



# Release Notes for the Catalyst 4500-X Series Switches, Cisco IOS XE Release 3.9.xE

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This release note describes the features, modifications, and caveats for the Cisco IOS XE Release 3.9.xE software on the Catalyst 4500-X Series Switches.

Cisco IOS XE Release 3.9.xE is a feature rich new software feature release for IOS and IOS-XE based Catalyst Access Switching products.

Support for Cisco IOS XE Release 3.9.xE follows the standard Cisco Systems® support policy, available at

[http://www.cisco.com/en/US/products/products\\_end-of-life\\_policy.html](http://www.cisco.com/en/US/products/products_end-of-life_policy.html)

For more information on the Catalyst 4500-X switch, visit the following URL:

<http://www.cisco.com/en/US/products/ps12332/index.html>



## Note

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Although this release note and those for the Catalyst 4500E Series Switches differ, each leverages the same *Software Configuration Guide* and *Command Reference Guide*.

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## Cisco IOS Software Packaging

The Enterprise Services image supports all Cisco Catalyst 4500-X Series software features based on Cisco IOS Software, including enhanced routing.

The IP Base image supports Open Shortest Path First (OSPF) for Routed Access, Enhanced Interior Gateway Routing Protocol (EIGRP) "limited" Stub Routing, Nonstop Forwarding/Stateful Switchover (NSF/SSO), and RIPv1/v2. The IP Base image does not support enhanced routing features such as BGP, Intermediate System-to-Intermediate System (IS-IS), Full OSPF, Full Enhanced Interior Gateway Routing Protocol (EIGRP) & Virtual Routing Forwarding (VRF-lite).

Starting with Cisco IOS Release XE 3.5.0E, OSPF Routed Access in IP Base supports up to 1000 routes.

## Cisco IOS XE Release Strategy

Customers with Catalyst 4500-X Series Switches who need the latest hardware and software features should migrate to Cisco IOS XE Release 3.9.xE.

IOS XE 3.8.xE, 3.6.xE, and 3.4.xSG are extended maintenance (EM) trains supporting 4500-X.

IOS XE 3.9.xE, 3.7.xE, 3.5.xE, and 3.3.xSG and standard maintenance (SM) trains supporting 4500-X.

## Support

Support for Cisco IOS XE Release 3.9.xE follows the standard Cisco Systems® support policy, available at

[http://www.cisco.com/en/US/products/products\\_end-of-life\\_policy.html](http://www.cisco.com/en/US/products/products_end-of-life_policy.html)

## System Requirements

This section describes the system requirements:

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## Supported Hardware on the Catalyst 4500-X Series Switches

The following table lists where you can find information about supported pluggable transceiver modules and the minimum Cisco IOS Software release required:

**Table 1**      **Supported Pluggables**

Module Type	URL
Cisco 10-Gigabit Ethernet Transceiver Modules Compatibility Matrix	<a href="http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/10GE_Tx_Matrix.html">http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/10GE_Tx_Matrix.html</a>
Cisco Gigabit Ethernet Transceiver Modules Compatibility Matrix	<a href="http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/GE_Tx_Matrix.html">http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/GE_Tx_Matrix.html</a>
Cisco 100-Megabit Ethernet SFP Modules Compatibility Matrix	<a href="http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/100MB_Tx_Matrix.html">http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/100MB_Tx_Matrix.html</a>
Cisco Wavelength Division Multiplexing Transceivers Compatibility Matrix	<a href="http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6982.html">http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6982.html</a>

## Feature Support by Image Type

Table 2 is a detailed list of features supported on Catalyst 4500-X Series switches running Cisco IOS XE Release 3.9.xE categorized by image type. Please visit Feature Navigator for package details:

<http://tools.cisco.com/ITDIT/CFN/>

**Table 2**      **IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series**

Feature	IP Base	Enterprise Services
2-way Community Private VLANs	Yes	Yes
8-Way CEF Load Balancing	Yes	Yes
10 Gigabit Uplink Use	Yes	Yes
10/ 100 Mbps for GLC-T transceiver	Yes	Yes
AAA Server Group	Yes	Yes
AAA Server Group Based on DNIS	Yes	Yes
ACL — Improved Merging Algorithm	Yes	Yes
ACL Logging	Yes	Yes
ACL Policy Enhancements	Yes	Yes
ACL Sequence Numbering	Yes	Yes
Address Resolution Protocol (ARP)	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
ANCP Client	Yes	Yes
ANSI TIA-1057 LLDP - MED Location Extension	Yes	Yes
ANSI TIA-1057 LLDP - MED Support	Yes	Yes
Application Visibility and Control with Domain Name System-Authoritative Source (AVC with DNS-AS)	Yes	Yes
FNF for AVC with DNS-AS	Yes	Yes
ARP Optimization	Yes	Yes
Auto Configuration	Yes	Yes
Auto Identity	Yes	Yes
Auto LAG	Yes	Yes
Auto QoS	Yes	Yes
Auto QoS Compact	Yes	Yes
Auto Security	Yes	Yes
Auto SmartPorts	Yes	Yes
Auto-MDIX	Yes	Yes
Auto-Voice VLAN (part of Auto QoS)	Yes	Yes
AutoInstall Using DHCP for LAN Interfaces	Yes	Yes
AutoQoS - VoIP	Yes	Yes
AutoRP Enhancement	Yes	Yes
Banner Page and Inactivity timeout for HTTP/S connections	Yes	Yes
BGP	No	Yes
BGP 4	No	Yes
BGP 4 4Byte ASN (CnH)	No	Yes
BGP 4 Multipath Support	No	Yes
BGP 4 Prefix Filter and In-bound Route Maps	No	Yes
BGP 4 Soft Config	No	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
BGP Conditional Route Injection	No	Yes
BGP Configuration Using Peer Templates	No	Yes
BGP Dynamic Update Peer-Groups	No	Yes
BGP Increased Support of Numbered as-path Access Lists to 500	No	Yes
BGP Link Bandwidth	No	Yes
BGP Neighbor Policy	No	Yes
BGP Prefix-Based Outbound Route Filtering	No	Yes
BGP Restart Neighbor Session After max-prefix Limit Reached	No	Yes
BGP Route-Map Continue	No	Yes
BGP Route-Map Continue Support for Outbound Policy	No	Yes
BGP Soft Rest	No	Yes
BGP Wildcard	No	Yes
Bidirectional PIM (IPv4 only)	Yes	Yes
Bidirectional SXP support	Yes	Yes
Bidirectional Forwarding Detection (BFD) for Intermediate System to Intermediate System (IS-IS)	No	Yes
Boot Config	Yes	Yes
Broadcast/Multicast Suppression	Yes	Yes
Call Home	Yes	Yes
CDP (Cisco Discovery Protocol) Version 2	Yes	Yes
CDP Enhancement — Host presence TLV	Yes	Yes
CEF/dCEF — Cisco Express Forwarding	Yes	Yes
CEFv6 Switching for 6to4 Tunnels	Yes	Yes
CEFv6/dCEFv6 — Cisco Express Forwarding	Yes	Yes
CFM/IEEE 802.1ag — D8.1 standard Compliant CFM, Y.1731 multicast LBM / AIS / RDI / LCK, IP SLA for Ethernet	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
CGMP — Cisco Group Management Protocol	Yes	Yes
Cisco IOS Scripting w/Tcl	Yes	Yes
Cisco Plug-In for OpenFlow	Yes	Yes
Cisco-Port-QoS-MIB — Support for cportQosQueueEnqueuePkts and cportQosQueueDropPkts	Yes	Yes
Cisco Service Discovery Gateway Support	Yes	Yes
CiscoView Autonomous Device Manager (ADP)	Yes	Yes
Cisco TrustSec—Critical Authentication	Yes	Yes
Cisco TrustSec—SGT Exchange Protocol (SXP) IPv4	Yes	Yes
Cisco TrustSec—SGT/ SGA	Yes	Yes
Cisco TrustSec—SGACL Logging and Statistics	Yes	Yes
Class Based Ethernet CoS Matching & Marking (802.1p & ISL CoS)	Yes	Yes
Class-Based Marking	Yes	Yes
Class-Based Policing	Yes	Yes
Class-Based Shaping	Yes	Yes
Clear Counters Per Port	Yes	Yes
CLI String Search	Yes	Yes
CNS	Yes	Yes
CNS — Configuration Agent	Yes	Yes
CNS — Event Agent	Yes	Yes
CNS — Image Agent	Yes	Yes
CNS — Interactive CLI	Yes	Yes
CNS Config Retrieve Enhancement with Retry and Interval	Yes	Yes
Command Scheduler (Kron)	Yes	Yes
Command Scheduler (Kron) Policy for System Startup	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
Commented IP Access List Entries	Yes	Yes
Community Private VLAN	Yes	Yes
Configuration Change Tracking Identifier	Yes	Yes
Configuration Change Notification and Logging	Yes	Yes
Configuration Replace and Configuration Rollback	Yes	Yes
Configuration Rollback Confirmed Change	Yes	Yes
Contextual Configuration Diff Utility	Yes	Yes
Control Plane Policing (Copp)	Yes	Yes
CPU Enhancement	Yes	Yes
CPU Optimization for Layer 3 Multicast Control Packets	Yes	Yes
Critical Authorization for Voice and Data	Yes	Yes
DAI (Dynamic ARP inspection)	Yes	Yes
DBL (Dynamic Buffer Limiting) - Selective DBL	Yes	Yes
Debounce Timer per Port	Yes	Yes
Default Passive Interface	Yes	Yes
DHCP Client	Yes	Yes
DHCP Configurable DHCP Client	Yes	Yes
DHCP Gleaning	Yes	Yes
DHCPv6 Option 18	Yes	Yes
DHCPv6 Option 37 (Relay Options Remote-ID)	Yes	Yes
DHCPv6 Option 52 (CAPWAP Access Controller )	Yes	Yes
DHCPv6 Relay Agent notification for Prefix Delegation	Yes	Yes
DHCP Option 82, Pass Through	Yes	Yes
DHCPv6 Ethernet Remote ID option	Yes	Yes
DHCPv6 Relay - Reload persistent Interface ID option	Yes	Yes
DHCPv6 Repackaging	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
DHCP Server	Yes	Yes
DHCP Snooping	Yes	Yes
Diffserv MIB	Yes	Yes
DSCP/CoS via LLDP	Yes	Yes
Duplication Location Reporting Issue	Yes	Yes
Dynamic Trunking Protocol (DTP)	Yes	Yes
Easy Virtual Network (EVN)	No	Yes
Easy VSS <sup>1</sup>	Yes	Yes
Embedded Event Manager	Yes	Yes
EIGRP	No	Yes
EIGRP Service Advertisement Framework	Yes	Yes
EIGRP Stub Routing	Yes	Yes
Embedded Event Manager (EEM) 3.2	Yes	Yes
Embedded Syslog Manager (ESM)	Yes	Yes
Energywise Agentless SNMP support	Yes	Yes
Energywise Wake-On-Lan Support	Yes	Yes
Entity API for Physical and Logical Mgd Entities	Yes	Yes
ErrDisable timeout	Yes	Yes
EtherChannel	Yes	Yes
EtherChannel Flexible PAgP	Yes	Yes
EtherChannel Enhancement - Single Port Channel	Yes	Yes
Fast EtherChannel (FEC)	Yes	Yes
FHRP — Enhanced Object Tracking of IP SLAs	Yes	Yes
FHRP — EOT integration with EEM	Yes	Yes
FHRP — GLBP - IP Redundancy API	Yes	Yes
FHRP — HSRP - Hot Standby Router Protocol V2	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
FHRP — Object Tracking List	Yes	Yes
Filter-ID Based ACL Application	Yes	Yes
FIPS/CC Compliance for NMSP	Yes	Yes
FIPS 140-2/3 Level 2 Certification	Yes	Yes
Flexible NetFlow — Application ID	Yes	Yes
Flexible NetFlow — Cisco TrustSec Fields (CTS)	Yes	Yes
Flexible NetFlow — Device type	Yes	Yes
Flexible NetFlow — Ether type	Yes	Yes
Flexible NetFlow — Export to an IPv6 address	Yes	Yes
Flexible NetFlow — Full Flow support	Yes	Yes
Flexible NetFlow — Ingress support	Yes	Yes
Flexible NetFlow — IPFIX	Yes	Yes
Flexible NetFlow — IPv4 Unicast Flows	Yes	Yes
Flexible NetFlow — IPv6 Unicast Flows	Yes	Yes
Flexible NetFlow — Layer 2 Fields	Yes	Yes
Flexible NetFlow — Multiple User Defined Caches	Yes	Yes
Flexible NetFlow — NetFlow Export over IPv4	Yes	Yes
Flexible NetFlow — NetFlowV5 Export protocol	Yes	Yes
Flexible NetFlow — NetFlow v9 Export Format	Yes	Yes
Flexible NetFlow — Power Reading	Yes	Yes
Flexible NetFlow — Username	Yes	Yes
Flexible NetFlow — VLAN ID support	Yes	Yes
Flex Links+(VLAN Load balancing)	Yes	Yes
FQDN ACL	Yes	Yes
Forced 10/100 Autonegotiation	Yes	Yes
FTP Support for Downloading Software Images	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
Gateway Load Balancing Protocol GLBP	Yes	Yes
Generic Routing Encapsulation (GRE)	Yes	Yes
GOLD Online Diagnostics	Yes	Yes
GRE Tunneled Packets Switched on Hardware	No	Yes
HSRP — Hot Standby Router Protocol	Yes	Yes
HSRP — Global IPv6 Address	Yes	Yes
HTTP Security	Yes	Yes
HTTP TACAC+ Accounting support	Yes	Yes
Identity 4.1 Network Edge Access Topology	Yes	Yes
IEEE 802.1ab LLDP (Link Layer Discovery Protocol)	Yes	Yes
IEEE 802.1ab LLDP/LLDP-MED	Yes	Yes
IEEE 802.1p Support	Yes	Yes
IEEE 802.1Q VLAN Trunking	Yes	Yes
IEEE 802.1s Multiple Spanning Tree (MST) Standard Compliance	Yes	Yes
IEEE 802.1s VLAN Multiple Spanning Trees	Yes	Yes
IEEE 802.1t <sup>2</sup>	Yes	Yes
IEEE 802.1w Spanning Tree Rapid Reconfiguration	Yes	Yes
IEEE 802.1x Auth Fail Open (Critical Ports)	Yes	Yes
IEEE 802.1x Auth Fail VLAN	Yes	Yes
IEEE 802.1x Flexible Authentication	Yes	Yes
IEEE 802.1x Multiple Authentication	Yes	Yes
IEEE 802.1x Open Authentication	Yes	Yes
IEEE 802.1x with User Distribution	Yes	Yes
IEEE 802.1x VLAN Assignment	Yes	Yes
IEEE 802.1x VLAN User Group Distribution	Yes	Yes
IEEE 802.1x Wake on LAN Support	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
IEEE 802.1x Authenticator	Yes	Yes
IEEE 802.1x Fallback support	Yes	Yes
IEEE 802.1x Guest VLAN	Yes	Yes
IEEE 802.1x Multi-Domain Authentication	Yes	Yes
IEEE 802.1x Private Guest VLAN	Yes	Yes
IEEE 802.1x Private VLAN Assignment	Yes	Yes
IEEE 802.1x RADIUS Accounting	Yes	Yes
IEEE 802.1x RADIUS-Supplied Session Timeout	Yes	Yes
IEEE 802.1x with ACL Assignments	Yes	Yes
IEEE 802.1x with Port Security	Yes	Yes
IEEE 802.3ad Link Aggregation (LACP)	Yes	Yes
IEEE 802.3ad Link Aggregation (LACP) Port-Channel Standalone Disable	Yes	Yes
IEEE 802.3x Flow Control	Yes	Yes
IGMP Fast Leave	Yes	Yes
IGMP Filtering	Yes	Yes
IGMP Snooping	Yes	Yes
IGMP Version 1	Yes	Yes
IGMP Version 2	Yes	Yes
IGMP Version 3	Yes	Yes
IGMP Version 3 — Explicit Tracking of Hosts, Groups, and Channels	Yes	Yes
IGMPv3 Host Stack	Yes	Yes
IGMP Version 3 Snooping: Full Support	Yes	Yes
Image Verification	Yes	Yes
Individual SNMP Trap Support	Yes	Yes
Interface Index Persistence	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
Interface Range Specification	Yes	Yes
Interface Templates	Yes	Yes
IOS Based Device Profiling	Yes	Yes
IP Enhanced IGRP Route Authentication	No	Yes
IP Event Dampening	Yes	Yes
IP Multicast Load Splitting - Equal Cost Multipath (ECMP) using S, G and Next-hop	No	Yes
IP Multicast Load Splitting across Equal-Cost Paths	Yes	Yes
IP Named Access Control List	Yes	Yes
IPv6 Tunnels (in software)	Yes	Yes
IPv6 ACL Wild Card Masking	Yes	Yes
IPv6 FHS on EtherChannels	Yes	Yes
IP Routing	Yes	Yes
IP SLAs — DHCP Operations	Yes	Yes
IP SLAs — Distribution of Statistics	Yes	Yes
IP SLAs — DNS Operation	Yes	Yes
IP SLAs — FTP Operation	Yes	Yes
IP SLA — HTTP Operation	Yes	Yes
IP SLAs — ICMP Echo Operation	Yes	Yes
IP SLAs — ICMP Path Echo Operation	Yes	Yes
IP SLAs — Multi Operation Scheduler	Yes	Yes
IP SLAs — One Way Measurement	Yes	Yes
IP SLAs — Path Jitter Operation	Yes	Yes
IP SLAs — Random Scheduler	Yes	Yes
IP SLAs — Reaction Threshold	Yes	Yes
IP SLAs — Responder	Yes	Yes
IP SLAs — Scheduler	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
IP SLAs — Sub-millisecond Accuracy Improvements	Yes	Yes
IP SLAs — TCP Connect Operation	Yes	Yes
IP SLAs — UDP Based VoIP Operation	Yes	Yes
IP SLAs — UDP Echo Operation	Yes	Yes
IP SLAs — UDP Jitter Operation	Yes	Yes
IP SLAs — Video Operations	Yes	Yes
IP SLAs — VoIP Threshold Traps	Yes	Yes
IP Summary Address for RIPv2	Yes	Yes
IP Unnumbered for VLAN-SVI interfaces	Yes	Yes
IPSG (IP Source Guard) v4	Yes	Yes
IPSG (IP Source Guard) v4 for Static Hosts	Yes	Yes
IPv4 OGACLs	Yes	Yes
IPv4 Policy-Based Routing	Yes	Yes
IPv4 Policy-Based Routing with recursive next hop	Yes	Yes
IPv4 Routing — Static Hosts/Default Gateway	Yes	Yes
IPv6 (Internet Protocol Version 6)	Yes	Yes
IPv6 Access Services: DHCPv6 Relay Agent	Yes	Yes
IPv6 Anycast Address	Yes	Yes
IPv6 / v4 BFD with OSPF/ BGP/ EIGRP and Static	Yes	Yes
IPv6 BGP	No	Yes
IPv6 Bootstrap Router (BSR) Scoped Zone Support	No	Yes
IPv6 CNS Agents	Yes	Yes
IPv6 Config Logger	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
IPv6 First Hop Security (FHS): DHCPv6 Guard IPv6 Destination Guard IPv6 Snooping (Data Gleaning, per-limit Address Limit) IPv6 Neighbor Discovery Inspection IPv6 Neighbor Discovery Multicast Suppression IPv6 Router Advertisement (RA) Guard	Yes	Yes
IPv6 First Hop Security (FHS) Phase 2: Binding table recovery Lightweight DHCPv6 Relay Agent (LDRA) Neighbor Discovery (ND) Multicast Suppress Source and Prefix Guard <sup>3</sup>	Yes	Yes
IPv6 HSRP	Yes	Yes
IPv6 HTTP(S)	Yes	Yes
IPv6 ICMPv6	Yes	Yes
IPv6 ICMPv6 Redirect	Yes <sup>4</sup>	Yes
IPv6 IP SLAs (UDP Jitter, UDP Echo, ICMP Echo, TCP Connect)	Yes	Yes
IPv6 Interface Statistics	Yes	Yes
IPv6 MLD Snooping v1 and v2	Yes	Yes
IPv6 MTU Path Discovery	Yes	Yes
IPv6 Multicast	Yes	Yes
IPv6 Multicast — Bootstrap Router (BSR)	No	Yes
IPv6 Multicast — Explicit Tracking of Receivers	Yes	Yes
IPv6 Multicast — MLD Access Group	Yes	Yes
IPv6 Multicast — Multicast Listener Discovery (MLD) Protocol, Versions 1 and 2	Yes	Yes
IPv6 Multicast — PIM Accept Register	Yes	Yes
IPv6 Multicast — PIM Embedded RP Support	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
IPv6 Multicast — PIM Source-Specific Multicast (PIM-SSM)	Yes	Yes
IPv6 Multicast — PIM Sparse Mode (PIM-SM)	Yes	Yes
IPv6 Multicast — Routable Address Hello Option	Yes	Yes
IPv6 Multicast — RPF Flooding of Bootstrap Router (BSR) Packets	Yes	Yes
IPv6 Multicast — Scope Boundaries	Yes	Yes
IPv6 Neighbor Discovery	Yes	Yes
IPv6 Neighbor Discovery Duplicate Address Detection	Yes	Yes
IPv6 OGACLs	Yes	Yes
IPv6 OSPFv3 NSF/SSO	Yes <sup>4</sup>	Yes
IPv6 OSPFv3 Fast Convergence	Yes	Yes
IPv6 Policy-Based Routing	No	Yes
IPv6 RA Guard (Host Mode)	Yes	Yes
IPv6 Routing — EIGRP Support	No	Yes
IPv6 Routing — OSPF for IPv6 (OSPFv3)	Yes <sup>4</sup>	Yes
IPv6 Routing — RIP for IPv6 (RIPng)	Yes	Yes
IPv6 Routing — Route Redistribution	Yes	Yes
IPv6 Routing — Static Routing	Yes	Yes
IPv6 Security — Secure Shell SSH support over IPv6	Yes	Yes
IPv6 Services — AAAA DNS Lookups over an IPv4 Transport	Yes	Yes
IPv6 Services — Cisco Discovery Protocol (CDP) - IPv6 Address Family Support for Neighbor Information	Yes	Yes
IPv6 Services — DNS Lookups over an IPv6 Transport	Yes	Yes
IPv6 Services — Extended Access Control Lists	Yes	Yes
IPv6 Services — Standard Access Control Lists	Yes	Yes
IPv6 Static Routing — Support for Tracking Objects	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
IPv6 Stateless Auto-configuration	Yes	Yes
IPv6 Switching — CEF Support	Yes	Yes
IPv6 Switching — CEFv6 Switched Automatic IPv4-compatible Tunnels (in software)	Yes	Yes
IPv6 Switching — CEFv6 Switched Configured IPv6 over IPv4 Tunnels (in software)	Yes	Yes
IPv6 Switching — CEFv6 Switched ISATAP Tunnels (in software)	Yes	Yes
IPv6 TCL	Yes	Yes
IPv6 Tunneling — Automatic 6to4 Tunnels (in software)	Yes	Yes
IPv6 Tunneling — Automatic IPv4-compatible Tunnels (in software)	Yes	Yes
IPv6 Tunneling — IPv6 over IPv4 GRE Tunnels (in software)	Yes	Yes
IPv6 Tunneling — ISATAP Tunnel Support (in software)	Yes	Yes
IPv6 Tunneling — Manually Configured IPv6 over IPv4 Tunnels (in software)	Yes	Yes
IPv6 Virtual LAN Access Control List (VACL)	Yes	Yes
IPsecv3/IKEv2 (for management traffic only)	Yes	Yes
IS-IS for IPv4 and IPv6	No	Yes
ISSU (IOS In-Service Software Upgrade)	Yes	Yes
Jumbo Frames	Yes	Yes
LACP Min-Links	Yes	Yes
LACP Rate Fast	Yes	Yes
Layer 2 Control Packet	Yes	Yes
Layer 2 Protocol Tunneling (L2PT)	Yes	Yes
L2PT for LACP and PAgP	Yes	Yes
L2PT for UDLD	Yes	Yes
Layer 2 Traceroute	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
Layer 3 Multicast Routing (PIM SM, SSM, Bidir)	Yes	Yes
Link State Group	Yes	Yes
Link State Tracking	Yes	Yes
Loadsharing IP packets over more than six parallel paths	Yes	Yes
Local Proxy ARP	Yes	Yes
Location MIBs	Yes	Yes
MAB for Voice VLAN	Yes	Yes
MAB with Configurable User Name/Password	Yes	Yes
MAC Address Notification	Yes	Yes
MAC Authentication Bypass	Yes	Yes
MAC Move and Replace	Yes	Yes
MACSec Agreement (MKA) MACsec with EAP-TLS	Yes	Yes
MACSec Agreement (MKA) MACsec <ul style="list-style-type: none"> <li>• Switch-to Switch Connections with Pre-Shared Keys</li> <li>• Port Channels</li> </ul>	Yes	Yes
Medianet 2.0 — AutoQoS SRND4 Macro	Yes	Yes
Medianet 2.0 — Integrated Video Traffic Simulator (hardware-assisted IP SLA); IPSLA generator and responder	Yes	Yes
Medianet 2.0 — Flow Metadata	Yes	Yes
Medianet 2.0 — Media Service Proxy	Yes	Yes
Medianet 2.0 — Media Monitoring (Performance Monitoring and Mediatrace)	Yes	Yes
Memory Threshold Notifications	Yes	Yes
Microflow policers	Yes	Yes
Modular QoS CLI (MQC)	Yes	Yes
Multi-authentication and VLAN Assignment	Yes	Yes
Multi-VRF Support (VRF lite)	No	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
Multicast BGP (MBGP)	No	Yes
Multicast Fast Switching Performance Improvement	Yes	Yes
Multicast Routing Monitor (MRM)	Yes	Yes
Multicast Source Discovery Protocol (MSDP)	Yes	Yes
Multicast Subsecond Convergence	Yes	Yes
Multicast VLAN Registration (MVR)	Yes	Yes
Multigigabit Ethernet Interface — Downshift Speed	Yes	Yes
NAC — L2 IEEE 802.1x	Yes	Yes
NAC — L2 IP	Yes	Yes
Named VLAN	Yes	Yes
ND Cache Limit/Interface	Yes	Yes
NETCONF over SSHv2	Yes	Yes
Network Edge Access Topology (NEAT)	Yes	Yes
NEAT Enhancement: Re-Enabling BPDU Guard Based on User Configuration	Yes	Yes
Network Time Protocol (NTP)	Yes	Yes
Network Time Protocol (NTP) master	Yes	Yes
NHRP	No	Yes
NMSP Enhancements <ul style="list-style-type: none"> <li>• GPS support for location</li> <li>• Location at switch level</li> <li>• Local timezone change</li> <li>• Name value pair</li> <li>• Priority settings for MIBs</li> </ul>	Yes	Yes
No Service Password Recovery	Yes	Yes
No. of VLAN Support	4096	4096
NSF — BGP	No	Yes
NSF — EIGRP	Yes	Yes

**Table 2** IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
NSF — OSPF (version 2 only)	Yes	Yes
NSF — SSO	Yes	Yes
NTP for IPv6	Yes	Yes
NTP for VRF aware	No	Yes
Object Tracking: IPv6 Route Tracking	Yes	Yes
Onboard Failure Logging (OBFL)	Yes	Yes
Open Plug-N-Play Agent	Yes	Yes
OSPF	Yes <sup>4</sup>	Yes
OSPF v3 Authentication	Yes <sup>4</sup>	Yes
OSPF Flooding Reduction	Yes <sup>4</sup>	Yes
OSPF for Routed Access <sup>5</sup>	Yes	Yes
OSPF Incremental Shortest Path First (i-SPF) Support	Yes <sup>4</sup>	Yes
OSPF Link State Database Overload Protection	Yes <sup>4</sup>	Yes
OSPF Not-So-Stubby Areas (NSSA)	Yes <sup>4</sup>	Yes
OSPF Packet Pacing	Yes <sup>4</sup>	Yes
OSPF Shortest Paths First Throttling	Yes <sup>4</sup>	Yes
OSPF Stub Router Advertisement	Yes <sup>4</sup>	Yes
OSPF Support for Fast Hellos	Yes <sup>4</sup>	Yes
OSPF Support for Link State Advertisement (LSA) Throttling	Yes <sup>4</sup>	Yes
OSPF Support for Multi-VRF on CE Routers	Yes <sup>4</sup>	Yes
OSPF Update Packet-Pacing Configurable Timers	Yes <sup>4</sup>	Yes
Out-of-band Management Port	Yes	Yes
Out-of-band Management Port - IPv6	Yes	Yes
PBR with Object Tracking	Yes	Yes
Per Intf IGMP State Limit	Yes	Yes
Per Intf MrouteState Limit	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
Per Port Per VLAN Policing	Yes	Yes
Per-User ACL Support for 802.1X/MAB/Webauth users	Yes	Yes
Per-VLAN Learning	Yes	Yes
Permanent Right-to-Use (PRTU) license	Yes	Yes
PIM Dense Mode State Refresh	Yes	Yes
PIM Multicast Scalability	Yes	Yes
PIM Version 1	Yes	Yes
PIM Version 2	Yes	Yes
PnP Agent	Yes	Yes
Port Security	Yes (supports 3072 MACs)	Yes (supports 3072 MACs)
Port Security on Etherchannel Trunk Port	Yes	Yes
Port Security MAC Address Filtering	Yes	Yes
Pragmatic General Multicast (PGM)	Yes	Yes
Priority Queueing (PQ)	Yes	Yes
Private VLAN Promiscuous Trunk Port	Yes	Yes
Private VLAN Trunk Ports	Yes	Yes
Private VLANs	Yes	Yes
Programmability	Yes	Yes
Propagation of Location Info over CDP	Yes	Yes
PVLAN over EtherChannel	Yes	Yes
PVST + (Per VLAN Spanning Tree Plus)	Yes	Yes
Q-in-Q	Yes	Yes
QoS Packet Marking	Yes	Yes
QoS Priority Percentage CLI Support	Yes	Yes
RADIUS	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
RADIUS Attribute 44 (Accounting Session ID) in Access Requests	Yes	Yes
RADIUS Change of Authorization	Yes	Yes
Rapid-Per-VLAN-Spanning Tree Plus (Rapid-PVST+)	Yes	Yes
Rapid PVST+ Dispute Mechanism	Yes	Yes
Rapid-Per-VLAN-Spanning Tree (Rapid-PVST)	Yes	Yes
Reduced MAC Address Usage	Yes	Yes
Redundancy Facility Protocol	Yes	Yes
Remote SPAN (RSPAN)	Yes	Yes
REP (Resilient Ethernet Protocol)	Yes	Yes
REP - No Edge Neighbour Enhancement	Yes	Yes
RIP v1	Yes	Yes
RMON events and alarms	Yes	Yes
Secure CDP	Yes	Yes
Secure Copy (SCP)	Yes	Yes
Secure Shell SSH Version 2 Client Support	Yes	Yes
Secure Shell SSH Version 2 Server Support	Yes	Yes
Security Group ACL at Interface Level	Yes	Yes
Single Rate 3-Color Marker for Traffic Policing	Yes	Yes
Smart Install Director—Configuration-only Deployment and Smooth Upgrade	Yes	Yes
Smart Port	Yes	Yes
SMI Catalyst 4K Client	Yes	Yes
SNMP (Simple Network Management Protocol)	Yes	Yes
SNMP Inform Request	Yes	Yes
SNMP Manager	Yes	Yes
SNMPv2C	Yes	Yes

**Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series**

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
SNMPv3 — 3DES and AES Encryption Support	Yes	Yes
SNMPv3 (SNMP Version 3)	Yes	Yes
Source Specific Multicast (SSM)	Yes	Yes
Source Specific Multicast (SSM) - IGMPv3,IGMP v3lite, and URD	Yes	Yes
Source Specific Multicast (SSM) Mapping	Yes	Yes
SPAN (# of bidirectional sessions) — Port Mirroring	Yes (16 bidirectional sessions)	Yes (16 bidirectional sessions)
SPAN ACL Filtering for IPv6	Yes	Yes
SPAN — Packet Type and Address Type Filtering	Yes	Yes
Spanning Tree Protocol (STP) <ul style="list-style-type: none"> <li>• Backbone Fast Convergence</li> <li>• Bridge Assurance</li> <li>• Dispute Mechanism</li> <li>• Loop Guard</li> <li>• Portfast</li> <li>• PortFast BPDU Filtering</li> <li>• Portfast BPDU Guard</li> <li>• Portfast Support for Trunks</li> <li>• PVST+ Simulation</li> <li>• Root Guard</li> <li>• STP Extension</li> <li>• Uplink Fast Convergence</li> <li>• Uplink Load Balancing</li> </ul>	Yes	Yes
Standard IP Access List Logging	Yes	Yes
Standby Supervisor Port Usage	Yes	Yes
Sticky Port Security	Yes	Yes
Sticky Port Security on Voice VLAN	Yes	Yes
Storm Control	Yes	Yes
Storm Control - Per-Port Multicast Suppression	Yes	Yes

**Table 2** *IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series*

<b>Feature</b>	<b>IP Base</b>	<b>Enterprise Services</b>
STP Syslog Messages	Yes	Yes
Stub IP Multicast Routing	Yes	Yes
Sub-second UDLD	Yes	Yes
SVI (Switch Virtual Interface) Autostate Exclude	Yes	Yes
Switch and IP Phone Security Interaction	Yes	Yes
Switch Port Analyzer (SPAN)	Yes	Yes
Switch Port Analyzer (SPAN) - CPU Source	Yes	Yes
Syslog over IPV6	Yes	Yes
System Logging — EAL4 Certification Enhancements	Yes	Yes
TACACS SENDAUTH function	Yes	Yes
TACACS Single Connection	Yes	Yes
TACACS+	Yes	Yes
TACACS+ and Radius for IPv6-	Yes	Yes
TCAM4 — Dynamic Multi-Protocol	Yes	Yes
TCAM4 — Service-Aware Resource Allocation	Yes	Yes
Time Domain Reflectometry (TDR)	Yes	Yes
Time-Based Access Lists	Yes	Yes
Time-Based Access Lists Using Time Ranges (ACL)	Yes	Yes
TrustSec: IEEE 802.1ae MACSec Layer 2 encryption	Yes	Yes
TrustSec: IEEE 802.1ae MACSec encryption on user facing ports	Yes	Yes
TrustSec: IEEE 802.1ae MACSec encryption between switch-to-switch links using Cisco SAP (Security Association Protocol)	Yes	Yes
Trusted boundary (extended trust for CDP devices)	Yes	Yes
UDI - Unique Device Identifier	Yes	Yes
Uni-Directional Link Routing (UDLR)	Yes	Yes
Unicast Mac Filtering	Yes	Yes

Table 2 IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
Unicast Reverse Path Forwarding (uRPF)	Yes	Yes
Unidirectional Ethernet	Yes	Yes
UniDirectional Link Detection (UDLD)	Yes	Yes
UDP Forwarding Support for IP Redundancy Virtual Router Group	Yes	Yes
Virtual Router Redundancy Protocol (VRRP) for IPv4	Yes	Yes
Virtual Switching System (VSS)	Yes	Yes
Virtual Switching System (VSS) — Layer 2 Protocol Tunneling, VLAN Translation, and Q-in-Q	Yes	Yes
Virtual Switching System (VSS) Phase 2 <sup>6</sup> <ul style="list-style-type: none"> <li>• Support for Layer 3 MEC—VSS with Layer 3 Multichassis EtherChannel (MEC) at the aggregation layer</li> <li>• Support for VSLP Fast Hello—With VSLP Fast Hello, the Catalyst 4500-X configured for VSS can now connect Access Switches that do not support the ePAgP protocol.</li> <li>• Support for VSL Encryption</li> </ul>	Yes	Yes
Virtual Switching System (VSS) — REP, Flexlinks, UDLD, and Fast UDLD	Yes	Yes
Virtual Trunking Protocol (VTP) — Pruning	Yes	Yes
VLAN Access Control List (VACL)	Yes	Yes
VLAN MAC Address Filtering	Yes	Yes
VLAN Mapping (VLAN Translation)	Yes	Yes
Vlan Switching and Selective QinQ on the Same Port	Yes	Yes
VRF-aware <b>copy</b> commands	Yes	Yes
VRF-aware PBR	No	Yes
VRF-aware SGT (Subnet-to-SGT mapping and VLAN-to-SGT mapping)	Yes	Yes
VRF-aware TACACS+	No	Yes
VRF-aware WCCP for IPv4 traffic	No	Yes

**Table 2** IP Base and Enterprise Services Image Support on Cisco Catalyst 4500-X Series

Feature	IP Base	Enterprise Services
VRF-aware WCCP for IPv6 traffic	No	Yes
VRF-lite for IPv6 on OSPF/ BGP/ EIGRP	No	Yes
VRRPv3: Object Tracking Integration	Yes	Yes
VRRPv3 Protocol Support	Yes	Yes
VSS	Yes	Yes
VTP (Virtual Trunking Protocol) Version 2	Yes	Yes
VTP Version 3	Yes	Yes
WCCP Version 2	Yes	Yes
WCCP Version 2 on VSS	Yes	Yes
WCCP Version 2 for IPv6	Yes	Yes
Web Authentication Proxy	Yes	Yes
Web Authentication Redirection to Original URL	Yes	Yes
Webauth Enhancements	Yes	Yes
Wireshark-based Ethernet Analyzer	Yes	Yes
XML-PI	Yes	Yes

1. Catalyst 4500-X, Supervisor Engine 7-E—IP Base. Supervisor Engine 7LE—Ent Services.
2. IEEE 802.1t—An IEEE amendment to IEEE 802.1D that includes extended system ID, long path cost, and PortFast.
3. When either Source or Prefix Guard for IPv6 is enabled, ICMPv6 packets are unrestricted on all Catalyst 4500 series switch platforms running IOS Cisco Release 15.2(1)E. All other traffic types are restricted.
4. IP Base supports only one OSPFv2 and one OSPFv3 instance with a maximum number of 1000 dynamically learned routes.
5. OSPF for Routed Access supports only one OSPFv2 and one OSPFv3 instance with a maximum number of 1000 dynamically learned routes.
6. As of IOS Release 3.5.0E, VSS supports Smart Install Director—Zero Touch installation without any convergence down-time.

## OpenFlow Version and Cisco IOS Release Support

The OVA package is available for download in the same location as your system image (.bin) file, on [cisco.com](http://cisco.com)



### Note

The OVA package is compatible only with its corresponding system image file name - as listed in the table below. Do not use an older version of the OVA package with a newer system image file, or a newer OVA package with an older system image file.

**Table 3** *Image Support for OpenFlow Version and Cisco IOS Release Support for Cisco OpenFlow Plug-In*

<b>Cisco IOS Release</b>	<b>Cisco OpenFlow Plug-In Version</b>	<b>Cisco OpenFlow Plug-In</b>	<b>Image Name</b>
IOS XE 3.8.0E	2.0.2	ofa-2.0.2-r2-cat4500-SPA-k9.ova	cat4500e-universalk9.SPA.03.08.00.E.152-4.E.bin

## MIB Support

For information on MIB support, please refer to this URL:

<ftp://ftp.cisco.com/pub/mibs/supportlists/cat4000/cat4000-supportlist.html>

## Features Not Supported on the Cisco Catalyst 4500-X Series Switches

The following features are not supported on a Catalyst 4500-X Series switches:

- CISCO-IETF-IP-FORWARD-MIB
- CISCO-IETF-IP-MIB
- LLDP HA
- SMI Proxy
- SSO (in non-VSS mode)
- WCCP Version 1
- SSH Version 1
- AES-256 Encryption algorithm for MACSec

With some exceptions, the VSS maintains “feature parity” with the standalone Catalyst 4500 or 4500-X series switches. Major exceptions include:

- CFM D8.1
- Energywise
- Mediatrace (Medianet active video monitoring feature)
- Metadata (Medianet feature)
- Per VLAN Learning
- UDE
- UDLR
- VMPS Client

## Orderable Product Numbers

**Table 4 Cisco IOS XE Software Release 3.9.0E Product Numbers and Images for the Catalyst 4500-X Series Switches**

Product Number	Description	Image
<b>Base Switch PIDs</b>		
WS-C4500X-32SFP+	Catalyst 4500-X 32 Port 10GE IP Base, Front-to-Back Cooling i.e. Port Side to Power Supply Cooling with no Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-F-32SFP+	Catalyst 4500-X 32 Port 10GE IP Base, Back-to-Front Cooling i.e. Power Supply to Port Side Cooling with no Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-16SFP+	Catalyst 4500-X 16 Port 10GE IP Base, Front-to-Back Cooling i.e. Port Side to Power Supply Cooling with no Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-F-16SFP+	Catalyst 4500-X 16 Port 10GE IP Base, Back-to-Front Cooling i.e. Power Supply to Port Side Cooling with no Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-24X-IPB	Catalyst 4500-X 24 Port 10GE IP Base, Front-to-Back Cooling (Power Supplies must be configured)	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-40X-ES	Catalyst 4500-X 40 Port 10G Enterprise Services, Front-to-Back Cooling, No Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
WS-C4500X-24X-ES	Catalyst 4500-X 24 Port 10G Enterprise Services, Front-to-Back Cooling, No Power Supply	cat4500e-universalk9.bin cat4500e-universal.SPA.03.04.00.SG.151-2.SG.bin
<b>FRU and OIR FANs</b>		
C4KX-FAN-F	Catalyst 4500-X Back-to-Front Cooling Fan	NA
C4KX-FAN-R	Catalyst 4500-X Front-to-Back Cooling Fan	NA
<b>Power Supply</b>		

**Table 4** Cisco IOS XE Software Release 3.9.0E Product Numbers and Images for the Catalyst 4500-X Series Switches

Product Number	Description	Image
C4KX-PWR-750AC-F	Catalyst 4500-X 750W AC Back-to-Front Cooling Power Supply (primary)	N/A
C4KX-PWR-750AC-F/2	Catalyst 4500-X 750W AC Back-to-Front Cooling Power Supply (secondary)	N/A
C4KX-PWR-750AC-R	Catalyst 4500-X 750W AC Front-to-Back Cooling Power Supply (primary)	N/A
C4KX-PWR-750AC-R/2	Catalyst 4500-X 750W AC Front-to-Back Cooling Power Supply (secondary)	N/A
C4KX-PWR-750DC-F	Catalyst 4500-X 750W DC Back-to-Front Cooling Power Supply (primary)	N/A
C4KX-PWR-750DC-F/2	Catalyst 4500-X 750W DC Back-to-Front Cooling Power Supply (secondary)	N/A
C4KX-PWR-750DC-R	Catalyst 4500-X 750W DC Front-to-Back Cooling Power Supply (primary)	N/A
C4KX-PWR-750DC-R/2	Catalyst 4500-X 750W DC Front-to-Back Cooling Power Supply (secondary)	N/A
<b>Accessories</b>		
CAB-CON-C4K-RJ45	Console Cable 6ft with RJ-45-to-RJ-45	N/A
SD-X45-2GB-E	Cisco Catalyst 4500 2-GB SD card	N/A
USB-X45-4GB-E	Cisco Catalyst 4500 4-GB USB device	N/A
C4KX-NM-8SFP+	Catalyst 4500-X 8 Port 10GE Network Module	N/A
<b>Software</b>		
S45XU-35-1521E	CAT4500-X Universal Image	cat4500e-universal.SPA.03.05.00.E.152-1E.bin
S45XUK9-35-1521E	CAT4500-X Universal Crypto image	cat4500e-universalk9.SPA.03.05.00.E.152-1.E.bin

# New and Changed Information

The Cisco IOS XE Release 3.9.xE Documentation Roadmap provides quick and easy access to all relevant documentation for specific platforms. Look for Quick Links to Platform Documentation on the respective platform documentation pages. For more information, see <http://www.cisco.com/c/en/us/support/ios-nx-os-software/ios-xe-3e/tsd-products-support-series-home.html>.

These sections describe the new and changed information for Catalyst 4500-X Series Switches running Cisco IOS XE software:

## New Features in Cisco IOS XE Release 3.9.2E

### New Software Features

**Table 5** *New Software Features in this Release*

Feature Name	Description
DHCPv6 Options	<ul style="list-style-type: none"> <li>DHCPv6 Option 52, Control and Provisioning of Wireless Access Points (CAPWAP) Access Controller —A protocol that allows lightweight access points to use DHCPv6, to discover a Wireless Controller to which it can connect. CAPWAP is a standard, interoperable protocol that enables a controller to manage a collection of wireless access points.</li> <li>DHCPv6 Option18—Refers to the interface-ID option, which is used by relay agents to decide which interface should be used when forwarding a RELAY-REPLY packet. If a relay agent receives a RELAY-REPLY message with an interface-ID option, the message is relayed to the client through the interface identified by the option.</li> <li>DHCPv6 Option 37, Relay Options Remote-ID—Adds the remote identification (remote-ID) option to relayed (RELAY-FORWARD) DHCPv6 packets.</li> </ul> (IP Base and Enterprise Services)
IPv6 Object Group ACLs (OGACLs)	Introduces support for IPv6 OGACLs. Object groups enable you to group ACE entries and add or remove entries while keeping your ACL structure more readable. (IP Base and Enterprise Services)
Flexible NetFlow (FNF) for AVC with DNS-AS	Introduces the ability to export application information using FNF. This enables you to gain visibility into the applications running on your network, and the use of FNF option templates to export application ID, description, and attribute information. (IP Base and Enterprise Services)
VRF-Aware Security Group Tag (SGT)	Introduces support for <ul style="list-style-type: none"> <li>Subnet-to-SGT mapping. This mapping binds an SGT to all host addresses of a specified subnet.</li> <li>VLAN-to-SGT mapping. This mapping binds an SGT to packets from a specified VLAN.</li> </ul> (IP Base and Enterprise Services)

# New Features in Cisco IOS XE Release 3.9.1E

## New Hardware Features

**Table 6** *New Hardware Features in this Release*

Feature Name	Description
10 Gigabit Ethernet (GE) SFP+ CWDM Transceivers	<p>Support for the following 10 GE SFP+ CWDM transceivers on Cisco Catalyst 4500-X Series Switches:</p> <ul style="list-style-type: none"> <li>• CWDM-SFP10G-1590</li> <li>• CWDM-SFP10G-1570</li> <li>• CWDM-SFP10G-1530</li> <li>• CWDM-SFP10G-1510</li> <li>• CWDM-SFP10G-1550</li> <li>• CWDM-SFP10G-1470</li> <li>• CWDM-SFP10G-1610</li> <li>• CWDM-SFP10G-1490</li> </ul>

## New Software Features

**Table 7** *New Software Features in this Release*

Feature Name	Description
Downshift Support on Multigigabit (mGIG) Ethernet Interfaces	<p>Introduces support for downshifted or lowered speeds on mGIG interfaces, automatically, if the link quality is poor or if the link is continuously down.</p> <p>(LAN Base, IP Base, Enterprise Services)</p>
MKA MACsec Enhancements	<ul style="list-style-type: none"> <li>• Supports MKA MACsec Pre-shared keys (PSKs) that are used to generate Connectivity Association Keys (CAKs), Key Encryption Keys (KEK), and Integrity Check Value Keys (ICK), when configuring switch-to-switch links.</li> <li>• Supports port channels</li> </ul> <p>(Enterprise Services)</p>
Multicast VLAN Registration	<p>The maximum number of supported MVR groups is now increased to 1500.</p> <p>(LAN Base, IP Base, Enterprise Services)</p>

**Table 7** *New Software Features in this Release*

<b>Feature Name</b>	<b>Description</b>
Programmability	<p>The capability to configure and manage networking devices using protocols that are specifically designed to be consumed by software, that is, machine to machine interfaces.</p> <p>The feature provides the use of NETCONF and RESTCONF interfaces, which reside in a container on the switch and enable remote management. The YANG data models available with these interfaces determine the scope of functions or actions that can be performed.</p> <p>Supported YANG Data Models include the Cisco device-specific ned.yang model (a configuration data model) and the NETCONF Operational Data Manager (ODM) (operational and state data).</p> <p>The feature also introduces support for the Preboot Execution Environment (PXE boot), a network boot loader, which supports booting from a network-based source. It enables the switch to retrieve the software image, and other files from a remote server during initial deployment, without end-user intervention, that is, Zero-Touch Provisioning.</p> <p>The PXE boot feature requires ROMMON version 15.0(1r)SG14. (LAN Base, IP Base, Enterprise Services)</p>
VNET IP Addressing Inheritance Overrides on Subinterfaces	<p>Allows the creation of separate IP addresses for subinterfaces, using the vnet interface configuration mode, overriding the IP address inherited from the main trunk interface.</p> <p>(Enterprise Services)</p>

## New Features in Cisco IOS XE Release 3.9.0E

### New Software Features

**Table 8** *New Software Features in this Release*

<b>Feature Name</b>	<b>Description</b>
Application Visibility and Control (AVC) with Domain Name System-Authoritative Source (DNS-AS)	<p>Provides a centralized means of controlling the identification and classification of trusted network traffic. It accomplishes this by using metadata stored in an authoritative DNS Server to identify applications and domains and provide traffic classification and business relevance information. Modular QoS CLI (MQC) configuration settings on the switch (DNS-AS Client) determine the policies that are enforced.</p> <p>The feature is disabled by default. (IP Base and Enterprise Services)</p>

**Table 8** *New Software Features in this Release*

Feature Name	Description
MACSec Agreement (MKA) MACsec with EAP-TLS	Provides support for IEEE 802.1X Port-based Authentication with Extensible Authentication Protocol- Transport Layer Security (EAP-TLS), to configure MKA MACsec on switch-to-switch links.  (IP Base and Enterprise Services)
Cisco-Port-QoS-MIB: Support for cportQosQueueEnqueuePkts and cportQosQueueDropPkts	Support for the following objects in Cisco-Port-QoS-MIB to manage queue counters on the device: <ul style="list-style-type: none"> <li>cportQosQueueEnqueuePkts - indicates the number of egress packets enqueued for a queue and threshold</li> <li>cportQosQueueDropPkts - indicates the number of egress packets that have been dropped for a queue and threshold.</li> </ul> (IP Base, and Enterprise Services)

## Cisco IOS XE to Cisco IOS Version Number Mapping

As [Table 9](#) shows, each version of Cisco IOS XE has an associated Cisco IOS version:

**Table 9** *Cisco IOS XE to Cisco IOS Version Number Mapping*

Cisco IOS XE Version	Cisco IOS Version
03.3.0SG	15.1(1)SG
03.3.1SG	15.1(1)SG1
03.4.0SG	15.1(2)SG
03.5.0E	15.2(1)E
03.6.0E	15.2(2)E
03.7.0E	15.2(3)E
03.8.0E	15.2(4)E
03.9.0E	15.2(5)E

## Upgrading the System Software

If you are upgrading to Cisco IOS XE Release 3.9.xE and plan to use VSS, you must upgrade your ROMMON to IOS Version 15.0(1r)SG11.

ISSU is supported on 4500-X in VSS configuration.

## Limitations and Restrictions

- mGRE with NHRP (DMVPN) is not supported.
- Starting with Cisco IOS XE Release 3.9.0E, Secure Shell (SSH) Version 1 is deprecated. Use SSH Version 2 instead.

- The maximum MTE supported on Catalyst 4500 switches is 8000, per direction.
- Although the **show memory** command is supported on Catalyst 4500 series switches, the CLI output for the command shows the value 0 for the config total, on Catalyst 4500 series switches using a daughter card on Supervisor Engine 7-E. This issue is, however, not seen on switches with Supervisor Engine 7-E baseboard. (CSCup28930)
- When you install the GLC-T (1000Base-T) SFP transceiver, 10/100 Mbps with auto negotiation is not supported.
- When you use the GLC-GE-100FX module between a Cisco Catalyst 4500-X switch and a Cisco Catalyst 2000 or 3000 series switch, traffic does not flow after the first time you change the interface from half duplex to a full duplex.

**Workaround:** You have to enter the **shutdown** and then the **no shutdown** interface configuration command for traffic flow to resume. (CSCus14532)

- The system allows you to delete policy maps related to these Auto QoS profiles:
  - Auto QoS enterprise
  - Auto QoS guest
  - Auto QoS voice

The problem is seen on a Catalyst 4500 series switch running Cisco IOS-XE release 3.7.0E, when you configure QoS using Auto Qos and you try to delete an Auto QoS profile related policy map.

**Workaround:** To recover the deleted policy-map, remove all the policies related to that profile, remove Auto QoS configuration from the WLAN, and then reconfigure Auto QoS.

- VSS: Do not use SVLAN for routing in SP network on ingress switch (where the mapping is present). This is not a valid scenario.
- Starting with Release IOS XE 3.3.0SG, the seven RP restriction was removed.
- More than 16K QoS policies can be configured in software. Only the first 16K are installed in hardware.
- Adjacency learning (through ARP response frames) is restricted to roughly 1000 new adjacencies per second, depending on CPU utilization. This should only impact large networks on the first bootup. After adjacencies are learned they are installed in hardware.
- Multicast fastdrop entries are not created when RPF failure occurs with IPv6 multicast traffic. In a topology where reverse path check failure occurs with IPv6 multicast, this may cause high CPU utilization on the switch.
- The SNMP ceImageFeature object returns a similar feature list for all the three license levels (IP Base and EntServices). Although the activated feature set for a universal image varies based on the installed feature license, the value displayed by this object is fixed and is not based on the feature license level.
- Performing an ISSU from a prior release to IOS XE 3.6.0E is not supported.
- Standard TFTP implementation limits the maximum size of a file that can be transferred to 32 MB. If ROMMON is used to boot an IOS image that is larger than 32 MB, the TFTP transfer fails at the 65,xxx datagram.

TFTP numbers its datagrams with a 16 bit field, resulting in a maximum of 65,536 datagrams. Because each TFTP datagram is 512 bytes long, the maximum transferable file is  $65536 \times 512 = 32$  MB. If both the TFTP client (ROMMON) and the TFTP server support block number wraparound, no size limitation exists.

Cisco has modified the TFTP client to support block number wraparound. So, if you encounter a transfer failure, use a TFTP server that supports TFTP block number wraparound. Because most implementations of TFTP support block number wraparound, updating the TFTP daemon should fix the issue.

- A XML-PI specification file entry does not return the desired CLI output.

The outputs of certain commands, such as **show ip route** and **show access-lists**, contain non-deterministic text. While the output is easily understood, the output text does not contain strings that are consistently output. A general purpose specification file entry is unable to parse all possible output.

**Workaround (1):**

While a general purpose specification file entry may not be possible, a specification file entry might be created that returns the desired text by searching for text that is guaranteed to be in the output. If a string is guaranteed to be in the output, it can be used for parsing.

For example, the output of the `show ip access-lists SecWiz_Gi3_17_out_ip` command is this:

```
Extended IP access list SecWiz_Gi3_17_out_ip
 10 deny ip 76.0.0.0 0.255.255.255 host 65.65.66.67
 20 deny ip 76.0.0.0 0.255.255.255 host 44.45.46.47
 30 permit ip 76.0.0.0 0.255.255.255 host 55.56.57.57
```

The first line is easily parsed because access list is guaranteed to be in the output:

```
<Property name="access list" alias="Name" distance="1.0" length="-1" type="String" />
```

The remaining lines all contain the term host. As a result, the specification file may report the desired values by specifying that string. For example, this line

```
<Property name="host" alias="rule" distance="s.1" length="1" type="String" />
```

will produce the following for the first and second rules

```
<rule>
  deny
</rule>
```

and the following for the third statement

```
<rule>
  permit
</rule>
```

**Workaround (2):**

Request the output of the **show running-config** command using NETCONF and parse that output for the desired strings. This is useful when the desired lines contain nothing in common. For example, the rules in this access list do not contain a common string and the order (three permits, then a deny, then another permit), prevent the spec file entry from using permit as a search string, as in the following example:

```
Extended MAC access list MACCOY
 permit 0000.0000.ffef ffff.ffff.0000 0000.00af.bcef ffff.ff00.0000 appletalk
 permit any host 65de.edfe.fefe xns-idp
 permit any any protocol-family rarp-non-ipv4
 deny host 005e.1e5d.9f7d host 3399.e3e1.ff2c dec-spanning
 permit any any
```

The XML output of **show running-config** command includes the following, which can then be parsed programmatically, as desired:

```

<mac><access-list><extended><ACLName>MACCOY</ACLName></extended></access-list></mac>
  <X-Interface> permit 0000.0000.ffef ffff.ffff.0000 0000.00af.bcef ffff.ff00.0000
  appletalk</X-Interface>
  <X-Interface> permit any host 65de.edfe.fefe xns-idp</X-Interface>
  <X-Interface> permit any any protocol-family rarp-non-ipv4</X-Interface>
  <X-Interface> deny host 005e.1e5d.9f7d host 3399.e3e1.ff2c
  dec-spanning</X-Interface>
  <X-Interface> permit any any</X-Interface>

```

#### CSCtg93278

- When attaching an existing policy-map (that is already applied to a control-port) to another front-panel port, the following message displays:

The policymap <policy-map name> is already attached to control-plane and cannot be shared with other targets.

**Workaround:** Define a policy-map with a different name and then reattach. CSCti26172

- If the number of unique FNF monitors attached to target exceeds 2048 (one per target), a switch responds slowly:

#### Workarounds:

- Decrease the number of monitors.
- Attach the same monitor to multiple targets. CSCti43798

- **ciscoFlashPartitionFileCount** object returns an incorrect file count for **bootflash:**, **usb0:**, **slot0:**, **slaveslot0:**, **slavebootflash:**, and **slaveusb0:**.

**Workaround:** Use the **dir device** command (for example, **dir bootflash:**) to obtain the correct file count. CSCti74130

- If multicast is configured and you make changes to the configuration, Traceback and CPUHOG messages are displayed if the following conditions exist:
  - At least 10K groups and roughly 20K mroutes exist.
  - IGMP joins with source traffic transit to all the multicast groups.

This is caused by the large number of updates generating SPI messages that must be processed by the CPU to ensure that the platform is updated with the changes in all the entries.

**Workaround:** None. CSCti20312

- With traffic running, entering **clear ip mroute \*** with larger number of mroutes and over 6 OIFs will cause Malloc Fail messages to display.

You cannot clear a large number of mroutes at one time when traffic is still running.

**Workaround:** Do not clear all mroutes at once.

#### CSCtn06753

- Although you can configure subsecond PIM query intervals on Catalyst 4500 platforms, such an action represents a compromise between convergence (reaction time) and a number of other factors (number of mroutes, base line of CPU utilization, CPU speed, processing overhead per 1 m-route, etc.). You must account for those factors when configuring subsecond PIM timers. We recommend that you set the PIM query interval to a minimum of 2 seconds. By adjusting the available parameters, you can achieve flawless operation; that is, a top number of multicast routes per given convergence time on a specific setup.
- Energywise WOL is not “waking up” a PC in hibernate or standby mode.

**Workaround:** None. CSCtr51014

- When OSPFv3 LSA throttling is configured, rate limiting does not take effect for a few minutes.  
**WorkAround:** None. CSCtw86319
- The ROMMON version number column in the output of **show module** command is truncated.  
**Workaround:** Use the **show version** command. CSCtr30294
- IP SLA session creation fails randomly for various 4-tuples.  
**Workaround:** Select an alternate destination or source port. CSCty05405
- The system cannot scale to greater than 512 SIP flows with MSP and metadata enabled.  
**Workaround:** None. CSCty79236
- When either the RADIUS-server test feature is enabled or RADIUS-server dead-criteria is configured, and either RADIUS-server deadtime is set to 0 or not configured, the RADIUS-server status is not properly relayed to AAA.  
**Workaround:** Configure both dead-criteria and deadtime.  

```
radius-server dead-criteria
radius-server deadtime
```

  
CSCtl06706
- If you use the **quick** option in the **issu changeversion** command, the following might occur:
  - Links flap for various Layer 3 protocols.
  - A traffic loss of several seconds is observed during the upgrade process.**Workaround:** Do not use the **quick** option with the **issu changeversion** command. CSCto51562
- While configuring an IPv6 access-list, if you specify **hardware statistics** as the first statement in v6 access-list mode (i.e. before issuing any other v6 ACE statement), it will not take effect. Similarly, your hardware statistics configuration will be missing from the output of the **show running** command.  
You will not experience this behavior with IPv4 access lists.  
**Workaround:** During IPv6 access-list configuration, configure at least one IPv6 ACE before the "hardware statistics" statement. CSCuc53234
- Routed packets that are fragmented are not policed if the egress interface is on the VSS Standby switch. However, if the egress interface is on the VSS active switch, these packets are policed.  
This applies to QoS policing only. QoS marking, shaping and sharing behave as expected.  
**Workaround:** None. CSCub14402
- When an IPv6 FHS policy is applied on a VLAN and an EtherChannel port is part of that VLAN, packets received by EtherChannel (from neighbors) are not bridged across the local switch.  
**Workaround:** Apply FHS policies on a non EtherChannel port rather than a VLAN. CSCua53148
- During VSS conversion, the switch intended as the Standby device may require up to 9 minutes to reach an SSO state. The boot up time depends on the configuration and on the number of line cards in the system.  
**Workaround:** None. CSCua87538
- An incorrect module number is displayed in the console messages during boot up of a Cat4500X VSS.

```
*Jul 18 12:36:11.138: %C4K_IOSMODPORTMAN-6-MODULEONLINE: Module 11 (WS-C4500X-32
S/N: JAE154503I8 Hw: 1.0) is online
```

Because the Catalyst 4500-X is a “fixed” configuration device, in a VSS, you would expect the two systems to be labeled 'Module 1' and 'Module 2.' However, because of software implementation similarities with the modular Catalyst 4500E series switches, the Standby switch is labeled 'Module 11.'

**Workaround:** None. CSCub11632

- Memory allocation failures can occur if more than 16K IPv6 multicast snooping entries are present.

**Workaround:** None. CSCuc77376

- Beginning with IOS Release XE 3.5.0E, error messages that occur when a QoS policy is applied will no longer appear directly on the console when **no logging console** is configured. They will appear only when a logging method is active (e.g., logging buffered, logging console, ...).

**Workaround:** None. CSCuf86375

- Setting a cos value based on QoS group triggers the following error message in a VSS system

```
set action fail = 9
```

**Workaround:** None. QoS groups are not supported in VSS. CSCuc84739

- Auto negotiation cannot be disabled on the Fa 1 port. It must be set to auto/auto, or fixed speed with duplex auto.
- The following messages are seen during boot up after POST check.

```
Rommon reg: 0x00004F80
Reset2Reg: 0x00000F00
```

```
Image load status: 0x00000000
```

```
#####
```

```
Snowtrooper 220 controller 0x0430006E..0x044E161D Size:0x0057B4C5 Program Done!
```

```
#####
```

```
[ 6642.974087] pci 0000:00:00.0: ignoring class b20 (doesn't match header type 01)
```

```
Starting System Services
```

```
Calculating module dependencies ...
```

```
Loading rtc-ds1307
```

```
RTNETLINK answers: Invalid argument
```

```
No Mountpoints DefinedJan 17 09:48:14 %IOSXE-3-PLATFORM: process sshd[5241]: error:
```

```
Bind to port
```

```
22 on :: failed: Address already in use
```

```
Starting IOS Services
```

```
Loading virtuclock as vuclock
```

```
Loading gsbu64atomic as gdb64atomic
```

```
/dev/fd/12: line 267: /sys/devices/system/edac/mc/edac_mc_log_ce: No such file or directory
```

```
Aug 8 20:30:29 %IOSXE-3-PLATFORM: process kernel: mmc0: Got command interrupt
```

```
0x00030000 even though no command operation was in progress.
```

```
Aug 8 20:30:29 %IOSXE-3-PLATFORM: process kernel: PME2: fsl_pme2_db_init: not on ctrl-plane
```

These messages are cosmetic only, and no ssh services are available unless configured within IOS.

**Workaround:** None CSCue15724

- When a logging discriminator is configured and applied to a device, memory leak is seen under heavy syslog or debug output. The rate of the leak is dependent on the quantity of logs produced. In extreme cases, the device may crash. As a workaround, disable the logging discriminator on the device (CSCur45606, CSCur28336).

# Caveats

Caveats describe unexpected behavior in Cisco IOS releases. Caveats listed as open in a prior release are carried forward to the next release as either open or resolved.


**Note**

For the latest information on PSIRTS, refer to the Security Advisories on CCO at the following URL: [http://www.cisco.com/en/US/products/products\\_security\\_advisories\\_listing.html](http://www.cisco.com/en/US/products/products_security_advisories_listing.html)

- [Cisco Bug Search Tool](#), page 38
- [Open Caveats in Cisco IOS XE Release 3.9.xE](#), page 38
- [Resolved Caveats in Cisco IOS XE Release 3.9.2E](#), page 39
- [Resolved Caveats in Cisco IOS XE Release 3.9.1E](#), page 39

## Cisco Bug Search Tool

The Bug Search Tool (BST), which is the online successor to Bug Toolkit, is designed to improve the effectiveness in network risk management and device troubleshooting. The BST allows partners and customers to search for software bugs based on product, release, and keyword, and aggregates key data such as bug details, product, and version. The tool has a provision to filter bugs based on credentials to provide external and internal bug views for the search input.

To view the details of a caveat listed in this document:

1. Access the BST (use your Cisco user ID and password) at <https://tools.cisco.com/bugsearch/>.
2. Enter the bug ID in the **Search For:** field.

## Open Caveats in Cisco IOS XE Release 3.9.xE

Use the Bug Search Tool to view the details of a caveat listed in this section:

**Table 10**      *Open Caveats in Cisco IOS XE Release 3.9.xE*

Bug ID	Headline
<a href="#">CSCvd51687</a>	Incremental leaks seen at ipv6_acl_entry_command
<a href="#">CSCvc78507</a>	CAT4k Crash after CPU hog messages
<a href="#">CSCvb43870</a>	When 10gSR & Zr SFPs inserted in sup8LE uplink port state are fluctuates
<a href="#">CSCvb89512</a>	Cat4k VSS stuck in the middle of show tech-support execution
<a href="#">CSCva52512</a>	3.9.348: Cat4k APs flapping after SSO
<a href="#">CSCuz82086</a>	Memory corruption with dot1x scale test
<a href="#">CSCuz00930</a>	MTU config removed on port-channel int after no sw/sw on channel member

## Resolved Caveats in Cisco IOS XE Release 3.9.2E

**Table 11** Resolved Caveats in Cisco IOS XE Release 3.9.2E

Bug ID	Headline
<a href="#">CSCvd43437</a>	Wrong Source IP Selection for eBGP in EVN/VNET environment
<a href="#">CSCvd58820</a>	Need API for ip best source address for given outgoing interface

## Resolved Caveats in Cisco IOS XE Release 3.9.1E

The following caveats were resolved in this release.

**Table 12** Resolved Caveats in Cisco IOS XE Release 3.9.1E

Bug ID	Headline
<a href="#">CSCuz72344</a>	ip ssh version 2 missing after the reload
<a href="#">CSCva14319</a>	Memory leak @auth_mgr_event_apply_user_profile
<a href="#">CSCva37519</a>	Stale flowmgr entry during ipv6 tacacs transaction leads to crash
<a href="#">CSCvb05793</a>	Traffic drop observed upto 2 mins on active Sup pull with ECMP
<a href="#">CSCvb70344</a>	Packet drops on standby supervisor in a standalone 4500 chassis with sup8
<a href="#">CSCvb76276</a>	Status LED of WS-X4748-12X48U+E is RED, although linecard is working
<a href="#">CSCvb16274</a>	PPTP Start-Control-Connection-Reply packet leaks router memory contents
<a href="#">CSCux05246</a>	snmpwalk and snmpget have incorrect behavior on IP SLA
<a href="#">CSCva35194</a>	PTF card is crashed while provisioning when all vty sessions exhausted.
<a href="#">CSCuu13476</a>	Cisco IOS & IOS XE Software OpenSSH TCP Denial of Service Vulnerability

## Hardware Documents

Installation guides and notes including specifications and relevant safety information are available at the following URLs:

- *Regulatory Compliance and Safety Information for the Catalyst 4500 Series Switches*  
[http://www.cisco.com/en/US/docs/switches/lan/catalyst4500/hardware/regulatory/compliance/78\\_13233.html](http://www.cisco.com/en/US/docs/switches/lan/catalyst4500/hardware/regulatory/compliance/78_13233.html)
- Installation notes for specific supervisor engines or for accessory hardware are available at:  
[http://www.cisco.com/en/US/products/hw/switches/ps4324/prod\\_installation\\_guides\\_list.html](http://www.cisco.com/en/US/products/hw/switches/ps4324/prod_installation_guides_list.html)
- Catalyst 4500-X hardware installation information is available at:  
[http://www.cisco.com/en/US/products/ps12332/prod\\_installation\\_guides\\_list.html](http://www.cisco.com/en/US/products/ps12332/prod_installation_guides_list.html)

## Software Documentation

Software release notes, configuration guides, command references, and system message guides are available at the following URLs:

- Release Notes—Cisco IOS Release Notes for the Catalyst 4500-X Series Switches are available at: [http://www.cisco.com/en/US/products/ps12332/prod\\_release\\_notes\\_list.html](http://www.cisco.com/en/US/products/ps12332/prod_release_notes_list.html)
- Guides—The Catalyst 4500-X Series Switches, and the Catalyst 4500-E Series Switches, leverage the same software configuration guide, command reference guide, and system message guide:
  - Software Configuration Guides: [http://www.cisco.com/en/US/products/hw/switches/ps4324/products\\_installation\\_and\\_configuration\\_guides\\_list.html](http://www.cisco.com/en/US/products/hw/switches/ps4324/products_installation_and_configuration_guides_list.html)
  - Command Reference Guides: [http://www.cisco.com/en/US/products/hw/switches/ps4324/prod\\_command\\_reference\\_list.html](http://www.cisco.com/en/US/products/hw/switches/ps4324/prod_command_reference_list.html)
  - System Message Guides: [http://www.cisco.com/en/US/products/hw/switches/ps4324/products\\_system\\_message\\_guides\\_list.html](http://www.cisco.com/en/US/products/hw/switches/ps4324/products_system_message_guides_list.html)

## Cisco IOS Documentation

Platform-independent Cisco IOS documentation is available at the following URLs:

- Cisco IOS configuration guides, Cisco IOS XE Release 3E <http://www.cisco.com/c/en/us/support/ios-nx-os-software/ios-xe-3e/products-installation-and-configuration-guides-list.html>
- Cisco IOS Master Command List. All Releases <https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/mcl/allreleasemcl/all-book.html>  
You can also use the Command Lookup Tool at: <http://tools.cisco.com/Support/CLILookup/cltSearchAction.do>
- Cisco IOS system messages, version 12.x [http://www.cisco.com/en/US/products/ps6350/products\\_system\\_message\\_guides\\_list.html](http://www.cisco.com/en/US/products/ps6350/products_system_message_guides_list.html)  
You can also use the Error Message Decoder tool at: <http://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi>

## Commands in Task Tables

Commands listed in task tables show only the relevant information for completing the task and not all available options for the command. For a complete description of a command, refer to the command in the *Catalyst 4500 Series Switch Cisco IOS Command Reference*.

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