

Cisco Catalyst 4500E Series Chassis

High Performance, Mobile and Secure User Experience

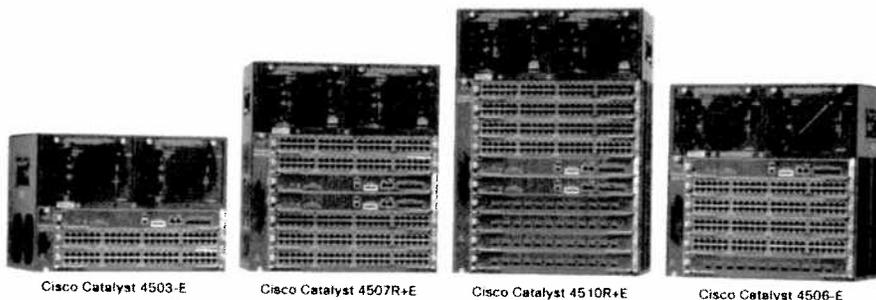
Overview

The Cisco® Catalyst® 4500 Series Switches enable borderless networks, providing high performance, mobile, and secure user experience through Layer 2-4 switching investments. It enables security, mobility, application performance, video, and energy savings over an infrastructure that supports resiliency, virtualization, and automation. Cisco Catalyst 4500 Series Switches provide borderless performance, scalability, and services with reduced total cost of ownership and superior investment protection.

Cisco Catalyst 4500 (Figure 1) has a centralized forwarding architecture that enables collaboration, virtualization, and operational manageability through simplified operations. With forward and backward compatibility spanning multiple generations, the new Cisco Catalyst 4500E Series provides exceptional investment protection and deployment flexibility to meet the evolving needs of organizations of all sizes. The Cisco Catalyst 4500E Series platform has 10 Gigabit Ethernet (GE) uplinks and supports PoEP, enabling the customers to future proof their network.

E-Series chassis come in four different form factors: 3-slot (4503-E), 6-slot (4506-E), 7-slot (4507R+E/4507R-E), and 10-slot (4510R+E/4510R-E). 4503-E, 4506-E, 4507R+E, and 4510R+E chassis are extremely flexible and support either 6 Gbps, 24 Gbps, or 48Gbps per line-card slot. 4507R-E and 4510R-E chassis are limited to 6 Gbps and 24 Gbps per line-card slot. Integrated resiliency in the Cisco Catalyst 4500E Series includes 1+1 supervisor engine redundancy (10-slot and 7-slot only), redundant fans, software-based fault tolerance, and 1+1 power supply redundancy. Integrated resiliency in both hardware and software minimizes network downtime, helping to ensure workforce productivity, profitability, and customer success.

Figure 1. Cisco Catalyst 4500E Series



The Cisco Catalyst 4500E Series extends control to the network edge with intelligent network services, including sophisticated quality of service (QoS), predictable performance, advanced security, comprehensive management, and integrated resiliency. Scalability of these intelligent network services is made possible with dedicated, specialized resources known as ternary content-addressable memory (TCAM). Ample TCAM resources (up to 384,000 entries) enable "high feature capacity," which provides wire-speed routing/switching performance independent of provisioning of services such as QoS and security.

Cisco Catalyst 4500E Series Chassis

The Cisco Catalyst 4500E Series offers four chassis options and eight supervisor engine options (Table 1). It provides a common architecture that can scale up to 388 ports. The Cisco Catalyst WS-C4507R+E, WS-C4510R+E, WS-C4507R-E, and WS-C4510RE offer high availability by supporting 1+1 redundant supervisor engines with subsecond failover time and full-image In-Service Software Upgrades (ISSUs). Nonstop forwarding with Stateful Switchover (NSF/SSO) and ISSU help ensure continuous packet forwarding during supervisor engine switchover to help ensure high availability for collaboration applications and voice over IP (VoIP). Using the same line cards as the widely deployed Cisco Catalyst 4000 Series Switches and classic Cisco Catalyst 4500 Series Switches, the Cisco Catalyst 4500E Series furthers Cisco's commitment to affordable enterprise and branch scalability.

Table 1. Cisco Catalyst 4500E Series Chassis Features

Feature	Cisco Catalyst WS-C4503-E Chassis	Cisco Catalyst WS-C4506-E Chassis	Cisco Catalyst WS-C4507R+E Chassis	Cisco Catalyst WS-C4510R+E Chassis
Total number of slots	3	6	7	10
Line-card slots	2	5	5	8
Supervisor engine slots	1 ¹	1 ¹	2 ²	2 ³
Dedicated supervisor engine slot numbers	1	1	3 and 4	5 and 6
Supervisor engine redundancy	No	No	Yes	Yes (Supervisor V-10GE, 6-E and 7-E)
Supervisor engines supported	Supervisor 7-E Supervisor 6-E Supervisor 6L-E Supervisor V-10GE	Supervisor 7-E Supervisor 6-E Supervisor 6L-E Supervisor V-10GE	Supervisor 7-E Supervisor 6-E Supervisor 6L-E Supervisor V-10GE	Supervisor 7-E Supervisor 6-E Supervisor V-10GE
Bandwidth scalability per line-card slot	Up to 48 Gbps on all slots	Up to 48 Gbps on all slots	Up to 48 Gbps on all slots	Up to 48 Gbps on all slots
Number of power supply bays	2	2	2	2
AC input power	Yes	Yes	Yes	Yes
DC input power	Yes	Yes	Yes	Yes
Integrated Power over Ethernet	Yes	Yes	Yes	Yes
Minimum number of power supplies	1	1	1	1
Power supplies supported	<ul style="list-style-type: none"> • 1000W AC • 1400W AC • 1300W ACV • 2800W ACV • 4200W ACV • 6000W ACV • 1400W DC (triple input) • 1400W-DC-P 	<ul style="list-style-type: none"> • 1000W AC • 1400W AC • 1300W ACV • 2800W ACV • 4200W ACV • 6000W ACV • 1400W DC (triple input) • 1400W-DC-P 	<ul style="list-style-type: none"> • 1000W AC • 1400W AC • 1300W ACV • 2800W ACV • 4200W ACV • 6000W ACV • 1400W DC (triple input) • 1400W-DC-P 	<ul style="list-style-type: none"> • 1400W AC • 2800W ACV • 4200W ACV • 6000W ACV • 1400W DC (triple input) • 1400W-DC-P
Number of fan-tray bays	1	1	1	1
Location of 19-inch rack mount	Front	Front	Front	Front
Location of 23-inch rack mount	Front (option)	Front (option)	Front (option)	Front (option)

¹ Slot 1 is reserved for supervisor engine only; slots 2 and higher are reserved for line cards.

² Slots 3 and 4 are reserved for supervisor engines only in Cisco Catalyst 4507R-E and 4507R+E; slots 1-2 and 5-7 are reserved for line cards.

³ Slots 5 and 6 are reserved for supervisor engines only in Cisco Catalyst 4510R-E and 4510R+E; slots 1-4 and 7-10 are reserved for line cards.

Configuration Alternatives

The Cisco Catalyst 4500 Series offers a powerful and flexible network solution that can be built with eight supervisor engine alternatives. Each provides a high-performance, centralized, shared-memory switch fabric, protecting your line-card investment by supporting the addition of optional higher layer engines (Table 2).

Table 2. Cisco Catalyst 4500E Series Supervisor Engine Support

Feature	Cisco Catalyst 4500 Series Supervisor V-10GE	Cisco Catalyst 4500 Series Supervisor 6L-E	Cisco Catalyst 4500 Series Supervisor 6-E	Cisco Catalyst 4500 Series Supervisor 7-E
Cisco Catalyst WS-C4503-E Chassis	6Gbps/Slot	24Gbps/Slot	24Gbps/Slot	48Gbps/Slot
Cisco Catalyst WS-C4506-E Chassis	6Gbps/Slot	24Gbps/Slot	24Gbps/Slot	48Gbps/Slot
Cisco Catalyst WS-C4507R+E Chassis	6Gbps/Slot	24Gbps/Slot	24Gbps/Slot	48Gbps/Slot
Cisco Catalyst WS-C4510R+E Chassis	6Gbps/Slot	Not supported	24Gbps/slot : Slots 1,2,3,4,7 6Gbps/slot : Slots 8,9,10	48Gbps/Slot
Cisco Catalyst WS-C4507R-E Chassis	6Gbps/Slot	24Gbps/Slot	24Gbps/Slot	24Gbps/slot
Cisco Catalyst WS-C4510R-E Chassis	6Gbps/Slot	Not supported	24Gbps/slot : Slots 1,2,3,4,7 6Gbps/slot : Slots 8,9,10	24Gbps/slot

The Cisco Catalyst 4500 Series has flexible interface types and port densities that allow network configurations to be mixed and matched to meet the specific needs of campus networks (Table 3).

Table 3. Cisco Catalyst 4500 Series Port Densities

Cisco Catalyst 4500 Series Switching Modules	Number of Interfaces Supported per Line Card	Cisco Catalyst 4503-E	Cisco Catalyst 4506-E	Cisco Catalyst 4507R+E	Cisco Catalyst 4510R+E
Switched 10/100 Fast Ethernet (RJ-45)	48	96	240	240	384
Switched 10/100 Fast Ethernet (RJ-45) with IEEE 802.3af at Power over Ethernet (PoE/PoEP)	48	96	240	240	384
Switched 100 FX Fast Ethernet (MT-RJ)	48	96	240	240	384
Switched 1000BASE-X (fiber)	6, 18, or 48	104	244	244	388
Switched 10/100/1000BASE-T Gigabit Ethernet	48	108	240	240	384
Switched 10/100/1000BASE-T Gigabit Ethernet with IEEE 802.3af at PoE/PoEP	48	108	240	240	384
Switched 10 Gigabit Ethernet	6 or 12	28	64	64 ⁶	100 ⁴

Configuration Flexibility and Modular Superiority

Cisco Catalyst 4500 Series line cards can be mixed and matched to suit numerous LAN access, server connectivity, SMB, or branch-office deployments. The Cisco Catalyst 4500 Series supports the following line cards, listed in Table 4 by part number.

Table 4. Cisco Catalyst 4500 Series Line Cards

Product Number	Description
Cisco Catalyst 4500E Series Line Cards	
WS-X4748-RJ45V+E	Cisco Catalyst 4500E Series 48-Port 802.3at PoEP 10/100/1000 (RJ-45)
WS-X4712-SFP+E	Cisco Catalyst 4500E Series 12-port 10 Gigabit Ethernet (SFP+)
WS-X4624-SFP-E	Cisco Catalyst 4500E Series 24-port GE (SFP)

⁴ WS-C4507R-E and WS-C4510R-E chassis support up to 34 switched 10 Gigabit Ethernet ports.

Product Number	Description
WS-X4612-SFP-E	Cisco Catalyst 4500E Series 12-port GE (SFP)
WS-X4648-RJ45V-E	Cisco Catalyst 4500E Series 48-Port PoE 10/100/1000(RJ45)
WS-X4648-RJ45V+E	Cisco Catalyst 4500E Series 48-Port Premium PoE 10/100/1000(RJ45)
WS-X4606-X2-E	Cisco Catalyst 4500E Series 6-Port 10GE (X2)
WS-X4648-RJ45-E	Cisco Catalyst 4500E Series 48-Port Data 10/100/1000(RJ45)
Cisco Catalyst 4500 Classic 10/100 Line Cards	
WS-X4148-RJ	Cisco Catalyst 4500 10/100 Auto Module, 48-Port (RJ-45)
WS-X4248-RJ45V	Cisco Catalyst 4500 PoE 802.3af 10/100, 48-Port (RJ-45)
Cisco Catalyst 4500 Classic 10/100/1000 Line Cards	
WS-X4548-GB-RJ45	Cisco Catalyst 4500 Enhanced 48-Port 10/100/1000 Module (RJ-45)
WS-X4548-RJ45V+	Cisco Catalyst 4500 48-Port 802.3af PoE and 802.3at PoEP 10/100/1000 (RJ-45)
WS-X4548-GB-RJ45V	Cisco Catalyst 4500 PoE IEEE 802.3af 10/100/1000, 48 Ports (RJ-45)
Cisco Catalyst 4500 Classic 100 BASE-X FE Line Cards	
WS-X4248-FE-SFP	Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-Port 100BASE-X (SFP)
Cisco Catalyst 4500 Classic 1000 BASE-X GE Line Cards	
WS-X4306-GB	Cisco Catalyst 4500 Gigabit Ethernet Module, 6 Ports (GBIC)
WS-X4506-GB-T	Cisco Catalyst 4500 6-Port 10/100/1000 RJ-45 PoE IEEE 802.3af and 1000BASE-X (SFP)
WS-X4418-GB	Cisco Catalyst 4500 Gigabit Ethernet Module, Server Switching 18 Ports (GBIC)
WS-X4448-GB-SFP	Cisco Catalyst 4500 Gigabit Ethernet Module, 48 Ports 1000X (SFP)

Table 5 lists the minimum software requirements for the Cisco Catalyst 4500 supervisor engines.

Table 5. Cisco Catalyst Supervisor Engine Software Minimum Requirements

Chassis	Supervisor Engine	Minimum Software Requirement
Cisco WS-C4503-E and WS-C4506-E	Supervisor Engine V-10GE	Cisco IOS® Software Release 12.2(37)SG
	Supervisor Engine 6-E	Cisco IOS Software Release 12.2(40)SG
	Supervisor Engine 6L-E	Cisco IOS Software Release 12.2(52)SG
	Supervisor Engine 7-E	Cisco IOS XE Software Release 3.0(1)SG
Cisco WS-C4507R+E	Supervisor Engine V-10GE	Cisco IOS Software Release 12.2(54)SG
	Supervisor Engine 6-E	Cisco IOS Software Release 12.2(54)SG
	Supervisor Engine 6L-E	Cisco IOS Software Release 12.2(54)SG
	Supervisor Engine 7-E	Cisco IOS XE Software Release 3.0(1)SG
Cisco WS-C4510R+E	Supervisor Engine V-10GE	Cisco IOS Software Release 12.2(54)SG
	Supervisor Engine 6-E	Cisco IOS Software Release 12.2(54)SG
	Supervisor Engine 7-E	Cisco IOS XE Software Release 3.0(1)SG
Cisco WS-C4507R-E	Supervisor Engine V-10GE	Cisco IOS Software Release 12.2(40)SG
	Supervisor Engine 6-E	Cisco IOS Software Release 12.2(40)SG
	Supervisor Engine 6L-E	Cisco IOS Software Release 12.2(52)SG
	Supervisor Engine 7-E	Cisco IOS XE Software Release 3.0(1)SG
Cisco WS-C4510R-E	Supervisor Engine V-10GE	Cisco IOS Software Release 12.2(40)SG
	Supervisor Engine 6-E	Cisco IOS Software Release 12.2(40)SG
	Supervisor Engine 7-E	Cisco IOS XE Software Release 3.0(1)SG

Managing the Catalyst 4500E Series Switch

Network Management applications are instrumental in lowering Operating Expenditures (OPEX) while improving network availability by simplifying and automating many of the day-to-day tasks associated with managing an end-to-end network.

Cisco Network Assistant

The Cisco Network Assistant application manages standalone devices from anywhere on your intranet. Using its GUI, you can perform multiple configuration tasks without using command-line interface (CLI) commands. You can apply actions to multiple devices and ports at the same time for VLAN and quality-of-service (QoS) settings, inventory and statistics reports, link and device monitoring, software upgrades, and many other networking features.

Cisco Network Assistant simplifies device management by offering an intuitive GUI, alternative modes for configuring network devices, two levels of access, and comprehensive online help. It features two modes of display: device view and topology view. In the device view, the Cisco Catalyst 4500 Series administrator may configure the switch, configure ports on the switch, or configure groups of ports. In the topology view, the administrator may configure VLAN settings, configure EtherChannels, and view a variety of reports on system and network status.

CiscoWorks LAN Management Solution

CiscoWorks LAN Management Solution (LMS) is an integrated suite of management functionality that simplify the configuration, administration, monitoring, and troubleshooting of Cisco Borderless Networks. Built upon popular Internet-based standards, CiscoWorks LMS enables network operators to manage the network through a browser-based interface that can be accessed anytime from anywhere within the network. The user experience allows for maximum flexibility and quick-and-easy access to management functions and tasks reducing complexity and error-prone tasks typically associated with managing a network. The breadth and depth of device support coupled with "day-one" device support program ensures that the 4500E Series Switch and the latest Cisco platforms are supported and manageable the day they ship.

Once installed, out-of-the-box monitoring and troubleshooting dashboards provide immediate results and actionable information to quickly isolate and fix network problems before they are service impacting. Work centers provide a single place where operators can quickly provision, monitor and manage new Cisco Catalyst 4500E Series Switch value-added network services such as: Cisco EnergyWise, Cisco TrustSec™, and AutoSmart Ports.

Network Analysis Module

Cisco NAM 2200 series appliance provides comprehensive operational visibility into Cisco Catalyst 4500 Series Switch deployments. It combines application performance visibility, traffic analysis and troubleshooting, to enable network administrators to effectively manage delivery of converged network services. The visibility provided by NAM allows IT to deliver consistent end-user experience and improve service levels. It also helps to optimize resources with comprehensive analysis of traffic and effective use of intelligent network services such as QoS and Cisco WAAS. In addition, Cisco NAM improves operational efficiency with proactive detection of performance issues and accelerated problem isolation and root-cause analysis

Physical Specifications

Table 6 lists physical specifications.

Table 6. Physical Specifications of Cisco Catalyst 4500 Series Chassis

Specification	WS-C4503-E	WS-C4506-E	WS-C4507R+E and WS-C4507R-E	WS-C4510R+E and WS-C4510R-E
Dimensions (H x W x D)	12.25 x 17.31 x 12.50 in. (31.12 x 43.97 x 31.70 cm)	17.38 x 17.31 x 12.50 in. (44.13 x 43.97 x 31.70 cm)	19.19 x 17.31 x 12.50 in. (48.74 x 43.97 x 31.70 cm)	24.35 x 17.31 x 12.50 in. (61.84 x 43.97 x 31.70 cm)
Rack units (RU)	7 RU	10 RU	11 RU	14 RU
Chassis weight (with fan tray)	32.25 lb (14.63 kg)	40.50 lb (18.37 kg)	44.50 lb (20.19 kg)	54.50 lb (24.73 kg)
Mounting	19- and 23-in. rack compatible (19-in. rack and cable guide hardware included)	19- and 23-in. rack compatible (19-in. rack and cable guide hardware included)	19- and 23-in. rack compatible (19-in. rack and cable guide hardware included)	19- and 23-in. rack compatible (19-in. rack and cable guide hardware included)

Power Supply Indicators and Interfaces

Tables 7 and 8 describe power supply indicators and interfaces:

- Fan cooling: Integrated in hot-insertion/hot-extraction unit
- Good: Green
- Fail: Red (faulty)
- SNMP MIB supported

Table 7. Cisco Catalyst 4500E Series Power Supply Specifications (Data Only)

Power Supply	1000W AC	1400W AC	1400W DC Triple Input
Integrated PoE	No (data only)	No (data Only)	No (data only)
Input current (rated)	12A at 100 VAC, 5A at 240 VAC	16A at 100 VAC, 7A at 240 VAC	2x -48 VDC at 15A 1x -48 VDC at 12.5A
Output current (data)	<ul style="list-style-type: none"> • 12V at 83.4A • 3.3V at 12.2A 	<ul style="list-style-type: none"> • 12V at 113.4A • 3.3V at 12.2A 	<ul style="list-style-type: none"> • 12V at 1360W • 3.3V at 40W
Output power redundant mode (data)	1000W + 40W	1360W + 40W	1400W + 40W
Output power combined mode (data)	1667W	2473W	-
Heat dissipation	943 Btus per hour	1048 Btus per hour	1048 Btus per hour
Holdup time	20 ms	20 ms	20 ms
Hot swappable	Yes	Yes	Yes

Table 8. Cisco Catalyst 4500E Series Power Supply Specifications (Data and PoE)

Power Supply	1300W AC	2800W AC	4200W AC	6000 AC	1400W DC with PEM	2500W AC - Power Shelf
Integrated PoE	Yes (up to 800W)	Yes (up to 1400W)	Yes (up to 3855W)	Yes (up to 4800W)	Up to 7500W (minus the power consumed for data) when connected directly to a DC power plant or 2 external AC power shelves	2500W per power supply; 5000W per shelf (minus the power consumed for data)
IEEE 802.3af/at compliant PoE/PoEP	Yes	Yes	Yes	Yes	Yes	Yes
Input current (rated)	<ul style="list-style-type: none"> • 16A at 100 VAC • 7A at 240 VAC 	16A at 200 VAC	<ul style="list-style-type: none"> • 2x 12A at 100VAC Or <ul style="list-style-type: none"> • 2x 12A at 200VAC 	<ul style="list-style-type: none"> • 2x 12A at 100VAC Or <ul style="list-style-type: none"> • 2x 16A at 200VAC 	<ul style="list-style-type: none"> • 31A at -60 VDC (data only) • 180A at -48 VDC (PoE) 	15A at 200 VAC
Output current (data)	<ul style="list-style-type: none"> • 12V at 84.7A • 3.3V at 12.5A 	<ul style="list-style-type: none"> • 12V at 113.3A • 3.3V at 12.1A 	<ul style="list-style-type: none"> • 12V at 115.3A • 3.3V at 12.5A 	<ul style="list-style-type: none"> • 12V at 186.9A • 3.3V at 12.5A 	<ul style="list-style-type: none"> • 12V at 120A • 3.3V at 10A 	-52 VDC at 50A (total output per supply)
Output current (PoE)	-50V at 16.7A	-50V at 28A	<ul style="list-style-type: none"> • -50V at 77.1A (200V) • -50V at 38A (100V) 	<ul style="list-style-type: none"> • -50V at 100.0A (200V) • -50V at 38.5A (120V) 	140A at -48/-60 VDC	-52 VDC at 50A (total output per supply)
Output power redundant mode (data)	1000W + 40W	1360W + 40W	1383W + 40W	2200W + 40W	1360W + 40W	Up to 1400W (through DC supply)
Output power redundant mode (PoE)	800W maximum per power supply	1400W maximum per power supply	<ul style="list-style-type: none"> • 3700W (220V) • 1850W (110V) 	<ul style="list-style-type: none"> • 4800W (220V) • 1850W (110V) 	Up to 7500W (minus the power consumed for data)	2500W per supply (minus the power consumed for data)
Output power combined mode (data)	1667W	2473W	2766W	4400W	-	-

Power Supply	1300W AC	2800W AC	4200W AC	6000 AC	1400W DC with PEM	2500W AC - Power Shelf
Output power combined mode (PoE)	1333W	2333W	6700W (220V) 3360W (110V)	8700W (220V) 3360W (110V)	3800W (100V)	-
Heat dissipation	1568 Btus per hour	2387 Btus per hour	3580 BTU/hr	2720 BTU/hr	Data only: 1591 Btus per hour Data and voice: 2905 Btus per hour	1210 Btus per hour, per power supply
Holdup rime	20 ms	20 ms	20 ms	20 ms	4 ms	20 ms
Hot swappable	Yes	Yes	Yes	Yes	Yes	Yes

Additional notes for Table 7 and 8:

- Output power is per power supply unless otherwise stated
- Heat dissipation numbers represent the power-conversion losses of the power supply in operation
- The number of power devices supported will depend on customer configuration

Fan Trays

Each Cisco Catalyst 4500E Series and classic Cisco Catalyst 4500 Series chassis uses a single fan tray for cooling. All fan trays are composed of independent fans. If one fan fails, the system will continue to operate without a significant degradation in cooling. The system will detect and notify the user (through LED, command-line interface [CLI], and SNMP) that a fan has failed and the tray needs to be replaced. Cisco Catalyst 4500E Series fans cannot be interchanged with classic Cisco Catalyst 4500 Series fans. The classic Cisco Catalyst 4500 Series chassis needs an E-Series fan tray in order to support the Metro Supervisor Engine 6-E.

Fabric-Redundancy Modules (Cisco WS-C4507R+E, WS-C4510R+E, WS-C4507R-E, and WS-C4510R-E Only)

The Cisco Catalyst 4500 and 4500E Series redundancy scheme uses removable fabric-redundancy modules on the passive backplane to switch traffic to the active supervisor engine. There is one fabric-redundancy module per line card. Fabric-redundancy modules and redundant clocks ship standard with every Cisco Catalyst 4507R+E, 4507R-E, 4510R+E, and 4510R-E chassis. Fabric-redundancy modules cannot be interchanged between the Cisco Catalyst 4507R+E/4510R+E and 4507R-E/4510R-E chassis.

Environmental Conditions

The Cisco Catalyst 4500 and 4500E Series require the following conditions:

- Operating temperature: 32 to 104°F (0 to 40°C)
- Storage temperature: -40 to 167°F (-40 to 75°C)
- Relative humidity: 10 to 90 percent, noncondensing
- Operating altitude: -60 to 2000 meters (m)

Regulatory Standards Compliance

Table 9 lists the regulatory standards compliance of the Cisco Catalyst 4500 and 4500E Series.

Table 9. Regulatory Standards Compliance

Specification	Standard
Regulatory compliance	CE Marking
Safety	<ul style="list-style-type: none"> • UL 60950 • CAN/CSA-C22.2 No. 60950

Specification	Standard
	<ul style="list-style-type: none"> • EN 60950 • IEC 60950 • TS 001 • AS/NZS 3260
EMC	<ul style="list-style-type: none"> • FCC Part 15 (CFR 47) Class A • ICES-003 Class A • EN55022 Class A • CISPR22 Class A • AS/NZS 3548 Class A • VCCI Class A • EN 55022 • EN 55024 • EN 61000-6-1 • EN 50082-1 • EN 61000-3-2 • EN 61000-3-3 • ETS 300 386
Industry EMC, safety, and environmental standards	<ul style="list-style-type: none"> • NEBS Level 3 • ETS 300 019 Storage Class 1.1 • ETS 300 019 Transportation Class 2.3 • ETS 300 019 Stationary Use Class 3.1 • ETS 300 386
Telecom (E1)	<ul style="list-style-type: none"> • CTR 12/13 • CTR 4 • ACA TS016
Telecom (T1)	<ul style="list-style-type: none"> • FCC Part 68 • Canada CS-03 • JATE Green Book
ROHS Compliance	ROHS5

Power and MTBF Information

Table 10 gives power and MTBF information for different chassis

Table 10. Power and MTBF Info

Part Number	Max Rated Power (W)	Rated MTBF (Hours)
WS-C4503-E	60	1,064,279
WS-C4506-E	120	710,119
WS-C4507R+E	135	248,630
WS-C4510R+E	200	179,714
WS-C4507R-E	135	365,896
WS-C4510R-E	200	290,525

Note:

All power numbers shown in the table above are maximum values recommended for facility power and cooling capacity planning. These figures are not indicative of the actual power draw during operation. Typical power draw is about 20% lower than the maximum value shown.

Ordering Information

Table 11 lists the ordering information for chassis, power supplies, supervisor engines, and memory that are commonly used with the Cisco Catalyst 4500 Series.

Table 11. Ordering Information

Product Number	Description
WS-C4503-E	Cisco Catalyst E-Series 4503 switch (3-slot chassis), fan, no power supply
WS-C4506-E	Cisco Catalyst E-Series 4506 switch (6-slot chassis), fan, no power supply
WS-C4507R-E	Cisco Catalyst E-Series 4507R switch (7-slot chassis), fan, no power supply, redundant supervisor capable
WS-C4507R+E	Cisco Catalyst E-Series 4507R+E switch (7-slot chassis), fan, no power supply, redundant supervisor capable
WS-C4510R-E	Cisco Catalyst E-Series 4510R switch (10-slot chassis), fan, no power supply; redundant supervisor capable
WS-C4510R+E	Cisco Catalyst E-Series 4510R+E switch (10-slot chassis), fan, no power supply; redundant supervisor capable
PWR-C45-1000AC	Cisco Catalyst 4500 Series 1000W AC power supply (data only)
PWR-C45-1400AC	Cisco Catalyst 4500 Series 1400W AC power supply (data only)
PWR-C45-1300ACV	Cisco Catalyst 4500 Series 1300W AC power supply (with integrated PoE)
PWR-C45-2800ACV	Cisco Catalyst 4500 Series 2800W AC power supply (with integrated PoE)
PWR-C45-4200ACV	Cisco Catalyst 4500 Series 4200W AC power supply (with integrated PoE)
PWR-C45-6000ACV	Cisco Catalyst 4500 Series 6000W AC power supply (with integrated PoE)
PWR-C45-1400DC-P	Cisco Catalyst 4500 Series 1400W DC power supply with integrated power entry module (PEM)
PWR-C45-1400DC	Cisco Catalyst 4500 Series triple input 1400W DC power supply (data only)
WS-P4502-1PSU	Cisco Catalyst 4500 Series auxiliary power shelf (2-slot), including 1 PWR-4502
PWR-4502	Cisco Catalyst 4500 Series auxiliary power-shelf redundant power supply
WS-X4013+	Cisco Catalyst 4500 Series Supervisor Engine II-Plus
WS-X4013+TS	Cisco Catalyst 4500 Series Supervisor Engine II-Plus-TS, twelve 10/100/1000 PoE (RJ-45) and eight 1000-X SFP ports included on supervisor-engine faceplate
WS-X4013+10GE	Cisco Catalyst 4500 Series Supervisor Engine II-Plus-10GE
WS-X4515	Cisco Catalyst 4500 Supervisor Engine IV
WS-X4516	Cisco Catalyst 4000 and 4500 Supervisor Engine V
WS-X4516-10GE	Cisco Catalyst 4500 Series Supervisor Engine V-10GE
WS-X45-Sup6-E	Cisco Catalyst 4500 Series Supervisor Engine 6-E
WS-X45-Sup6L-E	Cisco Catalyst 4500 Series Supervisor Engine 6L-E
MEM-C4K-FLD64M	Compact Flash memory, 64-MB option
MEM-C4K-FLD128M	Compact Flash memory, 128-MB option
MEM-X45-512MB-E	Cisco Catalyst 4500 Series Supervisor Engine 6-E, 512-MB option

Warranty

Cisco Catalyst 4500E Series and Cisco Catalyst 4500 switches are covered by the Cisco limited lifetime hardware warranty. For more information, visit http://www.cisco.com/en/US/docs/general/warranty/English/LH2DEN_.html.

Note: If you purchased a Cisco Catalyst 4500 Series chassis before May 1, 2009, it is covered by the Cisco 90-day limited hardware warranty. For more information, visit http://www.cisco.com/en/US/docs/general/warranty/English/901DEN_.html.

Cisco Technical Support Services

Cisco offers Cisco Technical Support Services to help ensure that your Cisco products operate efficiently, remain highly available, and benefit from current system software to assist you in effectively managing your network service while controlling operational costs.

Cisco Technical Support Services provide significant benefits that go beyond what is offered under the Cisco warranty policy.

Services available under a Cisco SMARTnet[®] service contract that are not covered under a warranty include the following:

- Latest software updates
- Rapid replacement of hardware in next-day, 4-hour, or 2-hour dispatch options
- Ongoing technical support through Cisco Technical Assistance Center (TAC)
- Registered access to <http://www.cisco.com>

Tables 12 and 13 list the components and competitive differentiators of Cisco Technical Support Services.

Table 12. Technical Support Services: Components

Service Feature Overview	Benefits
Software support	Offers maintenance and minor and major updates for licensed feature set. Downloading new maintenance releases, patches, or updates of Cisco IOS Software helps to enhance and extend the useful life of Cisco devices. Through major software updates it is possible to extend the life of equipment and maximize application technology investments by: <ul style="list-style-type: none"> • Increasing the performance of current functions • Adding new capability that, in many cases, requires no additional hardware investment • Enhancing network and application availability, reliability, and stability
TAC support	With more than 1000 highly trained customer support engineers, 390 CCIE [®] certifications, and access to 13,000 research and development engineers, Cisco TAC complements your in-house staff with a high level of knowledge in voice, video, and data communications networking technology. Its sophisticated call-routing system quickly routes calls to the correct technology personnel. The Cisco TAC is available 24 hours a day, 365 days a year.
Cisco.com	This award-winning website provides 24-hour access to an extensive collection of online product and technology information, interactive network-management and troubleshooting tools, and knowledge-transfer resources that can help customers reduce costs by increasing staff self-sufficiency and productivity.
Advance hardware replacement	Advance replacement and onsite field-engineer options supply fast access to replacement hardware and field resources for installing hardware, minimizing the risk of potential network downtime.

Table 13. Technical Support Services: Competitive Differentiators

Feature	Benefits
Worldwide Virtual Lab <ul style="list-style-type: none"> • TAC training • Boot camps • Tech calls 	This extensive lab of Cisco equipment and Cisco IOS Software releases provides an invaluable engineering resource and knowledge base for training, product information, and recreation and testing of selected network issues to help decrease time to resolution.
Tech forums	Cisco is committed to providing customers the latest in technology support. These TAC training programs assist customers in case avoidance as well as provide knowledge transfer of Cisco networking expertise.
Cisco Live	A powerful suite of Internet-enabled tools with firewall-friendly features; these secure, encrypted Java applets can turn a simple phone call into an interactive collaboration session, allowing a customer and Cisco TAC support engineer to work together more effectively.
Global logistics	Delivers award-winning, worldwide hardware-replacement support with 650 depots, covering 120 countries, at a US\$2.3 billion investment in inventory, using 10,000 onsite field engineers.
Cisco IOS Software	Employs 100 discrete technologies with more than 2000 features. 400 new features are added each year. Cisco IOS Software is installed in more than 10 million devices and is running on more than 10,000 networks worldwide. It operates on the world's largest IPv6 and VoIP networks and in all major service provider networks worldwide.

For More Information

To learn more about how you can take advantage of Cisco Technical Support Services, talk to your Cisco representative or visit Cisco Technical Support Services at

http://www.cisco.com/en/US/products/svcs/ps3034/ps2827/serv_category_home.html.

For additional information about the Cisco Catalyst 4500 Series, visit <http://www.cisco.com/go/catalyst4500>.

For additional information about Cisco products, contact:

- United States and Canada: 800 553-NETS (6387)
- Europe: 32 2 778 4242
- Australia: 612 9935 4107
- Other: 408 526-7209
- <http://www.cisco.com>

Cisco and Partner Services for Next-Generation Cisco Catalyst Modular Switches

Enable the borderless network architecture using personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the next-generation Cisco Catalyst modular switches into your architecture and incorporate network services onto that platform. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs.

For more information about services from Cisco and our partners, visit <http://www.cisco.com/go/services>.

Table 14 lists available technical services.

Table 14. Available Technical Services

Technical Services
<p>Cisco SMARTnet[®] Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco Technical Assistance Center (TAC) • Unrestricted access to the extensive Cisco.com knowledge base and tools • Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement and onsite parts replacement and installation available⁵ • Ongoing operating system software updates within the licensed feature set⁶ • Proactive diagnostics and real-time alerts on Smart Call Home enabled devices
<p>Cisco Smart Foundation Service</p> <ul style="list-style-type: none"> • Next business day advance hardware replacement as available • Business hours access to SMB TAC (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through Smart Foundation Portal • Operating system software bug fixes and patches
<p>Cisco SP Base Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco TAC • Registered access to Cisco.com • Next business day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement. Return to factory option available⁷ • Ongoing operating system software updates⁸ • Available direct from Cisco only to qualified service providers

⁵ Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with next business day (NBD) delivery. Where NBD is not available, same day ship is provided. Restrictions apply; please review the appropriate service descriptions for details.

⁶ Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.



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Cisco Catalyst 3750-X and 3560-X Series Switches

The Cisco® Catalyst® 3750-X and 3560-X Series Switches are an enterprise-class lines of stackable and standalone switches, respectively. These switches provide high availability, scalability, security, energy efficiency, and ease of operation with innovative features such as Cisco StackPower, IEEE 802.3at Power over Ethernet Plus (PoE+) configurations, optional network modules, redundant power supplies, and Media Access Control Security (MACsec) features. The Cisco Catalyst 3750-X Series with StackWise® Plus technology provides scalability, ease of management and investment protection for the evolving business needs. The Cisco Catalyst 3750-X and 3560-X enhance productivity by enabling applications such as IP telephony, wireless, and video for borderless network experience.

Cisco Catalyst 3750-X and 3560-X Series primary features:

- 24 and 48 10/100/1000 PoE+ and non-PoE models
- Optional four Gigabit Ethernet (GbE) SFP or two 10GbE SFP+ uplink network modules
- Industry first PoE+ with 30W power on all ports in 1 rack unit (RU) form factor
- Dual redundant, modular power supplies and fans
- Media Access Control Security (MACsec) hardware-based encryption
- Open Shortest Path First (OSPF) in IP Base image
- IPv4 and IPv6 routing, Multicast routing, advanced quality of service (QoS), and security features in hardware
- Enhanced limited lifetime warranty (LLW) with next business day (NBD) advance hardware replacement and 90 day access to Cisco Technical Assistance Center (TAC) support
- Enhanced Cisco EnergyWise for operational cost optimization by measuring actual power consumption of the PoE devices, reporting, and reducing energy consumption across the network
- USB Type-A and Type-B ports for storage and console respectively and an out-of-band Ethernet management port

In addition to the above features, the Cisco Catalyst 3750-X switches also offer:

- Cisco StackPower™ technology: An innovative feature and industry first for sharing power among stack members
- Cisco StackWise Plus technology for ease of use and resiliency with 64 Gbps of throughput
- Investment protection with backward compatibility with all other models of Cisco Catalyst 3750 Series Switches

Switch Configurations

All switch models can be configured with the optional four GbE or two 10 GbE network module. The switch models are available with either the LAN Base or IP Base feature set. IP Services feature set is available as an upgrade option at the time of ordering or through a license at a later time.

Stackable Switches

Figure 1 shows the Cisco Catalyst 3750-X Series Switches (front and back).

Figure 1. Cisco Catalyst 3750-X Series Switches (Front and Back)



Table 1 shows the Cisco Catalyst 3750-X Series configurations.

Table 1. Cisco Catalyst 3750-X Series Configurations

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power	StackPower
LAN Base	WS-C3750X-24T-L	24	350W	-	Available with upgrade to IP Base
	WS-C3750X-48T-L	48			
	WS-C3750X-24P-L	24 PoE+	715W	435W	
	WS-C3750X-48P-L	48 PoE+			
	WS-C3750X-48PF-L	48 PoE+			
IP Base	WS-C3750X-24T-S	24	350W	-	Yes
	WS-C3750X-48T-S	48			
	WS-C3750X-24P-S	24 PoE+	715W	435W	
	WS-C3750X-48P-S	48 PoE+			
	WS-C3750X-48PF-S	48 PoE+			

Standalone Switches

Figure 2 shows Cisco Catalyst 3560-X Series Switches.

Figure 2. Cisco Catalyst 3560-X Series Switches

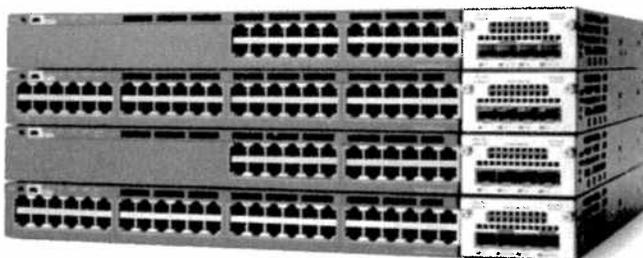


Table 2 shows the Cisco Catalyst 3560-X Series configurations.

Table 2. Cisco Catalyst 3560-X Series Configurations

Feature Set	Models	Total 10/100/1000 Ethernet Ports	Default AC Power Supply	Available PoE Power
LAN Base	WS-C3560X-24T-L	24	350W	-
	WS-C3560X-48T-L	48		
	WS-C3560X-24P-L	24 PoE+	715W	435W
	WS-C3560X-48P-L	48 PoE+		
	WS-C3560X-48PF-L	48 PoE+	1100W	800W
IP Base	WS-C3560X-24T-S	24	350W	-
	WS-C3560X-48T-S	48		
	WS-C3560X-24P-S	24 PoE+	715W	435W
	WS-C3560X-48P-S	48 PoE+		
	WS-C3560X-48PF-S	48 PoE+	1100W	800W

Cisco Catalyst 3750-X and 3560-X Series Software

In addition to IP Base and IP Services feature sets, the Cisco Catalyst 3750-X and 3560-X Series come with a new LAN Base feature set. The three feature sets available with all Cisco Catalyst 3750-X and 3560-X Series Switches are:

- LAN Base: Enhanced Intelligent Services
- IP Base: Baseline Enterprise Services
- IP Services: Enterprise Services

The LAN Base feature set offers enhanced intelligent services that includes comprehensive Layer 2 features, with up-to 255 VLANs. The IP Base feature set provides baseline enterprise services in addition to all LAN Base features, with 1K VLANs. IP Base also includes the support for routed access, StackPower, and MACsec. The IP Services feature set provides full enterprise services that includes advanced Layer 3 features such as Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Protocol Independent Multicast (PIM), and IPv6 routing such as OSPFv3 and EIGRPv6. IP Services feature set also includes the Embedded Event Manager (EEM) and IP service-level agreements (SLAs) initiator functionalities. All software feature sets support advanced security, QoS, and management features. The IP Services feature set is only available as an upgrade option at the time of ordering or through a license at a later time; there is no dedicated IP Services switch model.

The Cisco Catalyst 3750-X Series Switches with LAN Base feature set can only stack with other Cisco Catalyst 3750-X Series LAN Base switches. A mixed stack of LAN Base switch with IP Base or IP Services features set is not supported.

Customers can transparently upgrade the software feature set in the Cisco Catalyst 3750-X and 3560-X Series Switches through Cisco IOS® Software activation. Software activation authorizes and enables the Cisco IOS Software feature sets. A special file contained in the switch, called a license file, is examined by Cisco IOS Software when the switch is powered on. Based on the license's type, Cisco IOS Software activates the appropriate feature set. License types can be changed, or upgraded, to activate a different feature set. For detailed information about Software Activation, visit <http://www.cisco.com/go/sa>.

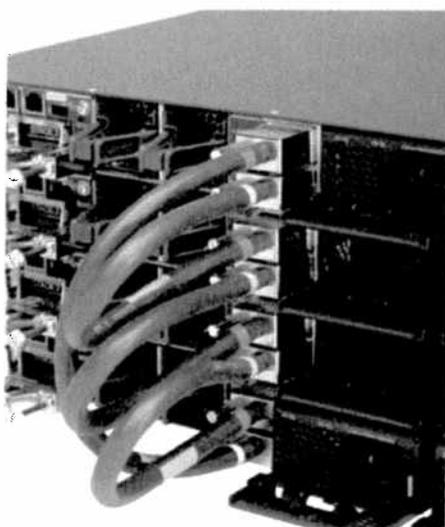
Cisco StackWise Plus Technology

Cisco StackWise Plus technology is built on the highly successful industry leading StackWise technology, which is a premium stacking architecture optimized for GbE. StackWise technology was designed to respond to additions, deletions, and redeployment while maintaining constant performance. The stack behaves as a single switching unit that is managed by a master switch elected from one of the member switches. The master switch automatically creates and updates all the switching and optional routing tables. A working stack can accept new members or delete old ones without service interruption. StackWise creates a highly resilient single unified system of up to nine switches, providing simplified management using a single IP address, single telnet session, single command-line interface (CLI), auto-version checking, autoconfiguration, and more. StackWise Plus supports all the features of StackWise and provides backward compatibility with the existing Cisco Catalyst 3750 Series Switches while enhancing the throughput of the system up to 64 Gbps. StackWise Plus also enables local switching in Cisco Catalyst 3750-X Series Switches. Local switching packets coming into a port in the Cisco Catalyst 3750-X Series or 3750-E Series Switch destined for another port in the same switch do not have to traverse through the stack ring, thus increasing the forwarding capacity of the switch. The Cisco Catalyst 3750-X Series stacks up to nine switches as a single logical unit for a total of 432 Ethernet 10/100/1000 ports with 18 10GbE ports. Individual 10/100/1000 units can be joined in any combination to evolve with network needs.

Cisco StackPower Technology

The Cisco Catalyst 3750-X Series introduces Cisco StackPower technology, innovative power interconnect system that allows the power supplies in a stack to be shared as a common resource among all the switches. Cisco StackPower unifies the individual power supplies installed in the switches and creates a pool of power, directing that power where it is needed. This feature is only available in the Cisco Catalyst 3750-X Series Switches with IP Base or IP Services feature set. Up to four switches can be configured in a StackPower stack with the special connector at the back of the switch using the StackPower cable, which is different than the StackWise cables available on all Cisco Catalyst 3750 models. (See Figure 3.)

Figure 3. StackPower Connector



StackPower can be deployed in either power sharing mode or redundancy mode. In power sharing mode, the power of all the power supplies in the stack is aggregated and distributed among the switches in the stack. In redundant mode, when the total power budget of the stack is calculated, the wattage of the largest power supply is not included. That power is held in reserve and used to maintain power to switches and attached devices when one

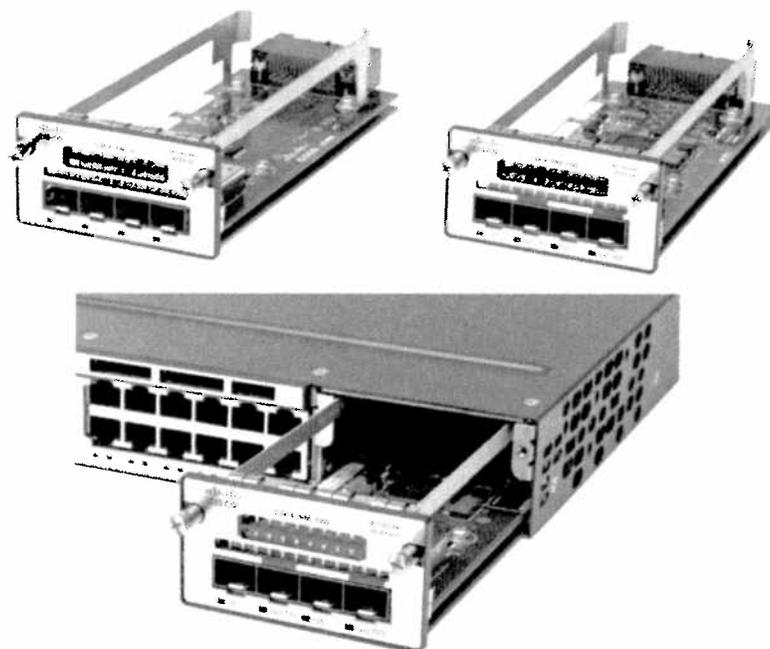
power supply fails, enabling the network to operate without interruption. Following the failure of one power supply, the StackPower mode becomes power sharing.

StackPower allows customers to simply add one extra power supply in any switch of the stack and provide either power redundancy for any of the stack members or simply add more power to the shared pool. StackPower eliminates the need for an external redundant power system or installation of dual power supplies in all the stack members.

Network Module

Figure 4 shows network module with four GbE or two 10GbE SFP+ interfaces.

Figure 4. Network Module with Four GbE or Two 10GbE SFP+ Interfaces



The Cisco Catalyst 3750-X Series and 3560-X Series Switches support an optional network module for uplink ports. The default switch configuration doesn't include the uplink module; the customer has the flexibility to choose from four GbE port (3KX-NM-1G) or two 10GbE port (3KX-NM-10G) network module at the time of switch purchase. The 10GbE uplink module features four physical ports with two SFP+ and two regular SFP ports. The SFP+ interface supports both 10GbE and GbE port, allowing customer to use their investment in GbE SFP and upgrade to 10GbE when business demands change, without having to do a comprehensive upgrade of the access switch. The uplink module is hot swappable. The 10GbE network module can be used in any of the combinations shown in Table 3.

Table 3. 10GbE Network Module Configuration

10GbE Network Module	
10GbE SFP+ Ports	GbE SFP Ports
2	0
0	4
1	2

MACsec

The Cisco Catalyst 3750-X and 3560-X Series Switches offer exceptional security with integrated hardware support for MACsec defined in IEEE 802.1AE. MACsec provides MAC layer encryption over wired networks using out-of-band methods for encryption keying. The MACsec Key Agreement (MKA) protocol provides the required session keys and manages the keys required for encryption when configured. MKA and MACsec are implemented following successful authentication using 802.1x Extensible Authentication Protocol (EAP) framework. In Cisco Catalyst 3750-X and 3560-X Series Switches only the user/down-link ports (links between the switch and endpoint devices such as a PC or IP phone) can be secured using MACsec.

Dual Redundant Modular Power Supplies

The Cisco Catalyst 3750-X Series and 3560-X Series Switches support dual redundant power supplies. The switch ships with one power supply by default, and the second power supply can be purchased at the time of ordering the switch or at a later time. If only one power supply is installed, it should always be in the power supply bay 1. (See Figure 5.)

Figure 5. Dual Redundant Power Supplies

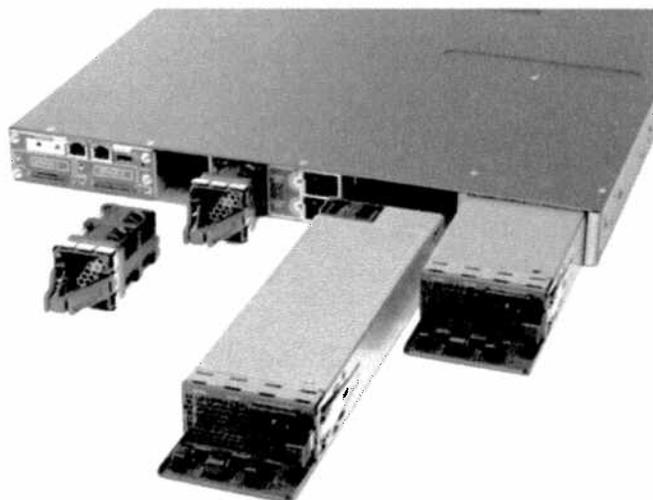


Table 4 shows the different power supplies available in these switches and available PoE power.

Table 4. Power Supply Models

Models	Default Power Supply	Available PoE Power
24 Port Data Switch	C3KX-PWR-350WAC	-
48 Port Data Switch		
24 Port PoE Switch	C3KX-PWR-715WAC	435W
48 Port PoE Switch		
48 Port Full PoE Switch	C3KX-PWR-1100WAC	800W

In addition to the above power supplies a 440W DC power supply is available as a configurable option on all switch models. The DC power supply also delivers 175W of PoE for maximum flexibility, and customers can mix and match the AC and DC power supplies in the two available power supply slots. Any of these power supplies can be installed in any of the switches.

Power over Ethernet Plus (PoE+)

In addition to PoE 802.3af, the Cisco Catalyst 3750-X and 3560-X Series Switches support PoE+ (IEEE 802.3at standard), which provides up to 30W of power per port. The Cisco Catalyst 3750-X and 3560-X Series Switches can provide a lower total cost of ownership for deployments that incorporate Cisco IP phones, Cisco Aironet® wireless LAN (WLAN) access points, or any IEEE 802.3af-compliant end device. PoE removes the need for wall power to each PoE-enabled device and eliminates the cost for additional electrical cabling and circuits that would otherwise be necessary in IP phone and WLAN deployments. Table 5 shows the power supply combinations required for different PoE needs.

Table 5. Power Supply Requirements for PoE and PoE+

	24 Port PoE Switch	48 Port PoE Switch
PoE (15.4W per port)	One C3KX-PWR-715WAC	One C3KX-PWR-1100WAC or Two C3KX-PWR-715WAC
PoE+ (30W per port)	One C3KX-PWR-1100WAC or Two C3KX-PWR-715WAC	Two C3KX-PWR-1100WAC or One C3KX-PWR-1100WAC and One C3KX-PWR-715WAC

eXpandable Power System (XPS) 2200

The XPS 2200 is the next-generation redundant power system (RPS). It not only provides the functionalities offered by the RPS but also provides enhanced services with the support for Cisco StackPower technology. When used with the Cisco Catalyst 3560-X, it provides RPS functionality, but when used with the Cisco Catalyst 3750-X, it provides StackPower functionality to all the stack members, including power supply redundancy.

The XPS supports dual redundant power supplies and fans. Up to nine switches can be connected to the XPS 2200, and it can provide power backup to two of the failed switches concurrently (when appropriately sized power supplies are used). The power supplies used the XPS 2200 are the same as the ones supported in the Cisco Catalyst 3750-X and 3560-X Series Switches. The XPS 2200 is fully configurable for setting switch priorities in case of multiple failures.

Please refer to the XPS 2200 Performance Specifications section at the end of this document.



Cisco Catalyst 3750-X and 3560-X Series Switches Enable Cisco Borderless Network Experience

Borderless Networks, a Cisco architecture, deliver the new workspace experience, connecting anyone, anywhere, using any device, to any resource securely, reliably, and transparently. Cisco's Borderless Networks architecture addresses primary IT and business challenges to help create a truly borderless experience by bringing interactions closer to the employee and customer.

Borderless experience is only possible with intelligent network elements designed and architected to meet the needs of a global workspace. Cisco Network Access is a primary component of this architecture, enabling various borderless network services such as mobility, security, MediaNet, EnergyWise, and ease of operations for increased productivity and operational efficiency. When network access is intelligent, it knows the identity of the user, as well as where the user is on the network. It knows what is connecting to the network, to automatically provision the network for QoS and delivery. It becomes services-aware to optimize user experience. Only with intelligent access network, your enterprise can go borderless securely and transparently. Your business can save energy, simplify operations with better business efficiency, and have an optimized total cost of ownership.

Cisco Network Access for Borderless solution focuses on the following primary areas:

- Sustainability
- Ease of operations
- Borderless security
- Borderless experience

Sustainability

Cisco Catalyst switching solutions enable greener practices through measurable power efficiency, integrated services, and continuous innovations such as Cisco EnergyWise, an enterprisewide solution that monitors and conserves energy with customized policies. Together, Cisco EnergyWise technology and Cisco Catalyst switches reduce greenhouse gas (GhG) emissions and increase energy cost savings and sustainable business behavior. Sustainability features in the Cisco Catalyst 3750-X and 3560-X Series Switches include the following features sets:

- Cisco EnergyWise technology
- Efficient switch operation
- Intelligent power management

Cisco EnergyWise Technology

Cisco EnergyWise is an innovative architecture, added to fixed configuration switches, promoting companywide sustainability by reducing energy consumption across an entire corporate infrastructure and affecting more than 50 percent of global greenhouse gas emissions created by worldwide building infrastructure, a much greater effect than the 2 percent generated by the IT industry. Cisco EnergyWise enables companies to measure the power consumption of network infrastructure and network-attached devices and manage power consumption with specific policies, reducing power consumption to realize increased cost savings, potentially affecting any powered device.

EnergyWise encompasses a highly intelligent network-based approach to communicate messages that measure and control energy between network devices and endpoints. The network discovers Cisco EnergyWise manageable devices, monitors their power consumption, and takes action based on business rules to reduce power consumption. EnergyWise uses a unique domain-naming system to query and summarize information from large sets of devices, making it simpler than traditional network management capabilities. Cisco EnergyWise's management interfaces allow facilities and network management applications to communicate with endpoints and each other using the network as a unifying fabric. The management interface uses standard SNMP or TCP to integrate Cisco and third-party management systems.

Efficient Switch Operation

Cisco Catalyst 3750-X and 3560-X Series Switches, designed and engineered by Cisco, provide optimum power saving, low power operations for industry best-in-class power management, and power consumption capabilities. The Cisco Catalyst 3750-X and 3560-X ports are capable of reduced power modes so that ports not in use can move into a lower power utilization state.

StackPower lets customers to simply add one extra power supply in any switch of the stack and provide either power redundancy for any of the stack members or simply add more power to the shared pool.

Intelligent Power over Ethernet Management

The Cisco Catalyst 3750-X and 3560-X Series PoE models support Cisco IP phones and Cisco Aironet WLAN access points providing up to 30W of power per port, as well as any IEEE 802.3af-compliant end device.

- **Cisco Discovery Protocol Version 2** allows the Cisco Catalyst 3750-X and 3560-X Series Switches to negotiate a more granular power setting when connecting to a Cisco powered device such as IP phones or access points than what is provided by IEEE classification.
- **Per port power consumption** command allows customers to specify maximum power setting on an individual port.
- **Per port PoE power sensing** measures actual power being drawn, enabling more intelligent control of powered devices.
- **The PoE MIB** provides proactive visibility into power usage and allows customers to set different power-level thresholds.

Ease of Operations

The Cisco Catalyst 3750-X and 3560-X help reduce the operating costs through:

- Cisco Catalyst Smart Operations
- Easy to use deployment and control features
- Advanced, intelligent network management tools

Cisco Catalyst Smart Operations

Cisco Catalyst Smart Operations are a comprehensive set of capabilities that simplify LAN deployment, configuration, and troubleshooting. In addition to adaptive, always on technologies such as StackWise and StackPower, Cisco Catalyst Smart Operations enable zero touch installation and replacement of switches, fast upgrade, as well as ease of troubleshooting with reduced operational cost. **Cisco Catalyst Smart Operations** is a set of features that includes Smart Install, auto Smartports, Smart Configuration, and Smart Troubleshooting to enhance operational excellence:

- **Cisco Smart Install** is a transparent plug and play technology to configure the Cisco IOS Software image and switch configuration without user intervention. Smart Install utilizes dynamic IP address allocation and the assistance of other switches to facilitate installation providing transparent network plug and play.
- **Cisco Auto Smartports** provide automatic configuration as devices connect to the switch port, allowing auto detection and plug and play of the device onto the network.
- **Cisco Smart Configuration** provides a single point of management for a group of switches and in addition adds the ability to archive and backup configuration files to a file server or switch allowing seamless zero touch switch replacement.
- **Cisco Smart Troubleshooting** is an extensive array of debug diagnostic commands and system health checks within the switch, including Generic Online Diagnostics (GOLD) and Onboard Failure Logging (OBFL).

Easy to Use Deployment and Control Features

- **Embedded Event Manager (EEM)** is a powerful and flexible feature that provides real-time network event detection and onboard automation. Using EEM, customers can adapt the behavior of their network devices to align with their business needs. This feature requires IP Services feature set.
- **IP service-level agreements (SLAs)** enable customers to assure new business-critical IP applications, as well as IP services that utilize data, voice, and video, in an IP network. This feature requires IP Services feature set.
- **Dynamic Host Configuration Protocol (DHCP)** autoconfiguration of multiple switches through a boot server eases switch deployment.
- **Automatic QoS (AutoQoS)** simplifies QoS configuration in voice over IP (VoIP) networks by issuing interface and global switch commands to detect Cisco IP phones, classify traffic, and help enable egress queue configuration.

- **Stacking master configuration management** and Cisco StackWise technology helps ensure that all switches are automatically upgraded when the master switch receives a new software version. Automatic software version checking and updating help ensure that all stack members have the same software version.
- **Autonegotiation** on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
- **Dynamic Trunking Protocol (DTP)** facilitates dynamic trunk configuration across all switch ports.
- **Port Aggregation Protocol (PAgP)** automates the creation of Cisco Fast EtherChannel[®] groups or Gigabit EtherChannel groups to link to another switch, router, or server.
- **Link Aggregation Control Protocol (LACP)** allows the creation of Ethernet channeling with devices that conform to IEEE 802.3ad. This feature is similar to Cisco EtherChannel technology and PAgP.
- **Automatic media-dependent interface crossover (MDIX)** automatically adjusts transmit and receive pairs if an incorrect cable type (crossover or straight-through) is installed.
- **Unidirectional Link Detection Protocol (UDLD)** and Aggressive UDLD allow unidirectional links caused by incorrect fiber-optic wiring or port faults to be detected and disabled on fiber-optic interfaces.
- **Switching Database Manager (SDM)** templates for access, routing, and VLAN deployment allow the administrator to easily maximize memory allocation to the desired features based on deployment-specific requirements.
- **Local Proxy Address Resolution Protocol (ARP)** works in conjunction with Private VLAN Edge to minimize broadcasts and maximize available bandwidth.
- **VLAN1 minimization** allows VLAN1 to be disabled on any individual VLAN trunk.
- **Smart Multicast, with Cisco StackWise Plus technology**, allows the Cisco Catalyst 3750-X Series to offer greater efficiency and support for more multicast data streams such as video by putting each data packet onto the backplane only once.
- **Internet Group Management Protocol (IGMP) Snooping** for IPv4 and IPv6 MLD v1 and v2 Snooping provide fast client joins and leaves of multicast streams and limit bandwidth-intensive video traffic to only the requestors.
- **Multicast VLAN Registration (MVR)** continuously sends multicast streams in a multicast VLAN while isolating the streams from subscriber VLANs for bandwidth and security reasons.
- **Per-port broadcast, multicast, and unicast storm control** prevents faulty end stations from degrading overall systems performance.
- **Voice VLAN** simplifies telephony installations by keeping voice traffic on a separate VLAN for easier administration and troubleshooting.
- **Cisco VLAN Trunking Protocol (VTP)** supports dynamic VLANs and dynamic trunk configuration across all switches.
- **Remote Switch Port Analyzer (RSPAN)** allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.
- For enhanced traffic management, monitoring, and analysis, the Embedded **Remote Monitoring (RMON)** software agent supports four RMON groups (history, statistics, alarms, and events).
- **Layer 2 traceroute** eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- **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 intranet switches.

Advanced, Intelligent Network Management Tools

The Cisco Catalyst 3750-X and 3560-X Series Switches offer both a superior CLI for detailed configuration and Cisco Network Assistant software, a PC-based tool for quick configuration based on preset templates. In addition, CiscoWorks LAN Management Solution (LMS) supports the Cisco Catalyst 3750-X and 3560-X Series Switches for networkwide management.

Cisco Network Assistant

A PC-based network management application designed for small and medium-sized business (SMB) networks with up to 250 users, Cisco Network Assistant offers centralized network management and configuration capabilities. Cisco Network Assistant uses Cisco Smartports technology to simplify both initial deployment and ongoing maintenance. This application also features an intuitive GUI where users can easily apply common services across Cisco switches, routers, and access points, such as:

- Configuration management
- Troubleshooting advice
- Inventory reports
- Event notification
- Network security settings
- Password synchronization
- Drag-and-drop Cisco IOS Software upgrades
- Secure wireless

For detailed information about Cisco Network Assistant, visit <http://www.cisco.com/go/cna>.

CiscoWorks LAN Management Solution

CiscoWorks LAN Management Solution (LMS) is a comprehensive network lifecycle management solution. It provides an extensive library of easy-to-use features to automate the initial and day-to-day management of your Cisco network infrastructure. CiscoWorks LMS uniquely uses Cisco hardware and software platform knowledge and operational experience into a powerful set of work-flow driven configuration, monitoring, troubleshooting, reporting, and administrative tools. Including:

- Support for new Cisco hardware platforms the day they ship
- Support for new technologies and services from initial deployment to day-to-day administration and management, such as EnergyWise, Identity, Cisco Auto Smartports, Cisco Smart Install, and much more
- Configuration management tools built from Cisco experience and Cisco Validated Design recommendations
- Monitoring and troubleshooting capabilities that incorporates Cisco hardware best practices and diagnostics features
- Automation in managing hardware inventories, security vulnerabilities (PSIRTS) and platform end-of-life and support cycles

For detailed information about CiscoWorks LMS, go to <http://www.cisco.com/en/US/products/sw/cscowork/ps2425/index.html>.

Borderless Security

The Cisco Catalyst 3750-X and 3560-X Series Switches provide superior Layer 2 threat defense capabilities for mitigating man-in-the-middle attacks (such as MAC, IP, and ARP spoofing). TrustSec, a primary element of Borderless Security Architecture, helps enterprise customers secure their networks, data and resources with policy-

based access control, identity and role-aware networking, pervasive integrity, and confidentiality. The borderless security is enabled by the following feature sets in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- Threat defense
- Cisco TrustSec
- Other advanced security features

Threat Defense

Cisco Integrated Security Features is an industry-leading solution available on Cisco Catalyst Switches that proactively protects your critical network infrastructure. Delivering powerful, easy-to-use tools to effectively prevent the most common and potentially damaging Layer 2 security threats, Cisco Integrated Security Features provides robust security throughout the network. Cisco Integrated Security Features include Port Security, DHCP Snooping, Dynamic ARP Inspection, and IP Source guard.

- **Port Security** secures the access to an access or trunk port based on MAC address. It limits the number of learned MAC addresses to deny MAC address-flooding.
- **DHCP Snooping** prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature is used by other primary security features to prevent a number of other attacks such as ARP poisoning.
- **Dynamic ARP Inspection (DAI)** helps ensure user integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol.
- **IP source guard** prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between the client's IP and MAC address, port, and VLAN.

Cisco TrustSec

TrustSec secures access to the network, enforces security policies, and delivers standard based security solutions such as 802.1X enabling secure collaboration and policy compliance. TrustSec capabilities reflect Cisco thought leadership, innovations, and commitment to customer success. These new capabilities include:

- **IEEE 802.1AE MACsec** with prestandard 802.1X-REV Key management: industry's first fixed switches with prestandard 802.1X-Rev key management. Available on Cisco Catalyst 3750-X and 3560-X Series Switches, MACsec provides Layer 2, line rate Ethernet data confidentiality and integrity on host facing ports, protecting against man-in-the-middle attacks (snooping, tampering, and replay).
- **Flexible authentication** that supports multiple authentication mechanisms including 802.1X, MAC Authentication Bypass and web authentication using a single, consistent configuration.
- **Open mode** that creates a user friendly environment for 802.1X operations.
- **Integration of device profiling technology and guest access** handling with Cisco switching to significantly improve security while reducing deployment and operational challenges.
- **RADIUS Change of Authorization and downloadable Calls** for Comprehensive policy management capabilities.
- **802.1X Supplicant with Network Edge Access Transport (NEAT)** enables extended secure access where compact switches in the conference rooms have the same level of security as switches inside the locked wiring closet.

Other Advanced Security Features

Other Advanced Security features include but are not limited to:

- **Private VLANs** restrict traffic between hosts in a common segment by segregating traffic at Layer 2, turning a broadcast segment into a nonbroadcast multiaccesslike segment.
- **Private VLAN Edge** provides security and isolation between switch ports, which helps ensure that users cannot snoop on other users' traffic.
- **Unicast Reverse Path Forwarding (RPF)** feature helps mitigate problems caused by the introduction of malformed or forged (spoofed) IP source addresses into a network by discarding IP packets that lack a verifiable IP source address.
- **Multidomain Authentication** allows an IP phone and a PC to authenticate on the same switch port while placing them on appropriate voice and data VLAN.
- **Cisco security VLAN ACLs** on all VLANs prevent unauthorized data flows from being bridged within VLANs.
- **Cisco standard and extended IP security router ACLs** define security policies on routed interfaces for control-plane and data-plane traffic. IPv6 ACLs can be applied to filter IPv6 traffic.
- **Port-based ACLs** for Layer 2 interfaces allow security policies to be applied on individual switch ports.
- **Secure Shell (SSH) Protocol, Kerberos, and Simple Network Management Protocol Version 3 (SNMPv3)** provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH Protocol, Kerberos, and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions.
- Bidirectional data support on the **Switched Port Analyzer (SPAN)** port allows Cisco Intrusion Detection System (IDS) to take action when an intruder is detected.
- **TACACS+ and RADIUS authentication** facilitates centralized control of the switch and restricts unauthorized users from altering the configuration.
- **MAC Address Notification** allows administrators to be notified of users added to or removed from the network.
- **Multilevel security on console access** prevents unauthorized users from altering the switch configuration.
- **Bridge protocol data unit (BPDU) Guard** shuts down Spanning Tree PortFast-enabled interfaces when BPDUs are received to avoid accidental topology loops.
- **Spanning Tree Root Guard (STRG)** prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- **IGMP filtering** provides multicast authentication by filtering out nonsubscribers and limits the number of concurrent multicast streams available per port.
- **Dynamic VLAN assignment** is supported through implementation of VLAN Membership Policy Server client capability to provide flexibility in assigning ports to VLANs. Dynamic VLAN facilitates the fast assignment of IP addresses.

Borderless Experience

Borderless network enables enterprise mobility and business-grade video services. Industry's first unified network (wired and wireless) location services enable tracking of mobile assets and the users of those assets for both wired and wireless devices. The true borderless experience is enabled by the following feature sets in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- High availability
- High-performance IP routing

- Superior QoS
- Location awareness and mobility

High Availability

The Cisco Catalyst 3750-X Series increases availability for stackable switches. Each switch can operate both as master controller and as forwarding processor. Each switch in the stack can serve as a master, creating a 1:N availability scheme for network control. In the unlikely event of a single unit failure, all other units continue to forward traffic and maintain operation.

Other high-availability features include but are not limited to:

- Cross-Stack EtherChannel provides the ability to configure Cisco EtherChannel technology across different members of the stack for high resiliency.
- Flexlink provides link redundancy with convergence time less than 100 ms.
- IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) provide rapid spanning-tree convergence independent of spanning-tree timers and also offers the benefit of Layer 2 load balancing and distributed processing. Stacked units behave as a single spanning-tree node.
- Per-VLAN Rapid Spanning Tree (PVRST+) allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances.
- Cisco Hot Standby Router Protocol (HSRP) is supported to create redundant, failsafe routing topologies.
- Switch-port autorecovery (Errdisable) automatically attempts to reactivate a link that is disabled because of a network error.

High-Performance IP Routing

Cisco Express Forwarding hardware routing architecture delivers extremely high-performance IP routing in the Cisco Catalyst 3750-X and 3560-X Series Switches.

- IP unicast routing protocols (Static, Routing Information Protocol Version 1 [RIPv1], and RIPv2, RIPv2, RIPv2, EIGRP stub) are supported for small-network routing applications with IP Base feature set.
- Advanced IP unicast routing protocols (OSPF, EIGRP, BGPv4, and IS-ISv4) are supported for load balancing and constructing scalable LANs. IPv6 routing (OSPFv3, EIGRPv6) is supported in hardware for maximum performance. The IP Services feature set is required.
- Equal-cost routing facilitates Layer 3 load balancing and redundancy across the stack.
- Policy-based routing (PBR) allows superior control by facilitating flow redirection regardless of the routing protocol configured. The IP Services feature set is required.
- Hot Standby Routing Protocol (HSRP) provides dynamic load balancing and failover for routed links, up to 32 HSRP links supported per unit or stack.
- Protocol Independent Multicast (PIM) for IP multicast routing is supported, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), PIM sparse-dense mode and Source Specific Multicast (SSM). The IP Services feature set is required.
- Virtual routing and forwarding (VRF)-Lite enables a service provider to support two or more VPNs, with overlapping IP addresses. IP Services feature set is required.

Superior Quality of Service

The Cisco Catalyst 3750-X and 3560-X Series offers GbE speed with intelligent services that keep everything flowing smoothly, even at 10 times the normal network speed. Industry-leading mechanisms for marking, classification, and scheduling deliver superior performance for data, voice, and video traffic, all at wire speed.

Following are some of the QoS features supported in the Cisco Catalyst 3750-X and 3560-X Series Switches:

- Cross-stack QoS allows QoS to be configured across the entire stack.
- 802.1p class of service (CoS) and differentiated services code point (DSCP) field classification are provided, using marking and reclassification on a per-packet basis by source and destination IP address, MAC address, or Layer 4 TCP/UDP port number.
- Cisco control-plane and data-plane QoS ACLs on all ports help ensure proper marking on a per-packet basis.
- Eight egress queues per port help enable differentiated management of different traffic types across the stack. Four queues are user configurable and four are reserved for system use.
- Shaped Round Robin (SRR) scheduling helps ensure differential prioritization of packet flows by intelligently servicing the ingress queues and egress queues.
- Weighted Tail Drop (WTD) provides congestion avoidance at the ingress and egress queues before a disruption occurs.
- Strict priority queuing helps ensure that the highest-priority packets are serviced ahead of all other traffic.
- The Cisco committed information rate (CIR) function provides bandwidth in increments as low as 8 Kbps.
- Rate limiting is provided based on source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields, using QoS ACLs (IP ACLs or MAC ACLs), class maps, and policy maps.
- Up to 64 aggregate or individual policers are available per Fast Ethernet or GbE port.

Location Awareness and Mobility

In order to provide delivery of a best-in-class network experience to end users, it's critical for network access to be location aware. A wide variety of devices can appear on the network, both wired (switches, routers, IP phones, PCs, access points, controllers, video digital media players, and so on) and wireless (mobile devices, wireless tags, rogues, and so on). In many industries, locating assets is primarily a manual process and is time consuming and error prone. The inability to locate assets in real time and to help ensure their availability when and where they are needed limits reaction time and efficiency.

Location services answer business-critical questions about both mobile assets and the users of those assets regardless of whether those assets are connecting using wired or wireless, and hence directly improve their organization's profitability. Network Location Services also improve security and accelerate client troubleshooting by locating an asset, user, or device on the network.

- Network visibility and control provide centralized visibility into wired and wireless devices on the network and their location.
- Location-assisted client troubleshooting enables tracking of wired or wireless clients for quick problem resolution.
- Asset tracking and improved security provide centralized inventory of wired and wireless devices and asset management for improved business processes.
- Cisco Mobility Service Engine (MSE) Open API provides an open API (based on Simple Object Access Protocol [SOAP] and XML protocol) for any business application that needs the location data.
- Location based policy allows greater control and visibility. With EnergyWise, power policies can be set up (to reduce the power or shut down the power from a port) based on the location.
- Cisco Emergency Responder (CER) enhances emergency calling from Cisco Unified CallManager. It helps assure that Cisco Unified CallManager sends emergency calls to the appropriate Public Safety Answering Point (PSAP) for the caller's location.

Cisco Catalyst 3750-X and 3560-X Series Specifications

Switch Performance

Table 6 shows Cisco Catalyst 3750-X and 3560-X Series Switches performance specifications.

Table 6. Cisco Catalyst 3750-X and 3560-X Performance Specifications

Performance Numbers for All Switch Models	
Switching Fabric	160 Gbps
DRAM	256 MB
Flash	64 MB
Total VLANs	1005
VLAN IDs	4K
Total Switched Virtual Interfaces (SVIs)	1K
Jumbo Frame	9216 Byte
Total Routed Ports per 3750-X Stack	468
Stack-forwarding rate (64-byte packets)	95 mpps
Forwarding Rate of the Switch Models (with Two 10GbE Uplinks)	
	Forwarding Rate
3750X-24T	65.5 mpps
3750X-24P	
3750X-48T	101.2 mpps
3750X-48P	
3750X-48PF	
3560X-24T	65.5 mpps
3560X-24P	
3560X-48T	101.2 mpps
3560X-48P	
3560X-48PF	

Scalability Numbers

MAC, routing, security, and QoS scalability numbers depend on the type template used in the switch. Routing template is not supported in the LAN Base feature set. Table 7 shows Cisco Catalyst 3750-X and 3560-X Series Switch scalability numbers.

Table 7. Cisco Catalyst 3750-X and 3560-X Series Switch Scalability Numbers

	Access	Default	Routing	VLAN
Unicast MAC addresses	4K	6K	3K	12K
IGMP groups and multicast routes	1K	1K	1K	1K
Unicast routes	6K	8K	11K	0
Directly connected hosts	4K	6K	3K	0
Indirect routes	2K	2K	8K	0
Policy-based routing ACEs	0.5K	0	0.5K	0
QoS classification ACEs	0.5K	0.5K	0.5K	0.5K
Security ACEs	2K	1K	1K	1K
VLANs	1K	1K	1K	1K

Dimensions, Weight, Acoustic, MTBF, and Environmental Range Specifications for Cisco Catalyst 3750-X and 3560-X Series Switches

Table 8 shows dimensions, weight, acoustic, MTBF, and environmental range.

Table 8. Dimensions, Weight, Acoustic, MTBF, and Environmental Range

Dimensions (H x W x D)	Inches	Centimeters
3750X-24T	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3750X-24P		
3750X-48T		
3750X-48P		
3750X-48PF	1.75 x 17.5 x 19.5	4.45 x 44.5 x 49.5
3560X-24T	1.75 x 17.5 x 18.0	4.45 x 44.5 x 46.0
3560X-24P		
3560X-48T		
3560X-48P		
3560X-48PF	1.75 x 17.5 x 19.5	4.45 x 44.5 x 49.5
Weight	Pounds	Kilograms
3750X-24T	15.6	7.1
3750X-24P	15.8	7.2
3750X-48T	16.3	7.4
3750X-48P	16.5	7.5
3750X-48PF	16.7	7.6
3560X-24T	15.4	7.0
3560X-24P	15.7	7.1
3560X-48T	16.1	7.3
3560X-48P	16.4	7.4
3560X-48PF	16.6	7.5
Mean Time Between Failure (MTBF) Hours		
3750X-24T	189,704	
3750X-24P	167,198	
3750X-48T	171,846	
3750X-48P	139,913	
3750X-48PF	139,913	
3560X-24T	208,218	
3560X-24P	181,370	
3560X-48T	186,778	
3560X-48P	149,594	
3560X-48PF	149,594	
C3KX-PWR-350WAC	580,710	
C3KX-PWR-715WAC	664,055	
C3KX-PWR-1100WAC	392,174	
C3KX-PWR-440WDC	469,350	
C3KX-NM-1G	5,083,574	
C3KX-NM-10G	2,468,553	

Environmental Ranges	
With AC Power Supply Operating Environment and Altitude	Normal Operating Temperature and Altitudes: -5°C to +45°C, up to 5,000 feet (1500 m) -5°C to +40°C, up to 10,000 feet (3000 m)
	Short-Term Exceptional Conditions: -5°C to +50°C, up to 5,000 feet (1500 m) -5°C to +45°C, up to 10,000 feet (3000 m) -5°C to +45°C, at sea level with single fan failure * Not more than following in one year period: 96 consecutive hours, or 360 hours total, or 15 occurrences
With DC Power Supply Operating Environment and Altitude	Normal Operating Temperature and Altitudes: -5°C to +45°C, up to 6,000 feet (1800 m) -5°C to +40°C, up to 10,000 feet (3000 m) -5°C to +35°C, up to 13,000 feet (4000 m)
	Short-Term Exceptional Conditions: -5°C to +55°C, up to 5,000 feet (1800 m) -5°C to +50°C, up to 10,000 feet (3000 m) -5°C to +45°C, up to 10,000 feet (4000 m) -5°C to +45°C, at sea level with single fan failure * Not more than following in one year period: 96 consecutive hours, or 360 hours total, or 15 occurrences
Acoustic Noise (with 16 PoE+ ports loaded)	With AC Power Supply: LpA: 43 dbA Typical, 46 dbA Maximum LwA: 5.2 Bel Typical, 5.5 Bel Maximum With DC Power Supply: LpA: 44 dbA Typical, 47 dbA Maximum LwA: 5.3 Bel Typical, 5.6 Bel Maximum
Relative Humidity	5% to 95%, noncondensing
Storage Environment:	Temperature: -40 C° to 70 C° Altitude: 15,000 ft
Vibration	Operating: 0.41Grms from 3 to 500Hz with spectral break points of 0.0005 G2/Hz at 10Hz and 200Hz 5dB/octave roll off at each end
	Nonoperating: 1.12Grms from 3 to 500Hz with spectral break points of 0.0065 G2/Hz at 10Hz and 100Hz 5dB/octave roll off at each end
Shock	Operating: 30G, 2ms Half sine
	Nonoperating: 55G, 10ms Trapezoid

Connectors and LED Indicators for Cisco Catalyst 3750-X and 3560X Series

Table 9 shows connectors and LED indicators.

Table 9. Connectors and LED Indicators

Connectors and Cabling	<ul style="list-style-type: none"> 1000BASE-T ports: RJ-45 connectors, 2-pair Cat-5E UTP cabling 1000BASE-T SFP-based ports: RJ-45 connectors, 2-pair Cat-5E UTP cabling 100BASE-FX, 1000BASE-SX, -LX/LH, -ZX, -BX10, DWDM and CWDM SFP Transceivers: LC fiber connectors (single-mode or multimode fiber) 10GBASE-SR, LR, LRM, CX1 (v02 or higher) SFP+ Transceivers: LC fiber connectors (single-mode or multimode fiber) Cisco StackWise stacking ports: copper-based Cisco StackWise cabling Cisco StackPower: Cisco Proprietary Power Stacking cables Ethernet Management port: RJ-45 connectors, 2-pair Cat-5 UTP cabling Management console port: RJ-45-to-DB9 cable for PC connections
Power Connectors	<ul style="list-style-type: none"> Customers can provide power to a switch by using either the internal power supply or the Cisco XPS 2200. The connectors are located at the back of the switch Internal power supply connector. The internal power supply is an autoranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet

Management and Standards Support for Cisco Catalyst 3750-X and 3560-X Series Switches

Table 10 shows management and standards support for the Cisco Catalyst 3750-X and 3560-X Series.

Table 10. Management and Standards Support for the Cisco Catalyst 3750-X and 3560-X Series

Description	Specification	
Management	BRIDGE-MIB CISCO-CDP-MIB CISCO-CLUSTER-MIB CISCO-CONFIG-MAN-MIB CISCO-ENTITY-FRU-CONTROL-MIB CISCO-ENVMON-MIB CISCO-FLASH-MIB CISCO-FTP-CLIENT-MIB CISCO-HSRP-MIB CISCO-HSRP-EXT-MIB CISCO-IGMP-FILTER-MIB CISCO-IMAGE-MIB CISCO-IP-STAT-MIB CISCO-L2L3-INTERFACE-CONFIG-MIB CISCO-POE-EXTENSIONS-MIB CISCO-MAC-NOTIFICATION-MIB CISCO-MEMORY-POOL-MIB CISCO-PAGP-MIB CISCO-PING-MIB CISCO-PROCESS-MIB CISCO-RTTMON-MIB CISCO-STP-EXTENSIONS-MIB CISCO-SYSLOG-MIB CISCO-TCP-MIB CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB CISCO-VLAN-MEMBERSHIP-MIB	CISCO-VTP-MIB ENTITY-MIB ETHERLIKE-MIB IF-MIB IGMP-MIB IPMROUTE-MIB OLD-CISCO-CHASSIS-MIB OLD-CISCO-FLASH-MIB OLD-CISCO-INTERFACES-MIB OLD-CISCO-IP-MIB OLD-CISCO-SYS-MIB OLD-CISCO-TCP-MIB OLD-CISCO-TS-MIB OSPF-MIB (RFC 1253) PIM-MIB RFC1213-MIB RFC1253-MIB RMON-MIB RMON2-MIB SNMP-FRAMEWORK-MIB SNMP-MPD-MIB SNMP-NOTIFICATION-MIB SNMP-TARGET-MIB SNMPV2-MIB TCP-MIB UDP-MIB
Standards	IEEE 802.1s IEEE 802.1w IEEE 802.1x IEEE 802.1x-Rev IEEE 802.3ad IEEE 802.1ae IEEE 802.3af IEEE 802.3at IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports IEEE 802.1D Spanning Tree Protocol IEEE 802.1p CoS Prioritization IEEE 802.1Q VLAN IEEE 802.3 10BASE-T specification IEEE 802.3u 100BASE-TX specification IEEE 802.3ab 1000BASE-T specification IEEE 802.3z 1000BASE-X specification	RMON I and II standards SNMPv1, SNMPv2c, and SNMPv3

Power Supply Specifications

Table 11 lists the power specifications for the Cisco Catalyst 3750-X and 3560-X Series based on the kind of power supply used.

Table 11. Power Specifications for Cisco Catalyst 3750-X and 3560-X Series

Description	Specification			
	C3KX-PWR-1100WAC	C3KX-PWR-715WAC	C3KX-PWR-350WAC	C3KX-PWR-440WDC
Power Supply Rated Maximum	1100W	715W	350W	440W
Total Output BTU (Note: 1000 BTU/hr = 293W)	3793 BTU/hr, 1100W	2465 BTU/hr, 715W	1207BTU/hr, 350W	1517BTU/hr, 440W
Input-Voltage Range and Frequency	115-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	100-240VAC, 50-60 Hz	-36VDC to -72VDC
Input Current	12-6A	10-5A	4-2A	<8A@-72VDC <16A@-36VDC
Output Ratings	-56V@19.64A	-56V@12.8A	-56V@6.25A	-56V@7.86A
Output Holdup Time	10 ms minimum @ 102.5VAC	16.7 ms minimum @ 100VAC	16.7 ms minimum @ 100VAC	> 2ms@-48VDC
Power-Supply Input Receptacles	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320-C16)	IEC 320-C16 (IEC60320- C16)	Terminal Strip
Power Cord Rating	15A	15A	10A	20A @ 100VDC
Physical Specifications	(H x W x D): 1.58 X 3.25 X 13.25 in Weight: 3.5 lb (1.6 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.78 lb (1.26 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.76 lb (1.25 kg)	(H x W x D): 1.58 X 3.25 X 11.75 in Weight: 2.65 lb (1.2 kg)
Operating Temperature	23 to 113F (-5 to 45°C)			
Storage Temperature	-40 to 158F (-40 to 70°C)			
Relative Humidity Operating, and Nonoperating Noncondensing	5 to 90% noncondensing			
Altitude	10,000 ft. (3000 meters), up to 45°C			
MTBF	Calculated MTBF must be greater than 300,000 using Telcordia SR-332, Method 1, Case 3. Demonstrated MTBF is 500,000 hr (with 90% confidence level)			
EMI and EMC Compliance	FCC Part 15 (CFR 47) Class A ICES-003 Class A EN 55022 Class A CISPR 22 Class A AS/NZS 3548 Class A BSMI Class A (AC input models only) VCCI Class A EN 55024, EN300386. EN 50082-1, EN 61000-3-2, EN 61000-3-3 EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN 61000-6-1			
Safety Compliance	UL 60950-1, CAN/CSA-C22.2 No. 60950-1, EN 60950-1, IEC 60950-1, CCC			
LED Indicators	"AC OK": Input power to the power supply is OK "PS OK": Output power from the power supply is OK			

Power Consumptions of Standalone Cisco Catalyst 3750-X and 3560-X Series Switches

Table 12 shows power consumptions of standalone Cisco Catalyst 3750-X and 3560-X Series Switches based on Alliance for Telecommunications Industry Solutions (ATIS) testing using IMIX distribution stream traffic, with input voltage of 115V AC @ 60 Hz and no PoE loading.

Table 12. Power Consumptions of Standalone Cisco Catalyst 3750-X and 3560-X Series

Models	Uplink Module	Power Consumption, W			
		0% Traffic	10% Traffic	100% Traffic	Weighted Average
3750X-24T & 3560X-24T	C3KX-NM-1G	93.6	92.8	93.5	93.0
3750X-24P & 3560X-24P		99.4	98.7	99.3	98.9
3750X-48T & 3560X-48T		121.3	119.7	120.4	120.0
3750X-48P & 3560X-48P		134.9	133.3	133.9	133.6
3750X-4PF & 3560X-48PF		137.4	135.8	137.2	136.2
3750X-24T & 3560X-24T	C3KX-NM-10G	95.8	95.4	98.7	95.8
3750X-24P & 3560X-24P		101.7	101.5	104.6	101.8
3750X-48T & 3560X-48T		124.2	122.7	126.0	123.3
3750X-48P & 3560X-48P		137.2	136.0	139.3	136.5
3750X-4PF & 3560X-48PF		140.9	139.6	142.9	140.1

Safety and Compliance

Table 13 lists the safety and compliance information for the Cisco Catalyst 3750-X and 3560-X Series.

Table 13. Safety and Compliance Information for Cisco Catalyst 3750-X and 3560-X Series

Description	Specification
Safety Certifications	UL60950-1 C-UL to CAN/CSA 22.2 No.60950-1 TUV/GS to EN 60950-1 CB to IEC 60950-1 with all country deviations AS/NZS 60950-1 CE Marking NOM (through partners and distributors) GOST (Russia Safety Mark)
Electromagnetic Emissions Certifications	FCC Part 15 Class A EN 55022B Class A (CISPR22 Class A) VCCI Class A AS/NZS 3548 Class A or AS/NZS CISPR22 Class A KCC CE Marking GOST (Russian mark - Post FCS through partners) CCC for PS FRU Redundant
Environmental	Reduction of Hazardous Substances (ROHS) 5
Noise Specifications	Office Product Spec: 48dBA at 30°C (refer to ISO 7779)
Telco	CLEI code

Cisco Enhanced Limited Lifetime Hardware Warranty

The Cisco Catalyst 3750-X and 3560-X Series Switches come with an enhanced limited lifetime hardware warranty (E-LLW) that includes next business day delivery of replacement hardware where available and 90 days of 8x5 Cisco Technical Assistance Center (TAC) support.

Your formal warranty statement, including the warranty applicable to Cisco software, appears in the Cisco information packet that accompanies your Cisco product. We encourage you to review carefully the warranty statement shipped with your specific product before use.

Cisco reserves the right to refund the purchase price as its exclusive warranty remedy.

For further information on warranty terms, visit <http://www.cisco.com/go/warranty>. Table 14 provides information about the enhanced limited lifetime hardware warranty.

Table 14. Enhanced Limited Lifetime Hardware Warranty

Cisco Enhanced Limited Lifetime Hardware Warranty	
Device Covered	Applies to Cisco Catalyst 3750-X and 3560-X Series Switches.
Warranty Duration	As long as the original end user continues to own or use the product, provided that fan and power supply warranty is limited to 5 years.
EoL Policy	In the event of discontinuance of product manufacture, Cisco warranty support is limited to 5 years from the announcement of discontinuance.
Hardware Replacement	Cisco or its service center will use commercially reasonable efforts to ship a replacement for next business day delivery, where available. Otherwise, a replacement will be shipped within ten (10) working days after receipt of the RMA request. Actual delivery times might vary depending on customer location.
Effective Date	Hardware warranty commences from the date of shipment to customer (and in case of resale by a Cisco reseller, not more than 90 days after original shipment by Cisco).
TAC Support	Cisco will provide during business hours, 8 hours per day, 5 days per week basic configuration, diagnosis, and troubleshooting of device-level problems for up to a 90-day period from the date of shipment of the originally purchased Cisco Catalyst 3750-X or 3560-X product. This support does not include solution or network-level support beyond the specific device under consideration.
Cisco.com Access	Warranty allows guest access only to Cisco.com.

Software Policy for Cisco Catalyst 3750-X and 3560-X Series Switches

Customers with Cisco Catalyst LAN Base and IP Base software feature sets will be provided with maintenance updates and bug fixes designed to maintain the compliance of the software with published specifications, release notes, and industry standards compliance as long as the original end user continues to own or use the product or up to one year from the end-of-sale date for this product, whichever occurs earlier. Customers with licenses for our premium software images require a service support contract such as Cisco SMARTnet[®] Service to download updates.

This policy supersedes any previous warranty or software statement and is subject to change without notice.

Cisco and Partner Services for Next-Generation Cisco Catalyst Fixed Switches

Enable the innovative, secure, intelligent edge in the Borderless Network Architecture using personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the next-generation Cisco Catalyst fixed switches into your architecture and incorporate network services onto that platform. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs. (See Table 15.)

Table 15. Technical Services Available for Cisco Catalyst 3750-X and 3560-X Switches

Technical Services
<p>Cisco SMARTnet Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco Technical Assistance Center (TAC) • Unrestricted access to the extensive Cisco.com knowledge base and tools • Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement and onsite parts replacement and installation available • Ongoing operating system software updates within the licensed feature set • Proactive diagnostics and real-time alerts on Smart Call Home enabled devices

Technical Services
<p>Cisco Smart Foundation Service</p> <ul style="list-style-type: none"> • Next business day advance hardware replacement as available • Business hours access to SMB TAC (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through Smart Foundation Portal • Operating system software bug fixes and patches
<p>Cisco SP Base Service</p> <ul style="list-style-type: none"> • Around-the-clock, global access to the Cisco TAC • Registered access to Cisco.com • Next business day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement. Return to factory option available² • Ongoing operating system software updates¹
<p>Cisco Focused Technical Support Services</p> <ul style="list-style-type: none"> • 3 levels of premium, high-touch services are available: • Cisco High-Touch Operations Management Service • Cisco High-Touch Technical Support Service • Cisco High-Touch Engineering Service • Valid Cisco SMARTnet or SP Base contracts on all network equipment are required

Notes:

¹ Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.

² Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with next business day (NBD) delivery. Where NBD is not available, same day ship is provided. Restrictions apply; for details, review the appropriate service descriptions.

Cisco Services for Access Switching

Cisco and our partners can help you create a robust, dependable Cisco Access Switching solution. The Cisco lifecycle approach to services defines the requisite activities at each phase of the solution lifecycle. Assessments help align your solution to business goals and gauge readiness to support new technology. Effective planning and design expedite solution adoption. Award-winning technical support increases operational efficiency and optimization improves performance, resiliency, stability, and predictability and prepares your network and teams for change. For more information, visit <http://www.cisco.com/go/services>.

Ordering Information

Table 16 lists ordering information for the Cisco Catalyst 3750-X and 3560-X Series. To place an order, visit the Cisco Ordering homepage at

http://www.cisco.com/en/US/ordering/or13/or8/order_customer_help_how_to_order_listing.html.

Table 16. Cisco Catalyst 3750-X and 3560-X Series Ordering Information

Product Number	Product Description
Cisco Catalyst 3750-X Series	
WS-C3750X-24T-L	Stackable 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3750X-48T-L	Stackable 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3750X-24P-L	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3750X-48P-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3750X-48PF-L	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, LAN Base feature set
WS-C3750X-24T-S	Stackable 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set

Product Number	Product Description
WS-C3750X-48T-S	Stackable 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3750X-24P-S	Stackable 24 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Base feature set
WS-C3750X-48P-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 715W AC Power Supply 1 RU, IP Base feature set
WS-C3750X-48PF-S	Stackable 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, LAN Base feature set
Cisco Catalyst 3560-X Series	
WS-C3560X-24T-L	Standalone 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48T-L	Standalone 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, LAN Base feature set
WS-C3560X-24P-L	Standalone 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48P-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48P-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, LAN Base feature set
WS-C3560X-48PF-L	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, LAN Base feature set
WS-C3560X-24T-S	Standalone 24 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3560X-48T-S	Standalone 48 10/100/1000 Ethernet ports, with 350W AC power supply 1 RU, IP Base feature set
WS-C3560X-24P-S	Standalone 24 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Base feature set
WS-C3560X-48P-S	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 715W AC power supply 1 RU, IP Base feature set
WS-C3560X-48PF-S	Standalone 48 10/100/1000 Ethernet PoE+ ports, with 1100W AC power supply 1 RU, IP Base feature set
Network Modules for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-NM-1G=	1G network module spare
C3KX-NM-10G=	10G network module spare
C3KX-NM-BLANK=	Network module blank spare
Power Supplies and Fan for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-PWR-350WAC=	350W AC power supply
C3KX-PWR-715WAC=	715W AC power supply
C3KX-PWR-1100WAC=	1100W AC power supply
C3KX-PWR-440WDC=	440W DC power supply
C3KX-PS-BLANK=	Power supply blank spare
C3KX-FAN-23CFM=	Fan module spare
eXpandable Power System (XPS) for the Cisco Catalyst 3750-X and 3560-X Series	
XPS-2200	eXpandable Power System 2200
CAB-XPS-58CM=	XPS cable 58 cm spare
CAB-XPS-150CM=	XPS cable 150 cm spare
XPS-2200-FAN=	XPS 2200 fan module spare
StackWise and StackPower Cables for the Cisco Catalyst 3750-X Series	
CAB-STACK-50CM=	Cisco StackWise 50 cm stacking cable
CAB-STACK-1M=	Cisco StackWise 1 m stacking cable
CAB-STACK-3M=	Cisco StackWise 3 m stacking cable
CAB-STACK-50CM-NH=	Cisco StackWise 50 cm nonhalogen lead-free stacking cable

Product Number	Product Description
CAB-STACK-1M-NH=	Cisco StackWise 1 m nonhalogen lead-free stacking cable
CAB-STACK-3M-NH=	Cisco StackWise 3 m nonhalogen lead-free stacking cable
CAB-SPWR-30CM=	Cisco Catalyst 3750-X StackPower cable 30 cm spare
CAB-SPWR-150CM=	Cisco Catalyst 3750-X StackPower cable 150 cm spare
SFP+ Transceivers for Cisco Catalyst 3750-X and 3560-X Series	
SFP-10G-LR=	10GBASE-LR SFP+ module
SFP-10G-SR=	10GBASE-SR SFP+ module
SFP-10G-LRM=	10GBASE-LRM SFP+ module
SFP-H10GB-CU1M=	10GBASE-CX1 SFP module
SFP-H10GB-CU3M=	10GBASE-CX3 SFP module
SFP-H10GB-CU5M=	10GBASE-CX5 SFP module
SFP Transceivers for Cisco Catalyst 3750-X and 3560-X Series	
GLC-GE-100FX=	100BASE-FX SFP on Gigabit Ethernet SFP ports for LAN switches ¹
GLC-LH-SM=	Gigabit Ethernet SFP, LC connector LX/LH transceiver
GLC-SX-MM=	Gigabit Ethernet SFP, LC connector SX transceiver
GLC-T=	1000BASE-T SFP transceiver module for copper connections
GLC-ZX-SM=	1000BASE-ZX SFP
GLC-BX-D=	1000BASE-BX SFP, 1490 nm
GLC-BX-U=	1000BASE-BX SFP, 1310 nm
CWDM-SFP-1470=	Coarse wavelength-division multiplexing (CWDM) 1470 nm SFP Gigabit Ethernet and 1G/2G Fibre Channel (FC)
CWDM-SFP-1490=	CWDM 1490 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510=	CWDM 1510 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530=	CWDM 1530 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550=	CWDM 1550 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570=	CWDM 1570 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590=	CWDM 1590 nm SFP Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610=	CWDM 1610 nm SFP Gigabit Ethernet and 1G/2G FC
SFP-GE-S=	1000BASE-SX SFP module for MMF, 850 nm (DOM) ²
SFP-GE-L=	1000BASE-LX/LH SFP module for SMF, 1300 nm (DOM) ²
DWDM-SFP-3033=	Dense wavelength-division multiplexing (DWDM) SFP 1530.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-3112=	DWDM SFP 1531.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-3190=	DWDM SFP 1531.90 nm SFP (100 GHz ITU grid)
DWDM-SFP-3268=	DWDM SFP 1532.68 nm SFP (100 GHz ITU grid)
DWDM-SFP-3346=	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3425=	DWDM SFP 1534.25 nm SFP (100 GHz ITU grid)
DWDM-SFP-3504=	DWDM SFP 1535.04 nm SFP (100 GHz ITU grid)
DWDM-SFP-3582=	DWDM SFP 1535.82 nm SFP (100 GHz ITU grid)
DWDM-SFP-3661=	DWDM SFP 1536.61 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739=	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-3819=	DWDM SFP 1538.19 nm SFP (100 GHz ITU grid)
DWDM-SFP-3898=	DWDM SFP 1538.98 nm SFP (100 GHz ITU grid)
DWDM-SFP-3977=	DWDM SFP 1539.77 nm SFP (100 GHz ITU grid)
DWDM-SFP-4056=	DWDM SFP 1540.56 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134=	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4214=	DWDM SFP 1542.14 nm SFP (100 GHz ITU grid)

Product Number	Product Description
DWDM-SFP-4294=	DWDM SFP 1542.94 nm SFP (100 GHz ITU grid)
DWDM-SFP-4373=	DWDM SFP 1543.73 nm SFP (100 GHz ITU grid)
DWDM-SFP-4453=	DWDM SFP 1544.53 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532=	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4612=	DWDM SFP 1546.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-4692=	DWDM SFP 1546.92 nm SFP (100 GHz ITU grid)
DWDM-SFP-4772=	DWDM SFP 1547.72 nm SFP (100 GHz ITU grid)
DWDM-SFP-4851=	DWDM SFP 1548.51 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931=	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5012=	DWDM SFP 1550.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-5092=	DWDM SFP 1550.92 nm SFP (100 GHz ITU grid)
DWDM-SFP-5172=	DWDM SFP 1551.72 nm SFP (100 GHz ITU grid)
DWDM-SFP-5252=	DWDM SFP 1552.52 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332=	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5413=	DWDM SFP 1554.13 nm SFP (100 GHz ITU grid)
DWDM-SFP-5494=	DWDM SFP 1554.94 nm SFP (100 GHz ITU grid)
DWDM-SFP-5575=	DWDM SFP 1555.75 nm SFP (100 GHz ITU grid)
DWDM-SFP-5655=	DWDM SFP 1556.55 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736=	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-5817=	DWDM SFP 1558.17 nm SFP (100 GHz ITU grid)
DWDM-SFP-5898=	DWDM SFP 1558.98 nm SFP (100 GHz ITU grid)
DWDM-SFP-5979=	DWDM SFP 1559.79 nm SFP (100 GHz ITU grid)
DWDM-SFP-6061=	DWDM SFP 1560.61 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141=	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)
Cisco Catalyst 3750-X Series Product Activation Keys	
C3750X-LIC=	Product activation keys for 3750-X Series
3750-X LAN Base to IP Base Upgrade License	
C3750X-24-L-S=	C3750X-24 LAN Base to IP Base Paper License
C3750X-48-L-S=	C3750X-48 LAN Base to IP Base Paper License
L-C3750X-24-L-S=	C3750X-24 LAN Base to IP Base E-License
L-C3750X-48-L-S=	C3750X-48 LAN Base to IP Base E-License
3750-X IP Base to IP Services Upgrade	
C3750X-24-IOS-S-E	C3750X-24 IP Base to IP Services factory IOS Upgrade
C3750X-48-IOS-S-E	C3750X-48 IP Base to IP Services factory IOS Upgrade
C3750X-24-S-E=	C3750X-24 IP Base to IP Services Paper License
C3750X-48-S-E=	C3750X-48 IP Base to IP Services Paper License
L-C3750X-24-S-E=	C3750X-24 IP Base to IP Services E-License
L-C3750X-48-S-E=	C3750X-48 IP Base to IP Services E-License
3750-X LAN Base to IP Services Upgrade	
C3750X-24-L-E=	C3750X-24 LAN Base to IP Services Paper License
C3750X-48-L-E=	C3750X-48 LAN Base to IP Services Paper License
L-C3750X-24-L-E=	C3750X-24 LAN Base to IP Services E-License
L-C3750X-48-L-E=	C3750X-48 LAN Base to IP Services E-License
Cisco Catalyst 3560-X Series Product Activation Keys	
C3560X-LIC=	Product activation keys for 3560-X Series

Product Number	Product Description
3560-X LAN Base to IP Base Upgrade License	
C3560X-24-L-S=	C3560X-24 LAN Base to IP Base Paper License
C3560X-48-L-S=	C3560X-48 LAN Base to IP Base Paper License
L-C3560X-24-L-S=	C3560X-24 LAN Base to IP Base E-License
L-C3560X-48-L-S=	C3560X-48 LAN Base to IP Base E-License
3560-X IP Base to IP Services Upgrade	
C3560X-24-IOS-S-E	C3560X-24 IP Base to IP Services factory IOS Upgrade
C3560X-48-IOS-S-E	C3560X-48 IP Base to IP Services factory IOS Upgrade
C3560X-24-S-E=	C3560X-24 IP Base to IP Services Paper License
C3560X-48-S-E=	C3560X-48 IP Base to IP Services Paper License
L-C3560X-24-S-E=	C3560X-24 IP Base to IP Services E-License
L-C3560X-48-S-E=	C3560X-48 IP Base to IP Services E-License
3560-X LAN Base to IP Services Upgrade	
C3560X-24-L-E=	C3560X-24 LAN Base to IP Services Paper License
C3560X-48-L-E=	C3560X-48 LAN Base to IP Services Paper License
L-C3560X-24-L-E=	C3560X-24 LAN Base to IP Services E-License
L-C3560X-48-L-E=	C3560X-48 LAN Base to IP Services E-License
Spare Power Cords for the Cisco Catalyst 3750-X and 3560-X Series	
CAB-3KX-AC=	AC Power Cord for Cisco Catalyst 3K-X (North America)
CAB-3KX-AC-AP=	AC Power Cord for Cisco Catalyst 3K-X (Australia)
CAB-3KX-AC-AR=	AC Power Cord for Cisco Catalyst 3K-X (Argentina)
CAB-3KX-AC-SW=	AC Power Cord for Cisco Catalyst 3K-X (Switzerland)
CAB-3KX-AC-UK=	AC Power Cord for Cisco Catalyst 3K-X (United Kingdom)
CAB-3KX-AC-JP=	AC Power Cord for Cisco Catalyst 3K-X (Japan)
CAB-3KX-250VAC-JP=	Japan 250V AC Power Cord for Cisco Catalyst 3K-X (Japan)
CAB-3KX-AC-EU=	AC Power Cord for Cisco Catalyst 3K-X (Europe)
CAB-3KX-AC-IT=	AC Power Cord for Cisco Catalyst 3K-X (Italy)
CAB-3KX-AC-IN=	AC Power Cord for Cisco Catalyst 3K-X (India)
CAB-3KX-AC-CN=	AC Power Cord for Cisco Catalyst 3K-X (China)
CAB-3KX-AC-DN=	AC Power Cord for Cisco Catalyst 3K-X (Denmark)
CAB-3KX-AC-IS=	AC Power Cord for Cisco Catalyst 3K-X (Israel)
Spare Accessory and Rack Mount Kits for the Cisco Catalyst 3750-X and 3560-X Series	
C3KX-ACC-KIT=	Accessory kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-RACK-KIT=	Rack mount kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 3750-X and 3560-X Series

¹ Not supported for NEBS

² DOM = digital optical monitoring

XPS 2200 Performance Specifications

Table 17 lists the performance specifications for the power supplies.

Please note that the same power supplies used in the 3750-X and 3560-X are all usable in the XPS-2200 (please refer to Table 11).

Table 17. XPS 2200 Performance Specifications

Performance Numbers for XPS 2200	
Total Power Sharing Capability (Stack Power Mode, 9 Switches and 20 total 1100W power supplies)	22kW
Maximum Power Back-up Capability (RPS Mode, 2x1100W power supplies in XPS 2200)	2200W
Nominal Voltage	56V
Nominal Maximum Current per Port (input or output)	40A
Flash	8MB

Heat Dissipation

Table 18 provides heat dissipation information for the Cisco XPS 2200.

Table 18. Heat Dissipation

Cisco XPS 2200 Power Supply Configuration	Heat Dissipation	
	No Load (BTU/hr)	Full Load (BTU/hr)
1 x 350WAC	120	480
2 x 350WAC	160	665
1 x 715WAC	155	610
2 x 715WAC	205	920
1 x 1100WAC	155	825
2 x 1100WAC	205	1350
1 x 440WDC	115	645
2 x 440WDC	155	990

Physical and Environmental Specifications

Table 19 lists the physical and environmental specifications for XPS-2200.

Table 19. Physical and Environmental Specifications

Description	Specification
Physical specifications	H x W x D: 1.73 x 17.5 x 20.5 in. (4.4 x 44.5 x 52.1 cm) Weight: 19.8 lb (9.0 kg)
Total input BTU (1000 BTU/Hr = 290W)	8525 BTU/Hr
Operating temperature	-5 to 45°C up to 5000ft elevation, -5 to 40°C up to 10000ft elevation
Storage temperature	-40 to 70°C
Relative humidity operating, non-condensing	5 to 95% non-condensing
Relative humidity non-operating, non-condensing	5 to 95% non-condensing
Operating altitude	10,000 ft. (3000m)
Storage altitude	15,000 ft. (4750 m)
Mean Time Between Failure (MTBF)	222,000 hours

Description	Specification
Electromagnetic compatibility certifications	FCC Class A for North America: 47 CFR Part 15 VCCI Class A for Japan: V-3/2007.04 CCC EMC for China on Spare Power Supplies: EN61000-3-2 (GB17625.1-1998) BSMI Class A for Taiwan: CNS13438 KCC (formerly MIC) GB17625.1-1998 Class A for Korea: KN24/KN22 AS/NZS Class A for Australia: CISPR22:2004 or EN55022 Brazil, ANATEL In-Country approval CE Class A for European Union: EN55022, EN300386, EN55024 (CISPR24)
Safety certifications	UL 60950-1 CAN/CSA 22.2 No.60950-1 EN 60950-1CB to IEC 60950-1 GB 4943

Acoustic Specifications

Table 20 lists the acoustic specifications of the Cisco XPS 2200.

The following numbers represent the range of values for Idle, 50% and 100%:

Table 20. Cisco XPS 2200 Acoustic Specifications

Cisco XPS 2200 Power Supply Configuration	Sound Pressure		Sound Power	
	LpA (Typical)	LpAD (Maximum)	LwA (Typical)	LwAD (Maximum)
2 x 1100WAC	43 dB	63 dB	5.3 B	7.3 B
2 x 715WAC	42 dB	61 dB	5.3 B	6.6 B

Dimensions and Weight Options

Table 21 describes various XPS2200 dimensions and weight options (All have a 1 RU height).

Table 21. Cisco XPS 2200 dimensions and weight options

XPS2200 dimensions and weight options	Dimensions (H x W x D)		Weight	
	Inches	Centimeters	Pounds	Kilograms
XPS2200 including 3 fan FRUs	1.73 x 17.5 x 17.46	4.4 x 44.5 x 44.4	12.8	5.8
With two C3K-PWR-1100WAC power supplies	1.73 x 17.5 x 20.5	4.4 x 44.5 x 52.1	19.0	8.6
With two C3K-PWR-715WAC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.5	8.4
With two C3K-PWR-350WAC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.5	8.4
With two C3K-PWR-440WDC power supplies	1.73 x 17.5 x 19.0	4.4 x 44.5 x 48.3	18.4	8.3

Connectors and Cabling

Table 22 describes the connectors and cabling for the XPS2200

Table 22. Cisco XPS 2200 connectors and cabling

Connectors and Cabling	<ul style="list-style-type: none"> • Cisco StackPower: Cisco Proprietary Power Stacking cables • Service port: RJ-45-to-DB9 cable for PC connections
Power Connectors	<ul style="list-style-type: none"> • Customers can provide power to a XPS-2200 by using either the internal power supply or via one or more 3750-X/3560-X Switches. The connectors are located at the back of the switch. (9 StackPower/XPS ports and up to two AC Power Inlet Connections) • Internal power supply connector: The internal power supply is an autoranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet

Fans

The Cisco XPS 2200 has 3 field-replaceable fan modules (XPS-2200-FAN).

Table 23 the fan module for the XPS2200.

Table 23. Cisco XPS 2200 Fan module dimensions and weight

	Dimensions (H x W x D)		Weight	
	Inches	Centimeters	Pounds	Kilograms
XPS2200 Fan Module	1.59 x 1.59 x 4.24	4.04 x 4.04 x 10.77	.13	.06

- System fan modules offer up to 24 cubic feet per minute (CFM) under full load at ambient temperature of 45°C and altitude of 3000 meters

Indicators

Table 24 describes the indicator options for the XPS2200

Table 24. Cisco XPS 2200 Indicators

RPS Mode- 9 port associated LEDs	<ul style="list-style-type: none"> • Solid Green when in RPS mode and able to backup this Port • Blinking Green when actively backing up Port • Solid Amber indicates backup not available for this Port • Blinking Amber for any port faults
SP Mode- 9 port associated LEDs	<ul style="list-style-type: none"> • Solid Green when in SP mode and there are no issues • Blinking Green not defined • Solid Amber indicates that SP port off-line (No Power Output) • Blinking Amber for any port faults
Combined function (SP and RPS) LEDs	<ul style="list-style-type: none"> • Blinking Amber on both RPS and SP LEDs indicates cable fault (short, etc.) • Both RPS and SP ports alternate Green/Amber when selected via push button • 18 Port LEDs for new features with more comprehensive single look status assessment
System LEDs - Front of System	<ul style="list-style-type: none"> • System <ul style="list-style-type: none"> ◦ Solid Green - Normal operation with no faults ◦ Blinking Green during boot ◦ Solid Amber - Temperature faults, cable faults, port faults, power supply faults, fan faults ◦ Blinking Amber during software updates • Fan <ul style="list-style-type: none"> ◦ Use one Fan LED, amber when any one fan fails, green when all OK ◦ Each FRU Fan (3) will have an associated Status LED (green=working, amber=failed), but no silkscreen on front panel • Temp <ul style="list-style-type: none"> ◦ Green - No Problems. Amber - Over Temperature • FEP (PS1 & PS2) <ul style="list-style-type: none"> ◦ Solid Green - Stack Power Mode OK ◦ Blinking Green - RPS Mode OK ◦ Solid Amber - Stack Power Mode Faulty

Power Supply Specifications

The XPS 2200 uses the same power supplies as the Cisco Catalyst 3750-X and 3560-X Series Switches. Refer to Table 11 for the power specifications for each type of power supply that is usable in the XPS 2200 as well as the Cisco Catalyst 3750-X and 3560-X Series Switches.

Cisco XPS2200 Ordering information

Table 25 shows Cisco XPS2200 ordering information.

Table 25. Ordering Information

Product Number	Product Description
XPS-2200	eXpandable Power System 2200
CAB-XPS-58CM=	XPS cable 58 cm spare Cable to connect XPS-2200 StackPower/XPS ports to 3750-X or 3560-X Switch SKUs
CAB-XPS-150CM=	XPS cable 150 cm spare Cable to connect XPS-2200 StackPower/XPS ports to 3750-X or 3560-X Switch SKUs
XPS-2200-FAN=	XPS 2200 fan module spare
C3KX-RACK-KIT=	Rack mount kit for Cisco Catalyst 3750-X and 3560-X Series
C3KX-ACC-KIT=	Accessory kit for Catalyst 3750-X and 3560-X Series
C3KX-4PT-KIT=	Extension rails and brackets for four-point mounting for Cisco Catalyst 3750-X and 3560-X Series



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