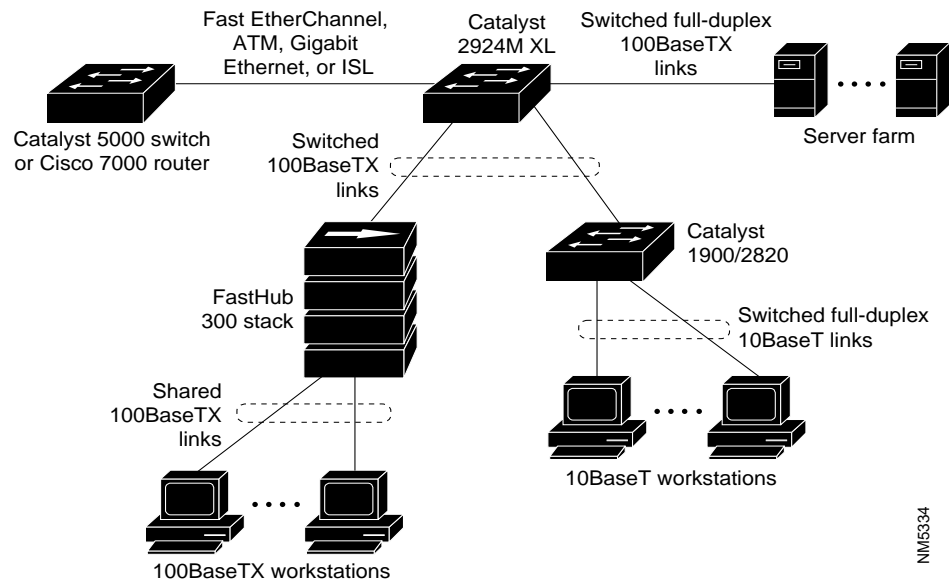
Power Workgroup

Figure 1-12 shows a Catalyst 2924C XL or 2924 XL with a 100BaseFX uplink to a Catalyst 5000 and 10/100 connections to individual workstations.

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