

## Cisco Catalyst 4500 Series Switches

Cisco Catalyst 4500 Series switches integrate resiliency for advanced control of converged networks of voice, video, and data traffic.

### OVERVIEW

Cisco® Catalyst® 4500 Series switches (Figure 1) integrate nonblocking Layer 2–4 switching with optimal control, helping enable business resilience for enterprises, small and medium-sized businesses (SMBs), and Metro Ethernet customers deploying business-critical applications. The Cisco Catalyst 4500 Series extends control to the network edge with intelligent network services, including sophisticated quality of service (QoS), predictable performance, advanced security, and comprehensive management. It delivers advanced control with integrated resiliency. Integrated resiliency in both hardware and software minimizes network downtime, helping to ensure workforce productivity, profitability, and customer success. The modular architecture, media flexibility, and expandability of the Cisco Catalyst 4500 Series extends deployment life while reducing the cost of ownership by minimizing recurring operational expenses and improving return on investment (ROI).

Figure 1. Cisco Catalyst 4500 Series Switches



### CONVERGENCE

In today's highly competitive business environment, a converged network plays a critical role in helping an organization gain a competitive advantage through increased productivity, organizational flexibility, and reduced operational costs. Integration of data, voice, and video on a single (IP-based) network requires a switching infrastructure that can distinguish each traffic type and manage it according to its unique requirements. The Cisco Catalyst 4500 Series provides a switching infrastructure that, when combined with Cisco IOS® Software, can deliver advanced functions and control.

### OPTIMAL CONTROL

The Cisco Catalyst 4500 Series provides the network infrastructure for all applications that will be integrated to solve business problems. Extending intelligent network services with integrated resiliency leads to control of all traffic types with minimal downtime. The Cisco Catalyst 4500 Series delivers this control with the following:

- **Integrated resiliency**—Network downtime is minimized with redundant supervisor engine (subsecond failover) capability (Cisco Catalyst 4507R and Catalyst 4510R switches), software-based fault tolerance, redundant fans, and 1+1 power-supply redundancy across the Cisco Catalyst 4500

Series. Integrated Power over Ethernet (PoE) in all Cisco Catalyst 4500 Series chassis simplifies network design and limits the number of points of failure in an IP telephony implementation.

- **Sophisticated QoS**—Integrated QoS and traffic-management capabilities based on Layer 2–4 classify and prioritize mission-critical and time-sensitive traffic based on 32,000 QoS policy entries. The Cisco Catalyst 4500 Series can shape and rate-limit bandwidth-intensive traffic with mechanisms such as input and output policers based on host, network, and application information.
- **Predictable performance**—The Cisco Catalyst 4500 Series offers up to a 102-million packets per second (mpps) wire-speed forwarding rate in hardware for Layer 2–4 traffic. Switching performance is independent of the number of route entries or advanced Layer 3 services enabled.
- **Advanced security**—Support for Cisco patented Layer 2 security features prevents security breaches from rogue servers as well as “man in the middle” attacks where passwords and data may be intercepted. Layer 2–4 filtering and policing are also supported to mitigate the traffic initiated from malicious network attackers.
- **Comprehensive management**—The Cisco Catalyst 4500 Series offers Web-based management for the configuration and control of all ports, allowing central management of critical network characteristics such as availability and responsiveness.

## SCALABLE ARCHITECTURE

Convergence lowers the overall cost of network ownership and simplifies administration and maintenance through the elimination of separate voice, video, and data infrastructures. The modular architecture of the Cisco Catalyst 4500 Series provides the scalability and flexibility to eliminate the need for multiplatform deployments, minimizing maintenance expenses. To further extend customers’ network-equipment deployment cycles, the Cisco Catalyst 4500 Series offers the following features:

- **Backward compatibility of line cards**—Customers are given the flexibility to upgrade line cards with the existing deployed chassis to higher-speed interfaces without changing the complete chassis, postponing the need for additional capital expenditures.
- **Extra room for future features**—The Cisco Catalyst 4500 Series architecture was designed with generous amounts of hardware resources to support future features applicable to your network needs. With a simple Cisco IOS Software upgrade, you can receive the benefits of many hardware-enabled features without the need for a complete chassis upgrade.

## CISCO CATALYST 4500 SERIES

The Cisco Catalyst 4500 Series includes four chassis options: Cisco Catalyst 4510R (10 slots), Catalyst 4507R (7 slots), Catalyst 4506 (6 slots), and Catalyst 4503 (3 slots). The Cisco Catalyst 4500 Series provides a common architecture, taking advantage of existing Cisco Catalyst 4000 Series line cards scaling up to 388 Ethernet ports. Offering compatibility with existing Cisco Catalyst 4000 Series line cards and supervisor engines, the Cisco Catalyst 4500 Series extends its window of deployment in converged networks.

## CISCO CATALYST 4500 SERIES BENEFITS

The Cisco Catalyst 4500 Series provides advanced, high-performance solutions for enterprise LAN access, small backbone networks, Layer 3 distribution points, and integrated SMB and branch-office solutions. Benefits include the following:

- **Performance**—Delivering advanced switching solutions that scale bandwidth as ports are added, the Cisco Catalyst 4500 Series is powered by leading-edge, application-specific integrated circuit (ASIC) technology that offers wire-speed Layer 2–3 10/100 or gigabit switching. Providing modular supervisor flexibility with complete line-card compatibility, Layer 2 switching can scale up to 136 Gbps, 102 mpps. Based on Cisco Express Forwarding, Layer 3–4 switching can also scale up to 136 Gbps, 102 mpps.
- **Port density**—The Cisco Catalyst 4500 Series meets network-element connectivity requirements of up to 388 Ethernet ports in a chassis. The Catalyst 4500 Series supports the industry’s highest-density 10/100/1000 autosensing, autonegotiating Gigabit Ethernet from the network edge directly to desktop computers. Optional 10 Gigabit Ethernet uplink ports help enable high-density Gigabit Ethernet-to-the-desk deployments and switch-to-switch applications. The hot-swappable, modular, easy-to-use switching solution of the Catalyst 4500 Series reduces complexity and easily supports the changing desktop environments of today’s networks.
- **Supervisor-engine redundancy**—The Cisco Catalyst 4507R and 4510R switches support 1+1 supervisor-engine redundancy for integrated resiliency. Redundant supervisor engines help minimize network downtime, facilitating business continuance and increasing employee productivity. Nonstop Forwarding with Stateful Switchover (NSF/SSO) offers continuous packet forwarding during supervisor engine switchover.

Information is fully synchronized between supervisors to allow the standby supervisor to immediately take over in subsecond time if the primary fails. NSF/SSO dramatically improves the network reliability and availability in a Layer 2 or Layer 3 environment. NSF/SSO is essential for business-critical applications such as voice over IP (VoIP). As a result, VoIP calls are not dropped.

- **Power over Ethernet (PoE)**—The Cisco Catalyst 4500 Series supports the 802.3af standard for PoE on 10/100 or 10/100/1000 ports, allowing customers to support telephones, wireless base stations, video cameras, and other appliances. PoE makes it possible to place devices in unique locations without having to provide new outlets and costly electrical circuits. Moreover, PoE allows businesses to isolate critical devices on a single power system—so the entire system can be supported by uninterruptible power supply (UPS) backup.

All new Cisco Catalyst PoE line cards can support 15.4 watts (W) of power per port simultaneously. Not only do the cards support the IEEE standard, including the optional power classifications, but the Cisco prestandard power implementation is also supported to help ensure backward compatibility with existing Cisco powered devices. The cards are compatible with any Cisco Catalyst 4500 Series chassis and supervisor engine. Most importantly, the Cisco Catalyst 4500 Series has the power supplies and accessories to support 15.4W per port on every port simultaneously in any fully loaded chassis.

- **Advanced security**—Enabling security features such as 802.1x, access control lists (ACLs), Secure Shell (SSH) Protocol, port security, Dynamic ARP Inspection (DAI), IP Source Guard, Control Plane Policing, 802.1x Inaccessible Authentication Bypass, 802.1x Unidirectional Controlled Port, MAC Authentication Bypass, and private virtual LANs (PVLANS) on the Cisco Catalyst 4500 Series enhances control and flexibility in the network. By enabling these features selectively or collectively, a network administrator can prevent unauthorized access to servers or applications, allow different people to use the same PC with different permissions, prevent network intruders from stealing usernames and passwords to access switches, or prevent a deliberate or accidental broadcast storm.
- **Cisco IOS Software network services**—Cisco Catalyst 4500 Series switches provide mature enterprise Layer 2–3 features capable of enhancing corporate networks. These features meet the advanced networking demands of medium-sized and large enterprise businesses because they have been improved based on years of customer feedback.
- **Consistent software architecture**—Because of the consistent Cisco Catalyst software and user interfaces, you can take advantage of your knowledge base and continue to grow your infrastructure using a combination of Cisco Catalyst 2950, Catalyst 3550, Catalyst 3560, Catalyst 3750, Catalyst 4500, and Catalyst 6500 series switches.
- **Investment protection**—The flexible modular architecture of the Cisco Catalyst 4500 Series provides cost-effective interface upgrades for LAN access or the branch-office network. Customers deploying the Cisco Catalyst 4503 and Catalyst 4506 switches with older supervisor engines who want higher performance and enhanced features can easily upgrade to the Cisco Catalyst 4500 Series Supervisor Engine II-Plus, II-Plus-TS, II-Plus-10GE, IV, V or V-10GE. Compatible sparing between the Catalyst 4500 Series, Catalyst 4003, and Catalyst 4006 chassis provides commonality of power supplies and switching line cards, lowering the overall deployment, migration, and support costs.
- **Functionally transparent line cards**—Cisco Catalyst 4500 Series systems can easily upgrade all system ports to higher-layer switching functions by simply adding a new supervisor engine. Higher-layer functional enhancements are possible on all system ports without replacing existing line cards and wiring, unlike conventional switching products where complete equipment upgrades are typical during migration. This architectural advantage extends the useful deployment life of Cisco Catalyst 4500 Series line cards.
- **Gigabit to the desktop**—The Cisco Catalyst 4500 Series already provides numerous 1000-Mbps desktop and server switching solutions. The scope of its gigabit solutions is easily extended to the desktop, with 48- and 24-port triple-speed autosensing and autonegotiating 10/100/1000BASE-T line cards for the Catalyst 4500 Series. The triple-speed 48- and 24-port modules, with autosensing technology, provide LAN investment protection by allowing Fast Ethernet desktops to migrate to Gigabit Ethernet in the future without replacing the line cards.

The Catalyst 4500 Series Supervisor Engine V-10GE provides two wire-speed 10 Gigabit Ethernet uplinks that are optimized for 10/100/1000BASE-T-to-the-desktop aggregation.

- **Hardware-based multicast**—Protocol Independent Multicast (PIM), dense and sparse mode, Internet Group Management Protocol (IGMP), and Cisco Group Management Protocol support standards-based and Cisco technology-enhanced efficient multimedia networking without compromising performance.
- **Manageability**—The Cisco Catalyst 4500 Series is supported by the Cisco Works product line, which provides innovative tools to centrally manage critical network characteristics such as availability, responsiveness, resilience, and security for the intelligent-switching infrastructure. A common modular QoS command-line interface (CLI) simplifies the creation of policy traffic maps and delivers a consistent interface across

large and small Cisco Catalyst switches. Network operations are enhanced with flexible Web-, GUI-, and CLI-based management alternatives. Best of all, behind every Cisco Catalyst 4500 Series Switch are Cisco service and support solutions.

- **Cisco NetFlow Services**—The Cisco NetFlow Services Card for the Supervisor Engine IV and V support statistics capture in hardware for flow-based and VLAN-based statistics monitoring. This data can be exported, collected, and analyzed for virus detection and mitigation, network-traffic accounting, usage-based network billing, network planning, network monitoring, and data-mining capabilities for both service provider and enterprise customers. Note: NetFlow support on the Supervisor Engine V-10GE is built into the hardware and does not require the NetFlow Services Card.
- **Bandwidth protection for mission-critical applications**—When deploying the Cisco Catalyst 4500 Series Supervisor Engine, there is no degradation of forwarding performance with QoS or security features enabled; the Catalyst 4500 Series platform continues to forward at full line rate.
- **Fiber to the desktop**—The Cisco Catalyst 4500 Series 100BASE-X line cards offer the security and resiliency features of fiber-optic cable plants, making them ideal for networks with distance limitations, intrusion vulnerabilities, or RF interference. Enterprise customers or government agencies that process confidential information or offer e-commerce will appreciate the security benefits of these line cards.

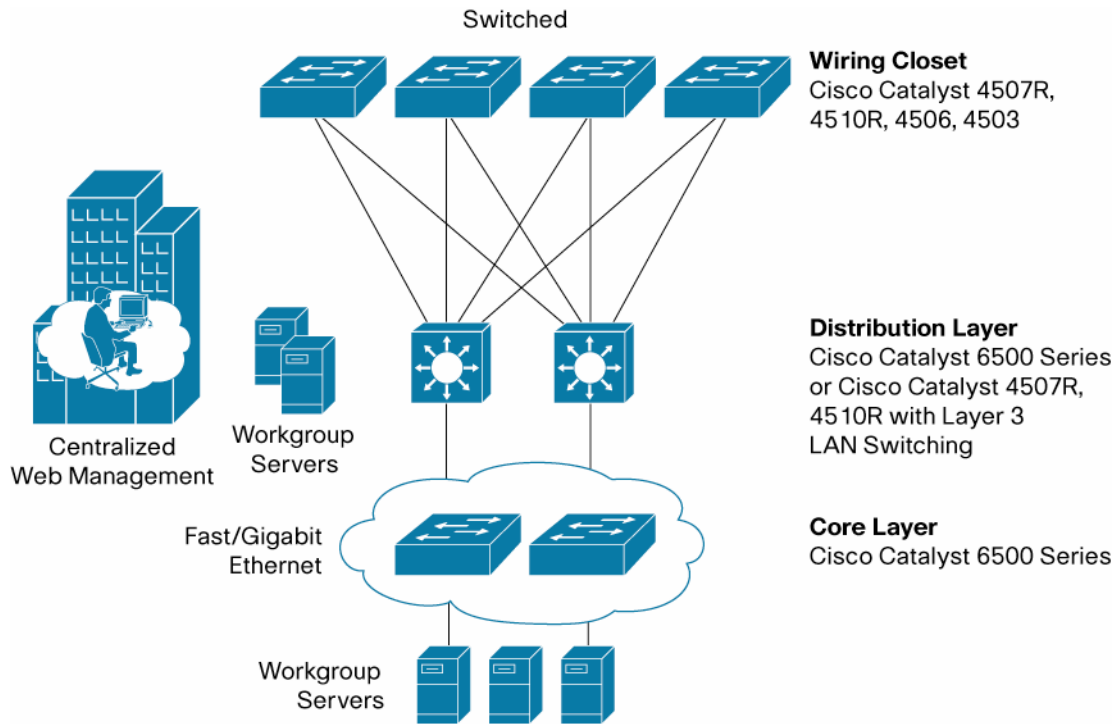
## APPLICATIONS

### Multilayer Switched Enterprise Network with Ethernet Backbone

Today's leading-edge network designs use a combination of Layer 2 and 3 services in the LAN (Cisco Catalyst 4500 Series) and Layer 3 routing in the distribution and core-network layers (Catalyst 4500 or Catalyst 6500 series). The Catalyst 4500 Series supports IP-only routing in hardware (Internetwork Packet Exchange [IPX] protocol and AppleTalk in software) with the Catalyst 4500 Series Supervisor Engines, and can be deployed in low-density distribution points in the enterprise network (Figure 2).

The distribution-layer Cisco Catalyst 4500 Series switches use the Cisco Express Forwarding routing engine, capable of scaling up to 136 Gbps at 102 mpps (on the Catalyst 4500 Series Supervisor Engine V-10GE). This helps enable millions of packets-per-second throughput of Layer 3 switching performed in hardware, with no penalty for header-prefix lengths.

**Figure 2.** Large Enterprise Network with Cisco Catalyst 4500 Series Switches



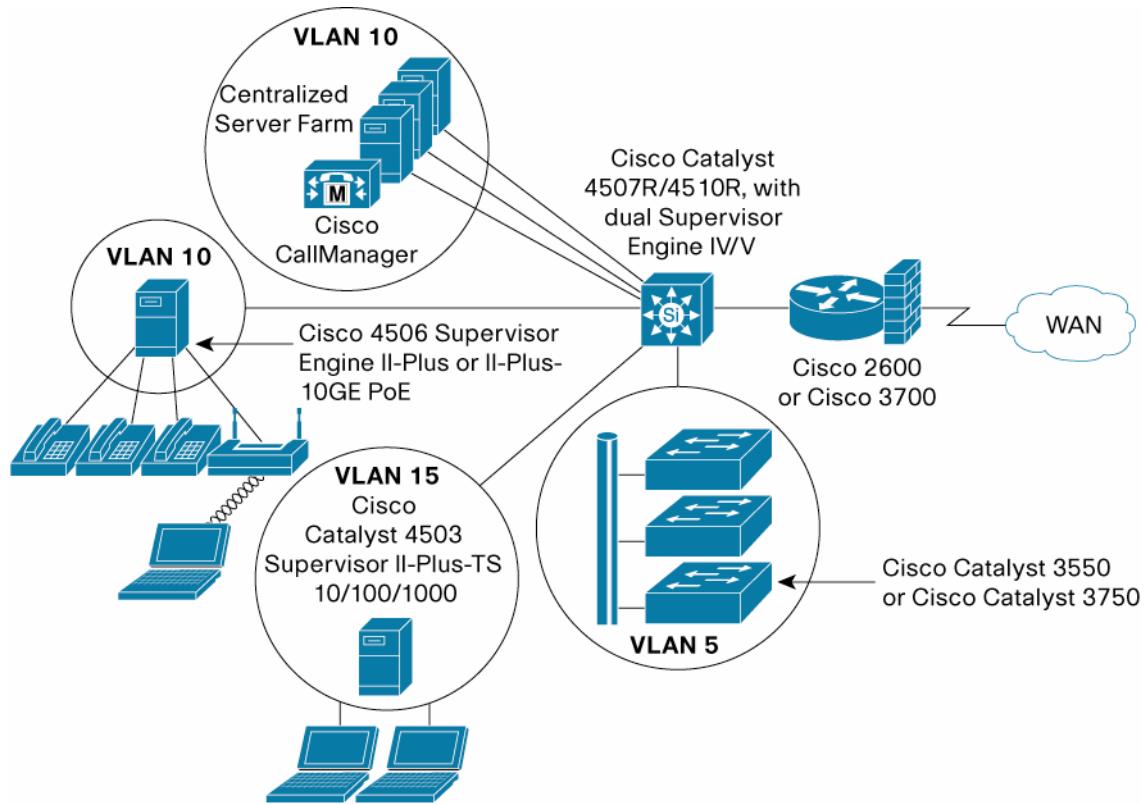
Cisco Catalyst enterprise solution advantages include the following:

- VLAN trunking maximizes uplink usage
- ASIC-based Layer 3 performance equals Layer 2 performance
- Mature Hot Standby Router Protocol (HSRP) provides Layer 3 redundancy
- Cisco UplinkFast, IEEE 802.3s, and IEEE 802.3w in the LAN provide Layer 2 resilience
- Traffic differentiation and service agreements benefit from the rich multilayer QoS—including policing (ingress and egress), classification, shaping, sharing, marking, and advanced scheduling—implemented in hardware with advanced parallel pipeline processing.

### Medium-Sized Enterprise and Enterprise Branch-Office Applications

Cisco Systems® also offers a medium-sized enterprise design alternative with the Cisco Catalyst 4500 Supervisor IV, V, and V-10GE, meeting the needs of value-conscious customers seeking a flexible and scalable LAN solution (Figure 3). Optimized for LAN access for medium-sized enterprises or for education customers, the supervisor engines provide the performance and features to manage network applications now and in the future. They deliver nonblocking Layer 2–4 services to power resilient, intelligent multilayer switching solutions for converged data, voice, and video networks.

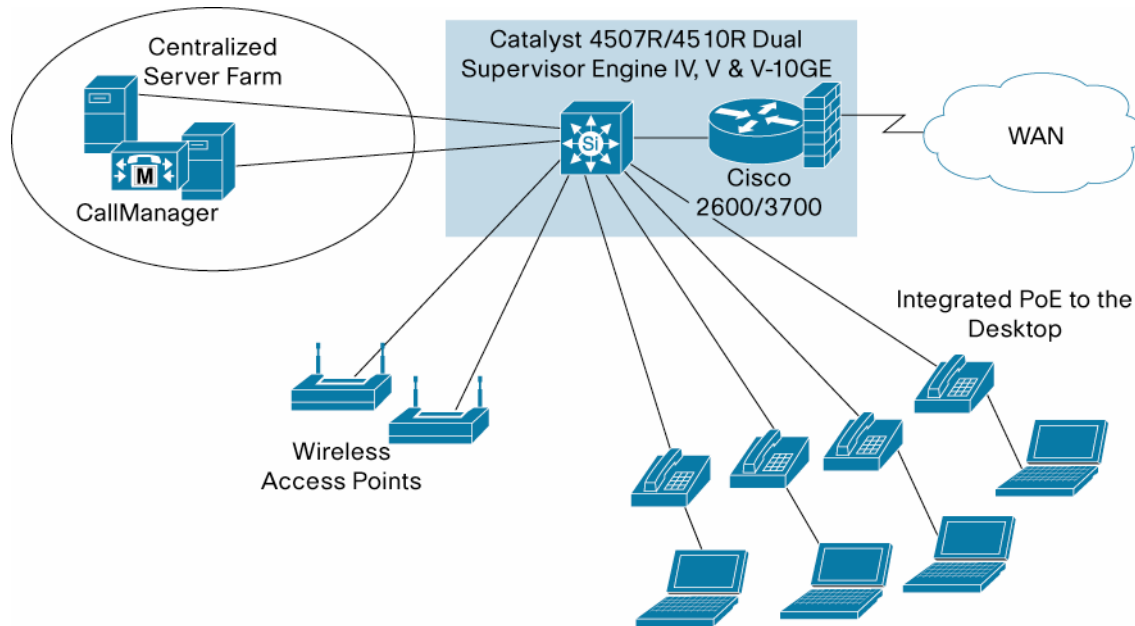
**Figure 3.** Cisco Catalyst Solution for Medium-Sized Enterprise



### Small or Medium-Sized Enterprise and Branch-Office Applications

The Cisco Catalyst 4500 Series provides an ideal branch-office solution capable of meeting the needs of both small and large operations, as well as small-enterprise applications. The Cisco Catalyst 4500 Supervisor Engine IV adds enhanced Layer 3 switching capabilities and gigabit wire-speed performance, allowing for deployment in a branch-office backbone network. Cisco IOS Software provides stable interconnection between other switches and WAN routers. Figure 4 shows a separate LAN switch and WAN router working together as a branch-office solution.

**Figure 4.** Small-Enterprise and Branch-Office Applications



**CISCO CATALYST 4500 SERIES FEATURES AND BENEFITS**

Table 1 lists the features and benefits of the Cisco Catalyst 4500 Series.

**Table 1.** Cisco Catalyst 4500 Series Features, Functions, and Benefits

Features	Functions and Description	Benefits
<b>Chassis</b>		
Modular 3-, 6-, 7-, and 10-slot Cisco Catalyst 4500 Series chassis	Supports supervisor engine (up to two on the Cisco Catalyst 4507R and Catalyst 4510R), power supplies with integrated PoE.	Provides a common architecture with advanced integrated resiliency that can be standardized for campuswide intranet needs.
Nonstop Forwarding (NSF) with Stateful Switchover (SSO)	Provides dual supervisor engines with subsecond failover. Layer 2 sessions remain up. Layer 3 forwarding continues during a routing event.	Ensures supervisor engine switchover is seamless to users in a Layer 2/3 environment, and Nonstop traffic forwarding including mission critical applications and IP voice calls.
SSO-Aware Hot Standby Router Protocol (HSRP)	Offers continuous data packet forwarding during a supervisor engine switchover without a path change to the standby HSRP router.	Adds supervisor redundancy over device redundancy with HSRP to minimize network recovery to a subsecond value.
Fault-tolerant, load-sharing power supplies	Support 1 or 2 power supplies.	Increases reliability using multiple power supplies in a fault-tolerant configuration.
Hot-swappable power supplies and switching modules	Enable hot insertion and extraction for changes and maintenance any time without bringing down your system.	Increases reliability by reducing downtime.
Flexible switching modules-standards-based, autosensing, and autonegotiating	Offer numerous interface choices: 10/100 Mbps Ethernet and 10/100/1000, 1000 Mbps Gigabit Ethernet, or 10000 Mbps 10 Gigabit Ethernet.	Accommodates IP campus LAN bandwidth growth, providing easy migration while scaling the network.

Features	Functions and Description	Benefits
100 Gbps capacity backplane (Cisco Catalyst 4506 and Catalyst 4507R)	Provides enough capacity to forward wire-rate, nonblocking 75 mpps.	Meets the worst-case throughput demands of a fully populated system with all interfaces operating at wire speed (nonblocking fabric requires Cisco Catalyst supervisor engines II-Plus, II-Plus-10GE, IV, V, or V-10GE).
136 Gbps capacity backplane (Cisco Catalyst 4510R)	Provides enough capacity to forward wire-rate, nonblocking 102 mpps, and supports up to 8 switching modules.	Nonblocking, high-density application.
Integrated Cisco IOS Software enhanced Layer 3 switching (Cisco Catalyst 4000/4500 supervisor engines IV and V)	Provides ASIC-based IP routing at gigabit speeds (Open Shortest Path First [OSPF], Enhanced Interior Gateway Routing Protocol [EIGRP], Intermediate System to Intermediate System [IS-IS], and Border Gateway Protocol [BGP]).	Offers Layer 3 subnet control of network traffic; mature and proven routed protocols.
Multilayer QoS	Provides QoS for both Layer 2 class of service (CoS) and Layer 3 type of service (ToS), traffic shaping, sharing, policing, and congestion avoidance with Dynamic Buffer Limiting (DBL).	Provides centralized control of prioritization of networkwide traffic; easily creates and manages policies to protect mission-critical applications.
Ingress and egress policing	Identifies packets at entrance and can reclassify and remark at exit on a per-port and per-VLAN basis.	Provides granular traffic control by user-defined traffic classifications to help ensure QoS policy.
Control Plane Policing	Provides a unified solution to rate limit the CPU-bound control plane traffic in hardware.	Prevents malicious DoS attack traffic from overwhelming the supervisor CPU and helps ensure network stability, availability, and predictable performance by controlling the traffic to the supervisor CPU.
Cisco traffic integration	Integrates voice, video, and data into 1 campus infrastructure.	Lowers cost of ownership; improves productivity, investment protection, scalability, and performance.
Integrated PoE	Provides power to devices attached to PoE-enabled Cisco Catalyst 4500 Series switch ports. Devices include IP phones, access points, video cameras, and other Cisco or IEEE 802.3af-compliant appliances.	Provides a single wire to the desktop; no cubicle uninterruptible power supply (UPS).
Dynamic Trunking Protocol and 802.1Q	Dynamically configures trunk ports between Cisco Catalyst switches.	Minimizes VLAN trunk configuration, maximizes ready-to-use capabilities.
Load balancing via Spanning Tree priority on parallel Layer 2 trunks	Assigns Spanning Tree priority on a per-VLAN basis.	Provides increased throughput and redundancy between Cisco Catalyst 4500 Series switches.
Multicast switching	Provides hardware-based multicasting replication.	Provides standards-based multicasting with a forwarding performance that is line rate.
Multilayer switching	Supports Layer 2 (MAC), Layer 3 (IP address), and Layer 4 (TCP/UDP port) switching.	Provides desktop switching and integrated enhanced routing functions (Cisco Catalyst 4000/4500 supervisor engines IV, V, and V-10GE) in the LAN, or as a small-enterprise backbone solution.

Features	Functions and Description	Benefits
Multiple queues on every port interface	Provides multiple queue classification and scheduling of network traffic on a packet-by-packet basis.	Differentiates network traffic to improve traffic control and latency; helps enable sophisticated QoS for superior data, voice, and video traffic.
Web Content Communication Protocol (WCCP) Version 2 Layer 2 Redirection	Enables transparent redirect content requests to the directly connected content engines using a Layer 2/MAC address rewrite.	Eliminates repetitive transmissions of identical content from the original content servers.
Cisco Discovery Protocol	Provides automated switch and router neighbor discovery.	Simplifies configuration management and helps enable a higher level of network services based on Cisco IOS Software.
4096 VLANs	Helps to ensure that numerous switched VLANs are available for enterprise networks; allows users to select interfaces on multiple switches, networkwide, to create logical LANs.	Eases network administration by allowing users to be logically grouped together, regardless of physical interface location, for performance and security considerations; provides VLAN capability without forcing users to invest in new network technology.
Switched VLAN trunks	Supports multiple VLANs between switches across any Fast Ethernet VLAN using the 802.1Q protocol (or Inter-Switch Link [ISL] with Cisco Catalyst supervisor engines II-Plus, IV, V, or V-10GE).	Allows for enterprise-wide VLANs.
VLAN Trunking Protocol (VTP)	Distributes VLAN configuration information.	Integrates Fast Ethernet VLANs.
<b>Comprehensive Switched Network Management and Security</b>		
Embedded Remote Monitoring (RMON)	Provides four RMON groups on all ports: <ul style="list-style-type: none"> <li>• Statistics</li> <li>• History</li> <li>• Alarms</li> <li>• Events</li> </ul>	<ul style="list-style-type: none"> <li>• Delivers efficient and effective workgroup troubleshooting tools.</li> <li>• Furnishes analysis tools to help managers tune network performance.</li> <li>• Helps identify heavy network users as candidates to move to dedicated or higher-speed ports.</li> <li>• Proactively monitors the switched internetworking centralized management using CiscoWorks solutions.</li> <li>• Industry standards-based.</li> </ul>
Enhanced Switch Port Analyzer (SPAN)	Allows for monitoring of a single port or multiple (VLAN) ports via a single monitor port.	<ul style="list-style-type: none"> <li>• Helps managers to use existing network analyzers to troubleshoot switched internetworking.</li> <li>• Preserves the network visibility that might otherwise be lost by switches that do not support SPAN.</li> <li>• Delivers an analysis path into a company's VLAN architecture.</li> </ul>
Remote SPAN	Allows monitoring of multiple switches across the network from a single switch.	Reduces the number of analyzers necessary to monitor networks.

Features	Functions and Description	Benefits
Full Simple Network Management Protocol (SNMP) management (for Ethernet MIB, MIB II, VTP, and system extensions)	Allows the Cisco Catalyst 4500 Series to be managed from any SNMP-based management station.	<ul style="list-style-type: none"> <li>Eases management from installed network management platforms.</li> <li>Extends VLAN configuration to SNMP management software.</li> </ul>
MAC Authentication Bypass	Upon detecting a new MAC address on a switch port, the switch will proxy an 802.1x authentication request based on the device's MAC address. Enhances Cisco NAC Layer 2 802.1x.	Provides network access to agentless devices without 802.1x supplicant capabilities.
MAC Address Notification	Monitors the MAC addresses that are learned by, aged out, or removed from the switch.	Notifies if there is any potential DoS or man-in-the-middle attack.
802.1x for Identity-Based Network Services	Using the 802.1x protocol with Cisco enhancements, the network grants privileges based on user logon information, regardless of the user's location or device.	Allows different people to use the same PC and have different capabilities, so that users only get their assigned privileges no matter how they are logged onto the network-preventing unauthorized access.
802.1x Inaccessible Authentication Bypass	Provides a configurable alternative on the switch to grant a critical port network access in a locally specified VLAN.	Minimizes business effect for the duration of the AAA server outage.
802.1x Unidirectional Controlled Port	Allows the Wake-on-LAN (WoL) magic packets to reach a workstation attached to an unauthorized 802.1x switch port.	Expands the WoL operations to workstations attached to 802.1x switch port.
ACL	Restricts users to designated areas of the network, blocking unauthorized access to all other applications and information.	Prevents unauthorized access to servers and applications; allows designated users to access specified servers.
Private VLAN	Prevents users from seeing traffic generated by someone else on the same switch.	Helps to ensure privacy for users on the same switch.
Private VLAN Promiscuous Trunk	Extends the promiscuous port to an 802.1Q trunk port, carrying multiple primary VLANs.	Offers different services or content on different primary VLAN to isolated subscribers.
Secure Copy Protocol (SCP)	Provides a secure and authenticated way to transfer files between switch and a network management station.	Secures transfer of switch configurations and images.
Password-Protected Administration Interface	Requires password for local or remote access using Telnet or SSH.	Provides protection from unauthorized configuration changes.
Local (in-band) management	Supervisor engine has an EIA/TIA-232 interface for modem- or console-terminal connection.	Manages the Cisco Catalyst 4500 Series from a directly attached, low-cost terminal or PC.
Remote (out-of-band) management through SNMP sets or Telnet (client) connection	Accessible through any switched interface.	Manages Cisco Catalyst 4500 Series switches from anywhere in the network.
Management console	CLI	<ul style="list-style-type: none"> <li>Provides easy-to-use ASCII text interface that requires no special applications.</li> <li>Takes advantage of support staff's Cisco Catalyst knowledge.</li> </ul>

Features	Functions and Description	Benefits
Onboard Flash memory for Trivial File Transfer Protocol (TFTP) download and upload of operating software	Remotely downloads new revisions of an operating system without hardware changes.	Reduces cost of administering software upgrades by providing centralized network-management capability.
Removable Compact Flash memory on supervisor engines	Allows Cisco IOS Software images and configuration-setting storage.	Supports centralized corporate administration with easy distribution of configuration and software standards across the enterprise.
Onboard hardware diagnostics and LEDs	The status LED on each module shows successful completion and minor and major failures of power-up diagnostics; link-good LEDs show the status of any interface; and switch-load LEDs show backplane usage.	<ul style="list-style-type: none"> <li>• Confirms module operation and helps enable easy visual inspection.</li> <li>• Improves access to switched-network usage.</li> <li>• Continues mature and proven Cisco Catalyst switch interfaces pioneered in earlier Cisco products.</li> </ul>
<b>Switch Management Applications</b>		
CiscoWorks Portfolio	Provides a comprehensive set of functions aimed at monitoring, troubleshooting, and configuring intelligent-switching infrastructures.	Offers superior, efficient management of the Cisco Catalyst 4500 Series for increased security and control.
CiscoView Application	Provides an intuitive GUI that supports chassis physical view, configuration, performance monitoring, and minor troubleshooting.	Simplifies switched-internetworking management; the integrated management solution provides the user with one tool for determining system status.

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