Cisco Catalyst 4500-X Series Fixed 10 Gigabit Ethernet Aggregation Switch

Product Overview

Cisco® Catalyst® 4500-X Series Switch (Figure 1) is a fixed aggregation switch that delivers best-in-class scalability, simplified network virtualization, and integrated network services for space-constrained environments in campus networks. It meets business growth objectives with unprecedented scalability, simplifies network virtualization with support for one-to-many (Cisco Easy Virtual Networks [EVN]) and many-to-one (Virtual Switching System [VSS]) virtual networks, and enables emerging applications by integrating many network services.

The Cisco Catalyst 4500-X Series offers key innovations, including:

- **Platform Scalability:** Delivers up-to 800 Gbps of switching capacity, capable of scaling up to 1.6-Tbps capacity with the VSS technology. Future-proof investment with modular uplink and auto-detect 10 Gigabit Ethernet and 1 Gigabit Ethernet ports.

- **High Availability:** Delivers the network availability demanded by business-critical enterprise applications through comprehensive high-availability capabilities, including VSS and EVN. Furthermore, innovative features such as redundant hot swappable fans and power supplies with AC to DC, and DC to AC failover remove single point of failure in network.

- **Application Monitoring:** Enhanced application monitoring through Flexible Netflow and eight ports of line rate bidirectional Switched Port Analyzer (SPAN)/Remote Switched Port Analyzer (RSPAN). In addition Cisco IOS® XE Software provides the ability to host third-party applications.

- **Security:** Support for Cisco TrustSec™ technology as well as robust control plane policing (CoPP) to address denial of service attacks.

- **Simplified Operations:** Support for Smart Install Director, providing a single point of management enabling zero-touch deployment for new switches and stacks in campus and branch networks.

Cisco Catalyst 4500-X Series Switch Family

Cisco Catalyst 4500-X Series provides scalable, fixed-campus aggregation solutions in space-constrained environments. The solution provides flexibility to build desired port density through two versions of base switches along with optional network module, providing line-rate 10GE capability. Both the 32-port and 16-port versions can be configured with optional network modules and offer similar features. The Small Form-Factor Pluggable Plus (SFP+) interface supports both 10 Gigabit Ethernet and 1 Gigabit Ethernet ports, allowing customers to use their investment in 1 Gigabit Ethernet SFP and upgrade to 10 Gigabit Ethernet when business demands change, without having to do a comprehensive upgrade of the existing deployment. The uplink module is hot swappable.

Following are key offering from this product family:

- 32 x 10 Gigabit Ethernet Port switch with optional module slot (Figure 1)
- 16 x 10 Gigabit Ethernet Port switch with optional module slot (Figure 2)
- 8 x 10 Gigabit Ethernet Port uplink module (Figure 3)

Figure 1.   32 x 10 Gigabit Ethernet Port Switch with Optional Uplink Module Slot

Figure 2.   16 x 10 Gigabit Ethernet Port Switch with Optional Uplink Module Slot

Figure 3.   8 x 10 Gigabit Ethernet Port Uplink Module

In addition, both 32 port and 16 port versions are available with front-to-back and back-to-front airflow. The front-to-back airflow switch comes with matching burgundy color fan and power supply handle to indicate warm side. Similarly, back-to-front airflow switch fan and power supply handles are color-coded in blue to indicate cool side. Figure 5 and Figure 6 show rear view of the switch with front-to-back and back-to-back airflow respectively.

Figure 4. Front-to-Back Airflow Rear View

Figure 5. Back-to-Front Airflow Rear View

Cisco Catalyst 4500-X switch provides redundant hot swappable fans and power supplies (Figure 7) for highest resiliency with no single point of failure.

Figure 6. Redundant Fan and Power Supply

Cisco Catalyst 4500-X Switch Series Feature Highlights

Cisco Catalyst 4500-X Series Switch provides nonblocking 10 Gigabit Ethernet per port bandwidth and Cisco IOS Flexible NetFlow for optimized application visibility. In addition to this, the enterprise-class Cisco Catalyst 4500-X offers the following:

- **Performance and scalability**
  - 800-Gbps switching capacity with up to 250 Mpps of throughput
  - External USB and SD card support for flexible storage options
  - 10/100/1000 RJ-45 console and management port
  - IPv6 support in hardware, providing wired-network-rate forwarding for IPv6 networks and support for dual stack with innovative resource utilization
  - Dynamic hardware forwarding-table allocations for ease of IPv4-to-IPv6 migration
  - Scalable routing (IPv4, IPv6, and multicast) tables, Layer 2 tables, and ACL and quality of service (QoS) entries to make use of eight queues per port and comprehensive security policies per port

- **Infrastructure services**
  - Cisco IOS XE Software, the modular open application platform for virtualized borderless services
  - Maximum resiliency with redundant components, Nonstop Forwarding/Stateful Switchover (NSF/SSO), and In-Service Software Upgrade (ISSU) support in a VSS enabled system
  - Network virtualization through Multi-VRF technology for Layer 3 segmentation
  - Automation through Embedded Event Manager (EEM), Cisco Smart Call Home, AutoQoS, and Auto SmartPorts for fast provisioning, diagnosis, and reporting
- **Cisco Borderless Networks services**
  - Optimized application performance through deep visibility with Flexible NetFlow supporting rich Layer 2/3/4 information (MAC, VLAN, TCP flags) and synthetic traffic monitoring with IP service-level agreement (SLA)
  - Medianet capabilities to simplify video quality of service, monitoring, and security. In addition, multicast features such as Protocol Independent Multicast (PIM) and Source-Specific Multicast (SSM) provide enterprise customers with the additional scalability to support multimedia applications
- **Investment protection and reduced TCO**

  Cisco Catalyst 4500-X Series eliminates the need for standalone solutions by integrating many network services. Customers can lower the total cost of ownership while streamlining management and accelerating deployment time. Integrated network services available on Cisco Catalyst 4500-X Series include:
  - Application visibility and control (Flexible NetFlow, Cisco IOS Embedded Event Manager)
  - Security with Cisco TrustSec[1]
  - Troubleshooting video or any User Datagram Protocol-based flows (Mediatrace)
  - Video network readiness assessment (built-in traffic simulator with IP SLA Video Operation)
  - Ability to run third-party applications (Wireshark)

Table 1 highlights the performance and scalability enhancements of the Cisco Catalyst 4500-X Series Switches.

Table 1.　　Cisco Catalyst 4500-X Switch Series Performance and Scalability Features

Product Number	Description
System	
Base System	Front to Back Airflow: • 32x10 GE SFP+/SFP - WS-C4500X-32SFP+ • 16x10 GE SFP+/SFP - WS-C4500X-16SFP+ Back to Front Airflow: • 32x10 GE SFP+/SFP - WS-C4500X-F-32SFP+ • 16x10 GE SFP+/SFP - WS-C4500X-F-16SFP+
Expansion Module (Optional)	8x10 GE SFP+/SFP - C4KX-NM-8SFP+
Management Port	10/100/1000 Base-T
USB Port	Type A (storage and boot) up-to 4 GB
Dual Power Supply	Yes
Field Replaceable Fans	Yes (5 fans)
Fan Redundancy	No performance impact with single fan failure
Scalability	
System Throughput	Up to 800 Gbps
IPv4 Routing in Hardware	Up to 250 Mpps

Product Number	Description
IPv6 Routing in Hardware	Up to 125 Mpps
L2 Bridging in Hardware	Up to 250 Mpps
Media Access Control (MAC) Entries	55K
Forwarding Entries	32x10 GE Port Base SKU: IPv4: 256K, IPv6: 128K 16x10 GE Port Base SKU: IPv4: 64K, IPv6: 32K
Flexible Netflow Entries	128K
Switched Port Analyzer (SPAN), Remote Switched Port Analyzer (RSPAN)	8 line rate bidirectional sessions (ingress and egress)
Total VLANs	4094
Total Switched Virtual Interfaces (SVIs)	4094
IGMP groups	32K
Multicast routes	32x10 GE Port Base SKU: IPv4: 32K, IPv6: 32K 16x10 GE Port Base SKU: IPv4: 24K, IPv6: 12K
Dynamic Host Configuration Protocol (DHCP) Snooping Entries	12K (DHCP snooping bindings)
ARP Entries	47K
Spanning Tree Protocol Instances	10K
Jumbo Frame Support for Bridged and Routed Packets	Up to 9216 bytes
High Availability and Resiliency	
High Availability Solution	Virtual Switching System (VSS)
Number of stackable switches in VSS	Up to 2
VSS Throughput	Up to 1.6 Tbps
Virtual Switch Link	1GE or 10GE
Max number of Virtual Switch Links	8
In-Service Software Upgrade	Across the switches
Nonstop Forwarding with Stateful Switchover	Across the switches
CPU and Memory	
Onboard Memory (SRAM DDR-II)	4 GB
Port Buffers	32-MB Shared Memory
CPU	Dual Core 1.5 GHz
NVRAM	2 GB
Optional External Memory (SD Card)	2 GB
QoS Features	
Port Queues	8 Queues/Port
CPU Queues	64
QoS Entries	128K (64K ingress and 64K in egress) Shared with ACL
Aggregate Rate-Limiting	Ingress port or VLAN and egress VLAN or Layer 3 port
Rate-Limiting Level Types	Committed Information Rate (CIR), Peak Information Rate (PIR)
Aggregate Traffic Rate-Limiting Policers (1K=1024)	16K

Product Number	Description
Flow-Based Rate-Limiting Method; Number of Rates	Supported using flow-records in the classification criteria and policing action
Qos Policy Enforcement	Per Port or Per Vlan or Per Port, Per VLAN Granularity
Class of Service (CoS)	Yes
Differentiated Services Code Point (DSCP)	Yes
Security Features	
Port Security	Yes
IEEE 802.1x and 802.1x Extensions	Yes
VLAN, Router, and Port ACLs	Yes
Security ACL Entries (1K=1024)	128K (64K ingress and 64K in egress) Shared with QoS
Unicast Reverse Path Forwarding (uRPF) Check in Hardware	Yes
CPU Rate Limiters (DoS Protection) Includes Control Plane Policing	Yes
Private VLANs	Yes
Micro Flow Policer	Yes. Supported using flow records in the class-map
CPU HW Rate Limiters by Packet Per Second (pps) and Bit Rate Policers (bps)	Supported in hardware control-plane policing (CoPP)
Control Plane Policing (CoPP) for Multicast	Yes
ACL Labels	Yes
Port ACL	Yes
Traffic Storm Control (formally known as Broadcast/Multicast Suppression)	Yes
Virtualization Features	
VRF-Lite Scalability	64
Easy Virtual Network (EVN) Scalability	32
Simplified Operations	
Smart Install	Smart Install Director[2]

[2] Smart Install Director support in VSS mode will be available in a future software release.

Continued Innovations Through Infrastructure Services
Modular Open Application Platform, Cisco IOS XE Software

Cisco IOS XE Software is the open service platform software operating system for the Cisco Catalyst 4500-X Series. Cisco continues to evolve Cisco IOS Software to support next-generation switching hardware and provide increased architectural flexibility to deliver Cisco Borderless Networks services. Cisco IOS XE Software provides the following customer benefits:

- Cisco IOS XE Software provides an enhanced operating system that can take advantage of the multicore CPU architecture of the Cisco Catalyst 4500-X system.
- Cisco IOS XE enables single software image, without the need to download a separate software image per license feature set.

- Cisco IOS XE Software provides customer investment protection in the existing Cisco IOS Software by keeping a consistent feature set and operational look and feel. This supports a transparent migration experience.
- Cisco IOS XE Software supports service virtualization capability that allows the Cisco Catalyst 4500-X to host third-party applications in parallel with Cisco IOS Software. The hosted application communicates with Cisco IOS Software to use its rich feature sets. This benefit keeps Cisco IOS Software simple and robust while allowing the customer to quickly adopt new technologies using proven code. Cisco IOS XE Software enables Cisco Catalyst 4500-X to be an open service platform and is a primary anchor for future Cisco Borderless Networks innovations.

Simplified Operations Through Automation

As campus switching has grown to support increasing enterprise demands, so has the need to deploy and manage new and evolving technologies. Simplified operations are critical in meeting these challenges and achieving increased operational efficiency through proactive management and reduction in unplanned network downtime. The Cisco Catalyst 4500-X offers the following rich set of capabilities for simplified operations:

- Auto Install and AutoQoS for fast deployment
- Smart Install Director support for plug-and-play configuration and image-management
- Flexible NetFlow and IP SLA for enhanced visibility
- EEM integration with NetFlow and third-party applications
- Smart Call Home, Generic Online Diagnostic (GOLD), and Digital Optical Monitoring (DOM) for simplified operations
- Cisco EnergyWise for simplified and effective power management
- ISSU, SSO, and NSF for simplified change management and high availability for VSS enabled deployment
- Configuration rollback for improved configuration management

Best-in-Class Resiliency

The Cisco Catalyst 4500-X Series is designed for excellent nonstop communications with non-interrupted hardware switching. With Cisco IOS XE Software, customers continue to reap the benefits of this best-in-class resiliency in various ways.

In addition to redundant power supplies and fans, the Cisco Catalyst 4500-X is Virtual Switching System (VSS).

Two Cisco Catalyst 4500-X Series Switches of the same model can be pooled together into a VSS. The two switches are connected with 10 Gigabit Ethernet links called Virtual Switch Links (VSLs). Once a VSS is created, it acts as a single virtual Cisco Catalyst switch delivering the following benefits:

Operational Manageability
- Two Cisco Catalyst 4500-X Series Switches share a single point of management, single gateway IP address, and single routing instance.
- Eliminates the dependence on First Hop Redundancy Protocols (FHRP) and Spanning Tree Protocol.

Scales to 1.6 Tbps
- Scales system bandwidth capacity to 1.6 Tbps by activating all available bandwidth across redundant Cisco Catalyst 4500-X Series Switches.
- Provides up to 80 ports of 10 Gigabit Ethernet per system.

Enhanced Application Visibility with Flexible NetFlow

Cisco IOS Flexible NetFlow is the next generation in flow monitoring technology, allowing optimization of the network infrastructure resources, reducing operation costs, and improving capacity planning and security incident detection with increased flexibility and scalability. The Cisco Catalyst 4500-X Series provides 128K Flexible NetFlow entries. Based on a custom-built ASIC, Cisco Catalyst 4500-X Series delivers unprecedented flexibility and comprehensive flow visibility extending from Layer 2 (MAC, VLAN) to Layer 4 (TCP, UDP flags, and so on).

The flow data collected by Flexible NetFlow can be exported to an external collector for analysis and reporting or tracked by EEM. The Cisco Catalyst 4500-X Series enables powerful on-box and customizable event correlation and policy actions with EEM. This allows the switches to trigger customized event alarms or policy actions when the predefined condition is met. With no external appliance required, customers are able to use existing infrastructure to perform traffic monitoring, making traffic analysis economical even on large IP networks.

Additional details on Cisco Flexible NetFlow are available at: https://www.cisco.com/go/fnf.

Features at a Glance

- **Cisco IOS XE Software IP Base:** Includes all Layer 2 features and some basic Layer 3 features.
- **Cisco IOS XE Software Enterprise Services:** Upgradable with a Software Activation License (SAL); supports full Layer 3 protocols and advanced features such as complete routing scalability, Border Gateway Protocol (BGP), Virtual Routing and Forwarding, Policy-Based Routing, and so on.

These features can be enabled using the software-licensing mechanism. For details about software licensing, see "Licensing" section later in this document or visit https://www.cisco.com/go/sa.

Industry Standards

- Ethernet: IEEE 802.3
- 10 Gigabit Ethernet: IEEE 802.3ae
- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w Rapid Reconfiguration of Spanning Tree
- IEEE 802.1s Multiple VLAN Instances of Spanning Tree
- IEEE 802.3ad LACP
- IEEE 802.1p CoS Prioritization
- IEEE 802.1Q VLAN
- IEEE 802.1X User Authentication
- IEEE 802.1x-Rev
- RMON I and II standards
- USGv6 and IPv6 Gold Logo certified

Supported Pluggables

For details about the different optical modules and the minimum Cisco IOS Software release required for each of the supported optical modules, visit:
https://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html.

Note: SFP-10G-ZR modules are not supported on ports 1 to 32 (or 1 to 16) in the back-to-front airflow configuration. They are supported on the uplink module ports instead. In the back-to-front airflow configuration, limit usage of ZR optics to the uplink module only.

Software Requirements

The Cisco Catalyst 4500-X Series is supported in Cisco IOS Software with minimum Cisco IOS XE Software Release 3.3.0SG. For VSS capability, minimum software requirement is Cisco IOS XE Software Release 3.4.0SG.

Environmental Conditions

Table 2 lists environmental conditions for Cisco Catalyst 4500-X Series.

Table 2.   Environmental Conditions for the Cisco Catalyst 4500-X Series

Parameter	Performance Range
Operating Temperature	0°C to 40°C (RH to 90%)
Storage Temperature	-40°C to 70°C (RH 93%)
Operating Altitude	60m below sea level to 3000m above sea level
Relative Humidity	Nonoperating Humidity: 95% RH
Acoustic Noise Measured per ISO 7779 and Declared per ISO 9296 Bystander Positions Operating to an Ambient Temperature of 25°C	Industrial Product: 65 dBA maximum
RoHS	Reduction of Hazardous Substances (ROHS) 5

Power Information

Table 3 lists power information for Cisco Catalyst 4500-X Series.

Table 3.   Power Supply Information for Cisco Catalyst 4500-X Series

Power Supply Feature	Support in the 4500-X Series
AC Power Max Rating	750W
System Power Consumption	330W nominal/400W max
Input-Voltage Range and Frequency	AC 100 to 240 VAC 50-60 Hz/DC -72 VDC to -40 VDC
DC Power Max Rating	750W
AC to DC failover and vice versa	Yes
Total Output BTU (Note: 1000 BTU/hr = 293W)	1122 BTU/hr (330 W) nominal/1365 BTU/hr (400 W) max
Input Current	AC 11A @ 110VAC, 6 A @ 200VAC/DC 25A Max
Output Ratings	12V @ 62A & 3.3V @ 3A
Output Holdup Time	AC = 16 ms; DC = 4 ms @ maximum load
Power-Supply Input Receptacles	AC IEC 60320 C15/DC Custom detachable screw terminal (supplied)
Power Cord Rating	AC 15A/DC 25A

MTBF Information

Table 4 lists mean-time-between-failures (MTBF) information for Cisco Catalyst 4500-X Series.

Table 4.   MTBF Information for Cisco Catalyst 4500-X Series

Product Number	Description
WS-C4500X-16SFP+	209,330
WS-C4500X-24X-ES	209,330
WS-C4500X-32SFP+	199,720
WS-C4500X-40X-ES	199,720
C4KX-NM-8SFP+	2,286,500
WS-C4500X-F-16SFP+	209,330
WS-C4500X-F-32SFP+	199,720
C4KX-FAN-F	L10 Life 60,000 at 40C[1]
C4KX-FAN-R	L10 Life 60,000 at 40C
C4KX-PWR-750AC-F	1,045,265
C4KX-PWR-750AC-R	1,045,265
C4KX-PWR-750DC-F	443,423
C4KX-PWR-750DC-R	443,423

[1] Since fan is an electro-mechanical device it doesn't follow electronics failure mode. L10 life means the time 10% of total PS population will fail at a particular temperature.

Regulatory Standards Compliance

Table 5 shows regulatory standards compliance information, and Table 6 provides ordering information.

Table 5.   Cisco Catalyst 4500-X Regulatory Standards Compliance

Standard	Specification
Regulatory Compliance	CE marking
EMI and EMC Compliance	47CFR Part 15 (CFR 47) Class A AS/NZS CISPR22 Class A CISPR22 Class A EN55022 Class A ICES003 Class A VCCI Class A EN61000-3-2 EN61000-3-3 KN22 Class A CNS13438 Class A EN55024 CISPR24 EN300386 KN24
Safety Certifications	UL 60950-1 Second Edition CAN/CSA-C22.2 No. 60950-1 Second Edition EN 60950-1 Second Edition IEC 60950-1 Second Edition AS/NZS 60950-1
Industry EMC, Safety, and Environmental Standards	GR-63-Core Network Equipment Building Systems (NEBS) Level 3 GR-1089-Core Level 3

Table 6.   Ordering Information

Product Number	Description
Base Switch PIDs	
WS-C4500X-16SFP+	Catalyst 4500-X 16 Port 10GE IP Base, Front-to-Back Cooling, No P/S
WS-C4500X-24X-IPB	Catalyst 4500-X 24 Port 10GE IP Base, Front-to-Back Cooling, No P/S
WS-C4500X-24X-ES	Catalyst 4500-X 24 Port 10GE Enterprise Services, Front-to-Back Cooling, No P/S
WS-C4500X-32SFP+	Catalyst 4500-X 32 Port 10GE IP Base, Front-to-Back Cooling, No P/S
WS-C4500X-40X-ES	Catalyst 4500-X 40 Port 10GE Enterprise Services, Front-to-Back Cooling, No P/S
C4KX-NM-8SFP+	Catalyst 4500-X 8 Port 10GE Network Module
WS-C4500X-F-16SFP+	Catalyst 4500-X 16 Port 10GE IP Base, Back-to-Front Cooling, No P/S
WS-C4500X-F-32SFP+	Catalyst 4500-X 32 Port 10GE IP Base, Back-to-Front Cooling, No P/S
FRU and OIR FANs	
C4KX-FAN-F	Catalyst 4500-X Back-to-Front Cooling Fan
C4KX-FAN-R	Catalyst 4500-X Front-to-Back Cooling Fan
Power Supply	
C4KX-PWR-750AC-F	Catalyst 4500-X 750W AC Back-to-Front Cooling Power Supply
C4KX-PWR-750AC-R	Catalyst 4500-X 750W AC Front-to-Back Cooling Power Supply
C4KX-PWR-750DC-F	Catalyst 4500-X 750W DC Back-to-Front Cooling Power Supply
C4KX-PWR-750DC-R	Catalyst 4500-X 750W DC Front-to-Back Cooling Power Supply
Accessories	
CAB-CON-C4K-RJ45	Console Cable 6ft with RJ-45-to-RJ-45
SD-X45-2GB-E	Cisco Catalyst 4500 2-GB SD card
USB-X45-4GB-E	Cisco Catalyst 4500 4-GB USB device
Software	
S45XU-33-1511SG	Cisco IOS Software XE Release 3.3.0 SG non-crypto universal image for Cisco Catalyst 4500-X 32-port and 40-port models
S45XUK9-33-1511SG	Cisco IOS Software XE Release 3.3.0 SG crypto universal image for Cisco Catalyst 4500-X 32-port and 40-port models
S45XU-331-1511SG	Cisco IOS Software XE Release 3.3.1 SG non-crypto universal image for Cisco Catalyst 4500-X 16-port and 24-port models
S45XUK9-331-1511SG	Cisco IOS Software XE Release 3.3.1 SG crypto universal image for Cisco Catalyst 4500-X 16-port and 24-port models
S45XU-34-1512SG	Cisco IOS Software XE Release 3.4.0 SG non-crypto universal image for all Cisco Catalyst 4500-X models
S45XUK9-34-1512SG	Cisco IOS Software XE Release 3.4.0 SG crypto universal image for all Cisco Catalyst 4500-X models
C4500X-LIC=	Base product ID for software upgrade licenses on Catalyst 4500-X (paper delivery)
C4500X-IPB	Catalyst 4500-X IP BASE software license (paper delivery)
C4500X-16P-IP-ES	Catalyst 4500-X IP BASE to Enterprise Services upgrade license (paper delivery) for 16-port and 24-port models
C4500X-IP-ES	Catalyst 4500-X IP BASE to Enterprise Services upgrade license (paper delivery) for 32-port and 40-port models
L-C4500X-LIC=	Catalyst 4500-X Base product ID for software upgrade licenses (electronic delivery)
L-C4500X-IPB	Catalyst 4500-X IP BASE software license (electronic delivery)
L-C4500X-16P-IP-ES	Catalyst 4500-X IP BASE to Enterprise Services upgrade license (electronic delivery) for 16-port and 24-port models
L-C4500X-IP-ES	Catalyst 4500-X IP BASE to Enterprise Services upgrade license (electronic delivery) for 32-port and 40-port models

Licensing

Software Activation Licensing

The Cisco Catalyst 4500-X Series enables software activation licensing. Each Cisco Catalyst 4500-X Series ships with a universal image containing all feature sets, IP Base and Enterprise Services. The level of functionality is determined by the license applied.

The software activation licensing enables customers to:

- Speed deployment and roll out new Cisco software activation feature sets across global networks
- Centrally and more accurately manage and track software and license compliance
- Easily conduct software compliance audits to meet regulations without affecting network operations

Additional benefits of Cisco activation licensing include:

- Operational simplicity
  - Simplified upgrades and license transfers save time and improve productivity. You can add new capabilities simply by using a license file.
  - You can easily track software assets, licenses, and feature set status.
  - A single software image improves service delivery.
- Ease of ordering:
  - "Try and buy" lets you use a temporary license to try and evaluate new Cisco IOS Software functionality before purchasing.
  - Pay-as-you-grow software key enables new features incrementally without service calls.

For more information about Cisco software licensing, visit: https://www.cisco.com/go/sa.

Cisco ONE Software

Cisco ONE Software for Access Switching is available for the Cisco Catalyst 4500-X Series Switches.

Cisco ONE Software is a new way for customers to purchase and use our infrastructure software. It offers a simplified consumption model, centered on common customer scenarios in the data center, WANs, and LANs.

Cisco ONE Software and services provide customers with four primary benefits:

- Software suites that address typical customer use scenarios at an attractive price
- Investment protection of their software purchase through software services-enabled license portability
- Access to ongoing innovation and new technology with Cisco Software Support Service (SWSS)
- Flexible licensing models to smoothly distribute customer's software spend over time

For ordering information for Cisco ONE Software for the Cisco Catalyst 4500-X Series Switches, go to https://www.cisco.com/c/en/us/products/software/one-access/switching-part-numbers.html.

Cisco Limited Lifetime Hardware Warranty

The Cisco limited lifetime hardware warranty (LLW) includes 10-day advance hardware replacement for as long as the original end user owns the product. Table 7 describes the Cisco limited lifetime hardware warranty.

The 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.

For additional information on warranty terms, visit: https://www.cisco.com/go/warranty.

Table 7.   Cisco Limited Lifetime Hardware Warranty

Warranty Terms	Description[1]
Warranty Duration	As long as the original end user continues to own or use the product.
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 part within 10 business days after receipt of the RMA request and confirmation that a replacement part is the appropriate response. Actual delivery times may vary depending on customer location.
Effective Date	Hardware warranty commences from the date of shipment to the customer (and in case of resale by a Cisco reseller, not more than 90 days after original shipment by Cisco).
Cisco Technical Assistance Center (TAC) Support	None.
Cisco.com Access	Warranty allows guest access only to Cisco.com.

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

Adding a Cisco Technical Services contract to your device coverage provides benefits not available through the warranty, including access to the Cisco Technical Assistance Center (TAC), a variety of hardware replacement options to meet critical business needs, updates for licensed Cisco IOS Software, and registered access to the extensive Cisco.com knowledge base and support tools. 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. Table 8 describes the benefits and features of Cisco Technical Services. For more information about Cisco Technical Services, visit: https://www.cisco.com/go/ts.

Table 8.   Cisco Technical Services for Cisco Catalyst 4500-X Series Switches

Technical Services
Cisco SMARTnet™ Service   • Around-the-clock, global access to the Cisco TAC   • Unrestricted access to the extensive Cisco.com resources, communities, and tools   • Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement[2] and onsite parts replacement and installation available   • Ongoing operating system software updates within the licensed feature set[1]   • Proactive diagnostics and real-time alerts on Smart Call Home-enabled devices
Cisco Smart Foundation Service   • Next-business day advance hardware replacement as available   • Business hours access to small and medium-sized business (SMB) TAC (access levels vary by region)   • Access to Cisco.com SMB knowledge base   • Online technical resources through Cisco Smart Foundation Portal   • Operating system software bug fixes and patches

Technical Services
Cisco Focused Technical Support Services
Three 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 Service or service provider base contracts on all network equipment are required.

Footnotes:

[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; please review the appropriate service descriptions for details.

Cisco and Partner Services

Enable the innovative, secure, intelligent edge in Cisco 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 4500-X Series 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.

For additional information about Cisco services, visit: https://www.cisco.com/go/services.

Cisco Capital

Flexible payment solutions to help you achieve your objectives.

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.

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