Cisco Catalyst **2950** Series Intelligent Ethernet Switches for Metro Access (Enhanced Image)

Product Overview

The Cisco Catalyst® 2950 Series Intelligent Ethernet switches is an affordable line of fixed-configuration Fast Ethernet and Gigabit Ethernet switches that extend intelligence to the metro access edge, enabling service breadth, availability, security, and manageability. Key components of the Cisco Metro Ethernet Switching portfolio, these switches are ideal for service providers looking to deliver profitable Ethernet services to the residential and small-office, home-office (SOHO) market. Featuring advanced rate limiting, voice virtual LAN (VLAN) support, and multicast management, these switches enable a variety of residential metro services such as Internet access, voice over IP (VoIP), and broadcast video.

The Cisco Catalyst 2950 Series Intelligent Ethernet switches consists of the following devices—which are only available with the Enhanced Image (EI) software for the Cisco Catalyst 2950 Series:

- Cisco Catalyst 2950G-48 Switch— 48 10/100 ports and 2 gigabit interface converter (GBIC)-based Gigabit Ethernet ports
- Cisco Catalyst 2950G-24 Switch— 24 10/100 ports and 2 GBIC ports
- Cisco Catalyst 2950G-24-DC Switch—24 10/100 ports, 2 GBIC ports, and DC power

- Cisco Catalyst 2950G-12 Switch— 12 10/100 ports and 2 GBIC ports
- Cisco Catalyst 2950T-24 Switch— 24 10/100 ports and 2 fixed 10/100/ 1000BaseT uplink ports
- Cisco Catalyst 2950C-24 Switch— 24 10/100 ports and 2 fixed 100BaseFX uplink ports
- Catalyst 2950ST-24-LRE—24 LRE and 2 Gigabit Ethernet ports (user can select either 10BaseT/100BaseTX/1000BaseT Ethernet Ports or Small Form Factor Pluggable (SFP) Transceivers)
- Catalyst 2950ST-8-LRE—8 LRE and 2 Gigabit Ethernet ports (user can select either 10BaseT/100BaseTX/1000BaseT Ethernet Ports or Small Form Factor Pluggable (SFP) Transceivers)

The two built-in Gigabit Ethernet ports on the Cisco Catalyst 2950G-12, 2950G-24, and 2950G-48 accommodate a range of GBIC transceivers, including the Cisco Course Wave Division Multiplexing (CWDM) GBIC Solution, Cisco GigaStack® GBIC, 1000BaseSX, 1000BaseLX/LH, 1000BaseZX and 1000BaseT GBICs. The dual GBIC-based Gigabit Ethernet implementation provides customers with tremendous deployment flexibility— allowing them increased availability with the redundant uplinks. High levels of resiliency can also be implemented by deploying dual redundant Gigabit Ethernet uplinks, UplinkFast and

Per-VLAN Spanning Tree Plus (PVST+) for uplink load balancing. This Gigabit Ethernet flexibility makes the Cisco Catalyst 2950 Series switches an ideal metro access edge complement to the Cisco 7600 Series Internet Router and Cisco Catalyst 6500 Series of metro Ethernet switches.

Intelligence at the Metro Access Edge: Enabling Profitable Ethernet Services

Service providers that address the residential and SOHO market face the continual challenge of offering compelling value-added services.

Although alternative broadband technologies such as DSL can offer bandwidth at speeds ranging up to 1.5 Mbps, the monthly subscriber fees for such speeds can be out of reach for most users. As a result, compelling high-quality services such as high-speed Internet access, VoIP, or broadcast video are often not viable propositions over these technologies. However, in the metro, service providers are discovering that high-performance, Ethernet access over fiber-optic networks can easily provide cost-effective bandwidth of 10 to 100 Mbps. By taking advantage of the simplicity and cost benefits of Ethernet, revenue growth via voice, video, and data services becomes a reality. When considering the deployment of Ethernet services, service providers must consider the following issues:

- Building cost-effective, highly available, scalable metro Ethernet networks
- Providing profitable new services while reducing operational and capital costs
- Having the network flexibility to move up market to enterprise and small and medium- sized business services

These issues are especially relevant at the metro access edge. As service providers look to provide profitable Ethernet services such as high-speed Internet access, voice, and video, Cisco intelligent functionality such as advanced quality of service (QoS), granular rate limiting, and multicast management are essential in the provider's customer-located equipment. In addition, availability and security concerns at the access edge are addressed with intelligent features such as subsecond Spanning Tree Protocol (STP) convergence and 802.1x support. With Cisco Catalyst 2950 Series Intelligent Ethernet switches, Cisco delivers the ideal balance of affordability and intelligence, enabling profitable Ethernet service breadth, availability, security and manageability.

Most important, the Cisco Catalyst 2950 Series is a key component of the Cisco Metro Ethernet Switching portfolio. As such, service providers are assured that they can offer a range of residential and commercial services over the same network. For regional metro, metro aggregation, and metro access, Cisco Metro Ethernet Switching enables service providers to deliver profitable, comprehensive Ethernet services. With the effective integration of existing WAN services such as Frame Relay and ATM, Cisco Metro Ethernet Switching offers an unmatched breadth of service delivery mechanisms. Cisco also helps service providers minimize total cost of ownership for new services with its extensive automated operations support. Through technology leadership, financial stability, and a commitment to customer support, Cisco ensures service success from "start to scale."

Service Breadth Through Advanced Quality of Service, Rate Limiting, and Voice/ Multicast Features

To achieve profitability, service providers that serve the residential and SOHO markets must offer value-added services such as voice and video in addition to basic high-speed Internet connectivity to increase revenue per subscriber. But these services are compelling only when service quality matches that of competing voice and video offerings.

The Cisco Catalyst 2950 Series offers superior and highly granular QoS to ensure that network traffic is classified and prioritized, and that congestion is avoided in the best possible manner. The Cisco Catalyst 2950 Series can classify, reclassify, police (determine if the packet is in or out of predetermined profiles and affect actions on the packet), and mark or drop the incoming packets before the packet is placed in the shared buffer. Packet classification allows the network elements to discriminate between various traffic flows and enforce policies based on Layer 2 and Layer 3 QoS fields.

To implement QoS, first, the Cisco Catalyst 2950 Series switches identify traffic flows, or packet groups, and classify or reclassify these groups using either the Differentiated Services Code Point (DSCP) field or the 802.1p class-of-service (CoS) field, or both. Classification and reclassification can be based on criteria as specific as the source/destination IP address, source/destination Media Access Control (MAC) address, or the Layer 4 Transmission Control Protocol/User Datagram Protocol (TCP/UDP) port. At the ingress, the Cisco Catalyst 2950 Series can also perform policing and marking of the packet.

After the packet goes through classification, policing, and marking, it is then assigned to the appropriate queue before exiting the switch. The Cisco Catalyst 2950 Series supports four egress (outgoing port) queues per port, which allows the service provider to be more discriminating and specific in assigning priorities for the various applications. At the egress, the switch performs Weighted Round Robin (WRR) or strict priority scheduling to determine the order in which the queues are processed. The WRR queuing algorithm ensures that the lower-priority packets are not entirely starved for bandwidth and are serviced without compromising the priority settings administered by the network manager. Strict priority scheduling ensures that the highest-priority packets are always serviced first, ahead of all other traffic.

In terms of rate limiting, the Cisco Catalyst 2950 Series is capable of allocating bandwidth based on several criteria, including MAC source address, MAC destination address, IP source address, IP destination address, and TCP/UDP port number. Bandwidth allocation is essential in network environments requiring service-level agreements (SLAs), or when it is necessary for the network manager to control the bandwidth given to certain subscribers. The Cisco Catalyst 2950 Series supports up to 6 policers per Fast Ethernet port and up to 60 policers on a Gigabit Ethernet port. Traffic policing can be done in 1-Mbps increments on Fast Ethernet ports and 8-Mbps increments on Gigabit Ethernet ports, giving the network manager very granular control of network bandwidth.

In addition, the Cisco Catalyst 2950 Series provides key voice and video service features with voice VLAN (auxiliary VLAN) for VoIP services and hardware-based Internet Group Management Protocol (IGMP) snooping, allowing the switch to "listen in" on the IGMP conversation between hosts and routers. When a switch hears an IGMP join request from a host for a given multicast group, the switch adds the host port number to the Group Destination Address (GDA) list for that group. And, when the switch hears an IGMP leave request, it removes the host port from the list. Together with the superior QoS and rate-limiting features mentioned previously, service providers can build a flexible network with the Cisco Catalyst 2950 Series to provide voice, video, and data services all in one network architecture.

Service Availability through Resiliency Enhancements and Network Redundancy

The Cisco Catalyst 2950 Series provides a rich set of resiliency enhancement features to ensure quick failover recovery and create a high-availability network. The IEEE 802.1w Rapid Spanning Tree standard allows the service provider to achieve subsecond spanning tree convergence times to maximize network stability and reliability. The

IEEE 802.1s Multiple Spanning Tree standard can be deployed in conjunction with 802.1w to improve the scalability of the STP by grouping VLANs into spanning tree instances, as well as to provide backward compatibility to devices running the 802.1D STP.

In addition, service providers can enable Bridge Protocol Data Unit (BPDU) guard and Spanning Tree Root Guard (STRG) to enhance the reliability of their networks. BPDU guard allows the service provider to shut down STP PortFast-enabled interfaces to avoid receiving BPDUs from their customers' networks. STRG prevents customer devices outside of the service provider's network from becoming STP root nodes.

The Cisco Catalyst 2950 Series enables the service provider to construct a highly redundant network. PVST+ allows the service provider to implement Layer 2 load-sharing on redundant links, efficiently utilizing the extra capacity inherent in a redundant design. Service providers can also utilize Cisco EtherChannel® technology to aggregate up to 4 Gbps through Gigabit EtherChannel technology and up to 1.6 Gbps through Fast EtherChannel technology. The Cisco EtherChannel technology enhances fault tolerance and offers higher-speed aggregated bandwidth between switches and to routers.

In addition to resiliency and network redundancy advantages, the Cisco Catalyst 2950 Series enables metro network scalability at the access edge through its support of Cisco CWDM GBIC Solution. This solution allows service providers to scale their bandwidth without deploying additional fiber. The service provider can scale up to eight gigabits of bandwidth on a pair of single-mode fibers at distances up to 120 km. With the support for Cisco CWDM GBICs on the Cisco Catalyst 2950 Series, service providers can aggregate multiple Cisco Catalyst 2950 Series switches to easily upgrade network bandwidth with existing fiber infrastructure.

Metro network scalability is also enhanced by the Cisco Catalyst 2950 Series support of 4096 VLAN IDs and 256 active VLANs per switch.

Service Security Through Cisco Access Control Parameters and Enhanced Security Features

The Cisco Catalyst 2950 Series offers enhanced data security through the use of access control parameters (ACPs). By denying packets based on source and destination MAC addresses, IP addresses, or TCP/UDP ports, users can be restricted from sensitive portions of the network. Also, because all ACP lookups are done in hardware, forwarding performance is not compromised when implementing ACP-based security in the network.

Service providers can also implement higher levels of data security by supporting private VLAN edge. This feature provides security and isolation between ports on a switch, ensuring that traffic travels directly from its entry point to the aggregation device through a virtual path and cannot be directed to a different port. Local Proxy Address Resolution Protocol (ARP) works in conjunction with private VLAN edge to minimize broadcasts and maximize available bandwidth.

With the Cisco Catalyst 2950 Series, service providers can implement high levels of console security. Multilevel access security on the switch console and the Web-based management interface prevents unauthorized users from accessing or altering switch configuration. Terminal Access Controller Access Control System (TACACS+) authentication enables centralized access control of the switch and restricts unauthorized users from altering the configuration.

Service providers are also able to enhance their network security by adding 802.1x port-based authentication for authenticating individual customers, and port security with MAC address aging for limiting the concurrent MAC addresses allowed per port.

Service Management Through Cisco IE 2100 Series and SNMP

The Cisco Catalyst 2950 Series provides outstanding service management capabilities via Cisco IE 2100 Series Intelligence Engine support and Simple Network Management Protocol (SNMP). Service providers will be able to integrate the Cisco Catalyst 2950 Series seamlessly into their operations support systems (OSSs) and enable improved flow-through provisioning.

The Cisco IE 2100 Series network device allows service providers to effectively manage a network of Cisco IOS® devices, including the Cisco Catalyst 2950 Series. It is a completely self-contained unit that includes a task-oriented Web graphical user interface (GUI), a programmable extensible markup language (XML) interface, configuration template management, and an embedded repository. Network operators can use the Web GUI to quickly turn existing Cisco IOS command-line interface (CLI) configuration files into reusable templates. The Cisco IE 2100 Series supports easy integration into existing customer OSS/business support system (BSS) and provisioning systems via its external repository support and the event-based Cisco IOS XML interface that effectively "workflow-enables" Cisco device deployment.

Service providers also can manage the Cisco Catalyst 2950 Series using SNMP version 2 and version 3, and the Telnet interface for comprehensive in-band management. A CLI-based management console provides detailed out-of-band management.

A comprehensive set of Management Information Bases (MIBs) is provided for the service provider to collect traffic information on the Cisco Catalyst 2950 Series for various billing methods.

Figure 1
Cisco Catalyst 2950 Series Intelligent Ethernet Switches

Product Features and Benefits

Feature	Benefit
Service Breadth	
Advanced QoS	• This feature enables end-to-end QoS in the network by extending the QoS trust boundary to the edge of the network. • The switches support configuring QoS ACPs on all ports to ensure proper policing and marking on a per-packet basis using ACPs. Up to four ACPs per switch are supported in configuring either QoS ACPs or security filters.
	QoS Classification Support at Ingress • The switches support QoS classification of incoming packets for QoS flows based on Layer 2, Layer 3, and Layer 4 fields. • The following Layer 2 fields or a combination can be used for classifying incoming packets to define QoS flows: source MAC address, destination MAC address, 16-bit Ethertype. • The following Layer 3 and 4 fields or a combination can be used to classify incoming packets to define QoS flows: source IP address, destination IP address, TCP source or destination port number, UDP source or destination port number.
	QoS Metering/Policing at Ingress • Support for metering/policing of incoming packets restricts incoming traffic flows to a certain rate. • The switches support up to 6 policers per Fast Ethernet port, and 60 policers on a Gigabit Ethernet port. • The switches offer granularity of traffic flows at 1 Mbps on Fast Ethernet ports, and 8 Mbps on Gigabit Ethernet ports. QoS Marking at Ingress • The switches support marking/remarking packets based on state of policers/meters. • The switches support marking/remarking based on the following mappings: from DSCP to 802.1p, and 802.1p to DSCP. • The switches support 14 well-known and widely used DSCP values. • The switches support classifying or reclassifying packets based on default DSCP per port. • The switches support classifying or reclassifying frames based on default 802.1p value per port. • The switches support 802.1p override at ingress.

Feature	Benefit
Service Breadth	
Advanced QoS (continued)	QoS Scheduling Support at Egress • Four queues per egress port are supported in hardware. • The WRR queuing algorithm ensures that low-priority queues are not starved. • Strict-priority queue configuration ensures that time-sensitive applications such as voice always follow an expedited path through the switch fabric.
Granular rate limiting	• The switch supports up to 6 policers per Fast Ethernet port and up to 60 policers on a Gigabit Ethernet port. • The switch offers granularity of traffic flows at 1 Mbps on Fast Ethernet ports and 8 Mbps on Gigabit Ethernet ports. • The switch offers the ability to limit data flows based on MAC source/destination address, IP source/destination address, TCP/UDP port numbers, or any combination of these fields. • The switch offers the ability to manage data flows asynchronously upstream and downstream from the end station or on the uplink.
Voice and video services	• The IGMP snooping feature allows the switch to "listen in" on the IGMP conversation between hosts and routers. When a switch hears an IGMP join request from a host for a given multicast group, the switch adds the host port number to the GDA list for that group. And, when the switch hears an IGMP leave request, it removes the host port from the list. • Multicast VLAN registration (MVR) continuously sends multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons. • IGMP filtering provides the control of the set of multicast groups to which a user on a switch port can belong. • Voice VLAN (auxiliary VLAN) support for VoIP application allows the creation
Resiliency and reliability	• IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) takes advantage of point-to-point wiring and provides rapid convergence of the spanning tree independent of spanning-tree timers. Reconfiguration of the spanning tree can occur in less than one second, a feature that is critical for networks carrying delay-sensitive traffic such as voice and video. • IEEE 802.1s Multiple Spanning Tree (MSTP), which uses RSTP for rapid convergence, enables VLANs to be grouped into a spanning-tree instance, with each instance having a spanning-tree topology independent of other spanning-tree instances. This architecture provides for multiple forwarding paths for data traffic, enables load balancing, and reduces the number of spanning-tree instances required to support a large number of VLANs. • Cisco UplinkFast/BackboneFast technologies ensure quick failover recovery, enhancing overall network stability and reliability.

Feature	Benefit
Service Breadth	
Resiliency and reliability (continued)	• Cisco CrossStack UplinkFast (CSUF) technology provides increased redundancy and network resiliency through fast spanning-tree convergence (less than two seconds) across a stack of switches using Cisco GigaStack GBICs in an independent stack backplane cascaded configuration. • Redundant stacking connections provide support for a redundant loopback connection for top and bottom switches in an independent stack backplane cascaded configuration. • BPDU guard shuts down STP PortFast-enabled interfaces when BPDUs are received to avoid accidental spanning tree topology changes. • STRG prevents edge devices not in the network administrator's control from becoming STP root nodes. • Command switch redundancy enabled in the Cisco Cluster Management Suite (CMS) Software allows customers to designate a backup command switch that takes over cluster management functions if the primary command switch fails. • Unidirectional link detection (UDLD) detects and disables unidirectional links on fiber-optic interfaces caused by incorrect fiber-optic wiring or port faults. Aggressive UDLD allows precautionary disabling of port on bidirectional links. • Per-port broadcast, multicast, and unicast storm control prevents faulty end stations from degrading overall systems performance. • Support for Cisco's optional RPS 300 Redundant Power System provides superior internal power source redundancy for up to six Cisco networking devices, resulting in improved fault tolerance and network uptime.
Redundancy	• Bandwidth aggregation up to 4 Gbps through Cisco Gigabit EtherChannel technology and up to 1.6 Gbps through Cisco Fast EtherChannel technology enhances fault tolerance and offers higher-speed aggregated bandwidth between switches, to routers and individual servers. • IEEE 802.1D STP support for redundant backbone connections and loop-free networks simplifies network configuration and improves fault tolerance. • PVST+ allows for Layer 2 load sharing on redundant links to efficiently utilize the extra capacity inherent in a redundant design. • VLAN Trunking Protocol (VTP) pruning limits bandwidth consumption on VTP trunks by flooding broadcast traffic only on trunk links required to reach the destination devices.
Scalability	• CWDM GBIC solution support allows for the scaling of bandwidth without deploying additional fiber. It provides scalability of up to eight Gigabits of bandwidth on a pair of single-mode fibers to reach distances up to 100–120 km. • Support for up to 4096 VLAN Ids with 250 active VLANs per switch, and up to 64 spanning tree instances per switch.

Feature	Benefit
Service Security	

Network-wide security features	• Filtering of incoming traffic flows based on Layer 2, Layer 3, or Layer 4 ACPs prevents unauthorized data flows. Up to four ACPs are supported in configuring either QoS or security filters.
	
	  – The following Layer 2 ACPs or a combination can be used for security classification of incoming packets: source MAC address, destination MAC address, and 16-bit Ethertype.
	
	  – The following Layer 3 and Layer 4 fields or a combination can be used for security classification of incoming packets: source IP address, destination IP address, TCP source or destination port number, UDP source, or destination port number.
	
	• Private VLAN edge provides security and isolation between ports on a switch, ensuring that voice traffic travels directly from its entry point to the aggregation device through a virtual path and cannot be directed to a different port.
	
	• IEEE 802.1x for dynamic port-based security.
	
	• Support for "secure ports" prevents unauthorized stations from accessing the switch by restricting the number of concurrent MAC addresses allowed to access the port. Up to 132 addresses can be configured per port.
	
	• STRG prevents edge devices not in the network administrator's control from becoming STP root nodes.
	
	• The STP PortFast/ BPDU guard feature disables access ports with STP PortFast enabled upon reception of a BPDU, and increases network reliability, manageability, and security.
	
	• Multilevel security on console access prevents unauthorized users from altering the switch configuration.
	
	• TACACS+ and Remote Access Dial-In User Service (RADIUS) authentication enables centralized control of the switch and restricts unauthorized users from altering the configuration.

Service Management	
Superior manageability	• Cisco IE 2100 support for flow- through provisioning and integration with OSS applications via programmatical interfaces. • SNMP v1, v2c, v3, and Telnet interface support delivers comprehensive in-band management, and a CLI-based management console provides detailed out-of-band management. • Manageable through CiscoWorks network management software on a per-port and per-switch basis providing a common management interface for Cisco routers, switches, and hubs. • Comprehensive MIBs enable the service provider to collect traffic information on the Cisco Catalyst 2950 Series for various billing methods.

Feature	Benefit
Service Management	
Superior manageability (continued)	• An embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events) for enhanced traffic management, monitoring, and analysis.
	• The switch supports all nine RMON groups through the use of a Cisco SwitchProbe® Analyzer (Switched Port Analyzer [SPAN]) port, permitting traffic monitoring of a single port, a group of ports, or the entire switch from a single network analyzer or RMON probe.
	• RSPAN (Remote SPAN) allows network administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.
	• The Domain Name System (DNS) provides IP address resolution with user-defined device names.
	• Trivial File Transfer Protocol (TFTP) reduces the cost of administering software upgrades by downloading from a centralized location.
	• Network Timing Protocol (NTP) provides an accurate and consistent timestamp to all switches within the intranet.
	• Multifunction LEDs per port for port status, half-duplex/full-duplex, 10BaseT/100BaseTX/1000BaseT indication, as well as switch-level status LEDs for system, redundant power supply, and bandwidth utilization provide a comprehensive and convenient visual management system.
Ease of use and ease of deployment	• Autoconfiguration eases deployment of switches in the network by automatically configuring multiple switches across a network via a boot server.
	• Autosensing on each non-GBIC port detects the speed of the attached device and automatically configures the port for 10-, 100-, or 1000-Mbps operation, easing the deployment of the switch in mixed 10, 100, and 1000BaseT environments.
	• Autonegotiating on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
	• Cisco Discovery Protocol Versions 1 and 2 enable a CiscoWorks network management station to automatically discover the switch in a network topology.
	• Cisco VTP supports dynamic VLANs and dynamic trunk configuration across all switches.
	• Support for dynamic VLAN assignment through implementation of VLAN Membership Policy Server (VMPS) client functionality provides flexibility in assigning ports to VLANs.
	• Dynamic Trunking Protocol (DTP) enables dynamic trunk configuration across all ports in the switch.
	• Port Aggregation Protocol (PAgP) automates the creation of Cisco Fast EtherChannel or Gigabit EtherChannel groups, enabling linking to another switch, router, or server.
	• IEEE 802.3z-compliant 1000BaseSX, 1000BaseLX/LH, 1000BaseZX, and 1000BaseT physical interface support through a field-replaceable GBIC module provides customers unprecedented flexibility in switch deployment.

Feature	Benefit
Service Management	
Ease of use and ease of deployment (continued)	• The default configuration stored in Flash memory ensures that the switch can be quickly connected to the network and can pass traffic with minimal user intervention. • The switches support nonstandard Ethernet frame sizes (mini-giants) up to 1542 bytes (configurations with GBIC ports only).

Product Specifications

(See separate Cisco Catalyst 2950 LRE data sheet for Catalyst 2950ST-24-LRE and Catalyst 2950ST-8-LRE product specifications)

Feature	Description
Performance	• 13.6-Gbps switching fabric • 6.8-Gbps maximum forwarding bandwidth • Forwarding rates based on 64-byte packets • Cisco Catalyst 2950G-48: 10.1-Mpps wire-speed forwarding rate • Cisco Catalyst 2950G-24 and 2950G-24-DC: 6.6-Mpps wire-speed forwarding rate • Cisco Catalyst 2950G-12: 4.8-Mpps wire-speed forwarding rate • Cisco Catalyst 2950T-24: 6.6-Mpps wire-speed forwarding rate • Cisco Catalyst 2950C-24: 3.9-Mpps wire-speed forwarding rate • 32-MB maximum packet buffer shared by all ports • 16-MB DRAM and 8-MB Flash memory • Configurable up to 8000 MAC addresses • Configurable maximum transmission unit (MTU) of up to 1530 bytes (Cisco Catalyst 2950G
Management	• BRIDGE-MIB • CISCO-CDP-MIB • CISCO-CLUSTER-MIB • CISCO-CONFIG-MAN-MIB • CISCO-FLASH-MIB • CISCO-IMAGE-MIB • CISCO-MAC-NOTIFICATION-MIB • CISCO-MEMORY-POOL-MIB • CISCO-PAGP-MIB • CISCO-PING-MIB • CISCO-PROCESS-MIB • CISCO-PRODUCTS-MIB • CISCO-RTTMON-MIB • CISCO-STACKMAKER-MIB • CISCO-STP-EXTENSIONS-MIB

Feature	Description
Management (continued)	• CISCO-SYSLOG-MIB • CISCO-TCP-MIB • CISCO-VLAN-MEMBERSHIP-MIB • CISCO-VTP-MIB • ENTITY-MIB • IANAifType-MIB • IF-MIB (RFC 1573) • OLD-CISCO-CHASSIS-MIB • OLD-CISCO-CPU-MIB • OLD-CISCO-INTERFACES-MIB • OLD-CISCO-IP-MIB • OLD-CISCO-MEMORY-MIB • OLD-CISCO-SYSTEM-MIB • OLD-CISCO-TCP-MIB • OLD-CISCO-TS-MIB • CISCO-PAGP-MIB • CISCO-UDLD-MIB • RFC1213-MIB (MIB-II) • RFC1398-MIB (ETHERNET-MIB) • RMON-MIB (RFC 1757) • RS-232-MIB • SNMPv2-MIB • SNMPv2-SMI • SNMPv2-TC • TCP-MIB • UDP-MIB
Standards	• IEEE 802.1x support • IEEE 802.1w • IEEE 802.1s • IEEE 802.3x full duplex on 10BaseT, 100BaseTX, and 1000BaseT ports • IEEE 802.1D STP • IEEE 802.1p class-of-service (CoS) prioritization • IEEE 802.1Q VLAN • IEEE 802.3 10BaseT specification • IEEE 802.3u 100BaseTX specification • IEEE 802.3ab 1000BaseT specification • IEEE 802.3z 1000BaseX specification

Feature	Description
Standards (continued)	• 1000BaseX (GBIC) • 1000BaseSX • 1000BaseLX/LH • 1000BaseZX • 1000Base-CWDM GBIC 1470 nm • 1000Base-CWDM GBIC 1490 nm • 1000Base-CWDM GBIC 1510 nm • 1000Base-CWDM GBIC 1530 nm • 1000Base-CWDM GBIC 1550 nm • 1000Base-CWDM GBIC 1570 nm • 1000BaseE-CWDM GBIC 1590 nm • 1000Base-CWDM GBIC 1610 nm • RMON I and II standards • SNMPv1, SNMPv2c, and SNMPv3
Year 2000 (Y2K) compliance	• Y2K compliant
Connectors and cabling	• 10BaseT ports: RJ-45 connectors; two-pair Category 3, 4, or 5 unshielded twisted-pair (UTP) cabling • 100BaseTX ports: RJ-45 connectors; two-pair Category 5 UTP cabling • 1000BaseT ports: RJ-45 connectors; two-pair Category 5 UTP cabling • 100BaseFX ports: MT-RJ connectors, 50/125 or 62.5/125 micron multimode fiber-optic cabling • 1000BaseSX, -LX/LH, -ZX GBIC-based ports: SC fiber connectors, single-mode or multimode fiber • Cisco GigaStack GBIC ports: copper-based Cisco GigaStack cabling • Management console port: 8-pin RJ-45 connector, RJ-45-to-RJ-45 rollover cable with RJ-45-to-DB9 adapter for PC connections; for terminal connections, use RJ-45-to-DB25 female data-terminal-equipment (DTE) adapter (can be ordered separately from Cisco, part number ACS-DSBUASYN=)

MT-RJ patch cables for Cisco Catalyst 2950C-24 Switch	Type of Cable	Cisco Part Number
	1-meter, MT-RJ-to-SC multimode cable	CAB-MTRJ-SC-MM-1M
	3-meter, MT-RJ-to-SC multimode cable	CAB-MTRJ-SC-MM-3M
	5-meter, MT-RJ-to-SC multimode cable	CAB-MTRJ-SC-MM-5M
	1-meter, MT-RJ-to-ST multimode cable	CAB-MTRJ-ST-MM-1M
	3-meter, MT-RJ-to-ST multimode cable	CAB-MTRJ-ST-MM-3M
	5-meter, MT-RJ-to-ST multimode cable	CAB-MTRJ-ST-MM-5M

Feature	Description
Power connectors	Customers can provide power to a switch by using either the internal power supply or the Cisco RPS 300. The connectors are located at the back of the switch. **Internal Power Supply Connector** • The internal power supply is an auto-ranging unit. • The internal power supply supports input voltages between 100 and 240 VAC. • Use the supplied AC power cord to connect the AC power connector to an AC power outlet. **Cisco RPS Connector** • The connector offers connection for an optional Cisco RPS 300 that uses AC input and supplies DC output to the switch. • The connector offers a 300-watt redundant power system that can support six external network devices and provides power to one failed device at a time. • The connector automatically senses when the internal power supply of a connected device fails and provides power to the failed device, preventing loss of network traffic. • When the internal power supply has been brought up or replaced, the Cisco RPS 300 automatically stops powering the device. • Attach only the Cisco RPS 300 (model PWR300-AC-RPS-N1) to the redundant power supply receptacle.
Indicators	• Per-port status LEDs: link integrity, disabled, activity, speed, and full-duplex indications • System status LEDs: system, RPS, and bandwidth utilization indications
Dimensions and weight **(H x W x D)**	• 1.72 x 17.5 x 9.52 in. (4.36 x 44.5 x 24.18 cm) (Cisco Catalyst 2950T-24, 2950C-24, 2950G-12, 2950G-24, and 2950G-24-DC) • 1.72 x 17.5 x 13 in. (4.36 x 44.5 x 33.02 cm) (Cisco Catalyst 2950G-48) • 1.0 rack-unit high • 6.5 lb. (3.0 kg) (Cisco Catalyst 2950T-24, 2950C-24, 2950G-12, 2950G-24, and 2950G-24-DC) • 10 lb. (4.5 kg) (Cisco Catalyst 2950G-48)
Environmental ranges	• Operating temperature: 32 to 113 F (0 to 45 C) • Storage temperature: –13 to 158 F (–25 to 70 C) • Operating relative humidity: 10 to 85% (noncondensing) • Operating altitude: Up to 10,000 ft. (3000m) • Storage altitude: Up to 15,000 ft. (4500m) • Not intended for use on top of desktops or in open office environments

Power requirements	• Power consumption: 30W maximum, 102 BTUs per hour (Cisco Catalyst 2950T-24, 2950C-24, 2950G-12, 2950G-24, and 2950G-24-DC)
	• Power consumption: 45W maximum, 154 BTUs per hour (Cisco Catalyst 2950G-48)
	• AC input voltage/frequency: 100 to 127/200 to 240 VAC (autoranging), 50 to 60 Hz
	• DC input voltages
	  – RPS input: +12V @ 4.5 A
	  – DC input for 2950G-24-DC: –36 to –72 VDC @ 1A

Feature	Description
Mean time between failure (MTBF) – Predicted	• 482,776 hours (Cisco Catalyst 2950G-12) • 468,884 hours (Cisco Catalyst 2950G-24) • 479,086 hours (Cisco Catalyst 2950G-24-DC) • 159,026 hours (Cisco Catalyst 2950G-48) • 297,144 hours (Cisco Catalyst 2950T-24) • 268,292 hours (Cisco Catalyst 2950C-24)
Fiber-port specifications for Cisco Catalyst 2950C-24 Switch	Fiber-port power levels: • Optical transmitter wavelength: 1300 nanometers • Optical receiver sensibility: –14 dBm2 • Optical transmitter power: –19 to –14 dBm • Transmit: –19 to –14 dBm
Regulatory Agency Approvals	
Safety certifications	• UL 1950/CSA 22.2 No. 950 • IEC 950-EN 60950 • AS/NZS 3260, TS001 • CE Marking
Electromagnetic emissions certifications	• FCC Part 15 Class A • EN 55022: 1998 Class A (CISPR22 Class A) • EN 55024: 1998 (CISPR24) • VCCI Class A • AS/NZS 3548 Class A • CE Marking • CNS 13438 • BSMI Class A • MIC
NEBS	• Bellcore • GR-1089-CORE • GR-63-CORE • SR-3580 Level 3
Warranty	• Limited lifetime warranty

Service and Support

The services and support programs described in the table below are available as part of the Cisco Desktop Switching Service and Support solution, and are available directly from Cisco and through resellers

Service and Support	Features	Benefits
Cisco Advanced Services		
Cisco Total Implementation Solutions (TIS)—available direct from Cisco **Packaged Total Implementation Solutions (Packaged TIS)—available through resellers**	• Project management • Site survey, configuration deployment • Installation, text, and cutover • Training • Major moves, adds, changes • Design review and product staging	• Supplements existing staff • Ensures functionality meets needs • Mitigates risk
Technical Support Services		
Cisco SMARTnet™ and SMARTnet Onsite Support (OS)—available direct from Cisco	• 24x7 access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC)	• Enables proactive or expedited issue resolution • Lowers cost of ownership by utilizing Cisco expertise and knowledge
Packaged SMARTnet— available through resellers	• Advance replacement of hardware parts	• Minimizes network downtime

Ordering Information

Model numbers	Configuration
WS-C2950G-48-EI	• 48 10/100 ports + 2 1000BaseX ports • Enhanced Software Image (EI) installed
WS-C2950G-24-EI	• 24 10/100 ports + 2 1000BaseX ports • EI installed
WS-C2950G-24-EI-DC	• 24 10/100 ports + 2 1000BaseX ports, DC power • EI installed
WS-C2950G-12-EI	• 12 10/100 ports + 2 1000BaseX ports • EI installed
WS-C2950T-24	• 24 10/100 ports + 2 1000BaseT ports • EI installed
WS-C2950C-24	• 24 10/100 ports + 2 100BaseFX ports • EI installed
WS-C2950ST-24-LRE	• 24 LRE ports + 2 10BaseT/100BaseTX/1000BasetT Ethernet ports + 2 Small Form Factor Pluggable (SFP) Transceivers (two of four uplink ports active at one time • EI Installed
WS-C2950ST-8-LRE	• 8 LRE ports + 2 10BaseT/100BaseTX/1000BasetT Ethernet ports + 2 Small Form Factor Pluggable (SFP) Transceivers (two of four uplink ports active at one time • EI Installed

For More Information on Cisco Products, Contact:

- United States and Canada: 800 553-NETS (6387)

- Europe: 32 2 778 4242

- Australia: 612 9935 4107

- Other: 408 526-7209

- World Wide Web URL: http://www.cisco.com

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