



Release Notes for the Catalyst 4500-X Series Switches, Cisco IOS XE Release 3.10.0E

First Published: August 8, 2017

This release note describes the features, modifications, and caveats for the Cisco IOS XE Release 3.10.0E software on the Catalyst 4500-X Series Switches.

Cisco IOS XE Release 3.10.0E is a feature rich new software feature release for IOS and IOS-XE based Catalyst Access Switching products.



Note

Although Cisco Catalyst 4500E Series Switches and Cisco Catalyst 4500-X Series Switches have separate release notes, each leverages the same *Software Configuration Guide* and *Command Reference Guide*.

Contents

This publication consists of these sections:

- [Cisco IOS Software Packaging, page 2](#)
- [Cisco IOS XE Release Strategy, page 2](#)
- [System Requirements, page 2](#)
- [New and Changed Information, page 29](#)
- [Cisco IOS XE to Cisco IOS Version Number Mapping, page 30](#)
- [Upgrading the System Software, page 31](#)
- [Limitations and Restrictions, page 31](#)
- [Caveats, page 36](#)



- [Notices, page 39](#)

Cisco IOS Software Packaging

Cisco Catalyst 4500E Series Switches support these license levels or feature sets.

The following permanent right-to-use licenses or base licenses are available:

- Enterprise Services—image supports all Cisco Catalyst 4500E Series software features based on Cisco IOS Software, including enhanced routing.
- IP Base

Starting with Cisco IOS XE Release 3.10.0E, the following add-on license options are available:

- DNA Essentials
- DNA Advantage

To find information about platform support and to know which license levels a feature is available with, use Cisco Feature Navigator. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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 3.10.0E.

Cisco IOS XE Release 3.10.xE, 3.8.xE 3.6.xE, and 3.4.xSG are extended maintenance (EM) trains supporting 4500-X.

Cisco IOS XE Release 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

System Requirements

This section describes the system requirements:

- [Supported Hardware on the Catalyst 4500-X Series Switches, page 3](#)
- [Feature Support by Image Type, page 3](#)
- [OpenFlow Version and Cisco IOS Release Support, page 25](#)
- [MIB Support, page 26](#)
- [Features Not Supported on the Cisco Catalyst 4500-X Series Switches, page 26](#)
- [Orderable Product Numbers, page 27](#)

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 | http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/10GE_Tx_Matrix.html |
| Cisco Gigabit Ethernet Transceiver Modules Compatibility Matrix | http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/GE_Tx_Matrix.html |
| Cisco 100-Megabit Ethernet SFP Modules Compatibility Matrix | http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/100MB_Tx_Matrix.html |
| Cisco Wavelength Division Multiplexing Transceivers Compatibility Matrix | http://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6982.html |

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 3.10.0E 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 |
| 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 |
| BGP Conditional Route Injection | No | Yes |

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

| Feature | IP Base | Enterprise Services |
|---|---------|---------------------|
| 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 |
| CGMP — Cisco Group Management Protocol | Yes | Yes |

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

| Feature | IP Base | Enterprise Services |
|---|---------|---------------------|
| 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 |
| Commented IP Access List Entries | Yes | Yes |

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

| Feature | IP Base | Enterprise Services |
|--|---------|---------------------|
| 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 |
| DHCP Server | Yes | Yes |

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

| Feature | IP Base | Enterprise Services |
|--|---------|---------------------|
| 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 ¹ | 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 |
| FHRP — Object Tracking List | Yes | Yes |

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

| Feature | IP Base | Enterprise Services |
|---|----------------|----------------------------|
| 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 |
| Flexible NetFlow (FNF) for AVC with DNS-AS | 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 ² | 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

| Feature | IP Base | Enterprise Services |
|--|---------|---------------------|
| 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

| Feature | IP Base | Enterprise Services |
|---|----------------|----------------------------|
| 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 ³ | Yes | Yes |
| IPv6 HSRP | Yes | Yes |
| IPv6 HTTP(S) | Yes | Yes |
| IPv6 ICMPv6 | Yes | Yes |
| IPv6 ICMPv6 Redirect | Yes ⁴ | 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

| Feature | IP Base | Enterprise Services |
|---|------------------|---------------------|
| 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 ⁴ | Yes |
| IPv6 OSPFv3 Fast Convergence | Yes | Yes |
| IPv6 Policy-Based Routing | No | Yes |
| IPv6 RA Guard (Host Mode) | Yes | Yes |
| IPv6 Router Advertisement Options for Domain Name System (DNS) Configuration | Yes | Yes |
| IPv6 Routing — EIGRP Support | No | Yes |
| IPv6 Routing — OSPF for IPv6 (OSPFv3) | Yes ⁴ | 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 |

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

| Feature | IP Base | Enterprise Services |
|---|---------|---------------------|
| IPv6 Static Routing — Support for Tracking Objects | Yes | Yes |
| 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 |

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

| Feature | IP Base | Enterprise Services |
|--|---------|---------------------|
| Layer 2 Traceroute | Yes | Yes |
| 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 |
| Master Key Agreement (MKA) MACsec with EAP-TLS | Yes | Yes |
| Master Key Agreement (MKA) MACsec <ul style="list-style-type: none"> • Switch-to-Switch Connections with Pre-Shared Keys • Port Channels | 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 |

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

| Feature | IP Base | Enterprise Services |
|--|---------|---------------------|
| Multi-VRF Support (VRF lite) | No | Yes |
| 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"> • GPS support for location • Location at switch level • Local timezone change • Name value pair • Priority settings for MIBs | Yes | Yes |
| No Service Password Recovery | Yes | Yes |
| No. of VLAN Support | 4096 | 4096 |
| NSF — BGP | No | Yes |

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

| Feature | IP Base | Enterprise Services |
|--|------------------|---------------------|
| NSF — EIGRP | Yes | Yes |
| 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 ⁴ | Yes |
| OSPF v3 Authentication | Yes ⁴ | Yes |
| OSPF Flooding Reduction | Yes ⁴ | Yes |
| OSPF for Routed Access ⁵ | Yes | Yes |
| OSPF Incremental Shortest Path First (i-SPF) Support | Yes ⁴ | Yes |
| OSPF Link State Database Overload Protection | Yes ⁴ | Yes |
| OSPF Not-So-Stubby Areas (NSSA) | Yes ⁴ | Yes |
| OSPF Packet Pacing | Yes ⁴ | Yes |
| OSPF Shortest Paths First Throttling | Yes ⁴ | Yes |
| OSPF Stub Router Advertisement | Yes ⁴ | Yes |
| OSPF Support for Fast Hellos | Yes ⁴ | Yes |
| OSPF Support for Link State Advertisement (LSA) Throttling | Yes ⁴ | Yes |
| OSPF Support for Multi-VRF on CE Routers | Yes ⁴ | Yes |
| OSPF Update Packet-Pacing Configurable Timers | Yes ⁴ | 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 |

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

| Feature | IP Base | Enterprise Services |
|---|--------------------------|--------------------------|
| Per Intf MrouteState Limit | Yes | Yes |
| 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

| Feature | IP Base | Enterprise Services |
|---|----------------|----------------------------|
| 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

| Feature | IP Base | Enterprise Services |
|---|---------------------------------|---------------------------------|
| 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"> • Backbone Fast Convergence • Bridge Assurance • Dispute Mechanism • Loop Guard • Portfast • PortFast BPDU Filtering • Portfast BPDU Guard • Portfast Support for Trunks • PVST+ Simulation • Root Guard • STP Extension • Uplink Fast Convergence • Uplink Load Balancing | 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

| Feature | IP Base | Enterprise Services |
|---|---------|---------------------|
| 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 ⁶ <ul style="list-style-type: none"> • Support for Layer 3 MEC—VSS with Layer 3 Multichassis EtherChannel (MEC) at the aggregation layer • 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. • Support for VSL Encryption | 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 copy 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



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*

| Platform | Cisco IOS Release | Cisco OpenFlow Plug-In Version | Cisco OpenFlow Plug-In | Image Name |
|---------------------------------------|--------------------------|---------------------------------------|------------------------------------|---|
| Cisco Catalyst 4500-X Series Switches | IOS XE 3.10.0E | 2.0.2 | ofa-2.0.2-r2-cat4500es8-SPA-k9.ova | cat4500e-universalk9.SPA.03.10.00.E.152-6.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

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 |
|-------------------------|---|---|
| Base Switch PIDs | | |
| 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 |
| FRU and OIR FANs | | |
| C4KX-FAN-F | Catalyst 4500-X Back-to-Front Cooling Fan | NA |
| C4KX-FAN-R | Catalyst 4500-X Front-to-Back Cooling Fan | NA |
| Power Supply | | |

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 |
| Accessories | | |
| 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 |
| Software | | |
| 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

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

- [New Features in Cisco IOS XE Release 3.10.0E](#)

New Features in Cisco IOS XE Release 3.10.0E

New Hardware Features

| Feature Name | Description |
|-------------------------|---|
| SFP Transceiver Support | Support for the GLC-TE= SFP transceiver on Cisco Catalyst 4500-X Series Switches This is a 1000BASE-T SFP transceiver module for Category 5 copper wire, RJ-45 connector, Extended Temperature |

New Software Features

| Feature Name | Description and License Level Information |
|--|---|
| DNA-SA Licensing | <p>Introduces support for a new add-on licensing option.</p> <p>Features that are available with add-on license levels provide Cisco innovations on the switch, as well as on the Cisco Digital Network Architecture Center (Cisco DNA Center).</p> <p>You can activate or deactivate add-on licenses by using the license right-to-use [activate deactivate] [addon {dna-essentials dna-advantage}] {subscription evaluation}[acceptEULA] command options.</p> <p>There are no changes in the way you activate or deactivate the existing (base) license options (Enterprise Services and IP Base), but there are restrictions to the permitted combinations of base and add-on licenses you can order. See the software configuration guide for more information.</p> |
| IPv6 Router Advertisement Options for Domain Name System (DNS) Configuration | <p>The Domain Name System (DNS) protocol controls the DNS, a distributed database with which you can map hostnames to IP addresses. The DNS record types support IPv6 addresses.</p> <p>This release introduces support for RFC 6106, which specifies IPv6 Router Advertisement (RA) options. These options are supported:</p> <ul style="list-style-type: none"> Recursive DNS Server (RDNSS) Option—A resolution service for translating domain names into IP addresses. The option allows IPv6 routers to advertise a list of RDNSS addresses used for DNS name resolution in IPv6 hosts. DNS Search List (DNSSL) Option—A list of DNS suffix domain names used by IPv6 hosts when they perform DNS query searches for short, unqualified domain names. <p>(IP Base and Enterprise Services)</p> |
| CISCO-POWER-ETHERNET-EXT-MIB | This MIB is used to monitor Power-over-Ethernet (PoE). |

Cisco IOS XE to Cisco IOS Version Number Mapping

As [Table 5](#) shows, each version of Cisco IOS XE has an associated Cisco IOS version:

Table 5 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 |

| Cisco IOS XE Version | Cisco IOS Version |
|----------------------|-------------------|
| 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 |
| 03.10.0E | 15.2(6)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

- 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 x 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.

- [Cisco Bug Search Tool](#)
- [Open Caveats for Cisco IOS XE Release 3.10.0E](#)
- [Resolved Caveats in Cisco IOS XE Release 3.10.0E](#)



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

Cisco Bug Search Tool

The [Bug Search Tool](#) (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 BST is designed to improve the effectiveness in network risk management and device troubleshooting. 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, click on the identifier.

Open Caveats for Cisco IOS XE Release 3.10.0E

| Caveat ID Number | Description |
|----------------------------|--|
| CSCvf11880 | OGACLv6:Configuring second ipv6 object-group/acl makes the switch to come out of test-acl mode |
| CSCvc43718 | UCI-4k:Vrf SGT: SGACL for VRF host fails after add/remove ip to sgt binding in global. |
| CSCvf38908 | S9E: Crash seen on a Quad-sup VSS when left idle with 'Port has no RkiosPort Port: 832 Vlan: 4095' |
| CSCvf12919 | CAT4k UCI ph2: Segmentation fault @ K5L3MulticastMan::newRetChain |
| CSCuq78908 | GRE: Sync the internal vlan id of GRE tunnels to standby |
| CSCvf21202 | UCI: layer3 instance id is not getting cleared once L2 overlay configured over same instance id |
| CSCvf34157 | S9E: Netflow: Issues with number of flows greater than monitor cache size |
| CSCvf53559 | UCI : DHCP option 82 not added when "IP device tracking cli" is enabled on the client facing port |
| CSCve85689 | UCI Phase2: Crash seen at GalK5SupervisorVp::systemResetRequest |
| CSCvf51199 | [3.10]: Tracebacks observed during ISSU loadversion |
| CSCve79402 | %COMMON_FIB-4-FIBHWIDBMISMATCH: STANDBY: Mis-match between hwidb AccessTunnel2 |
| CSCvf45410 | DNA Licensing Show CLI are static - Doesn't change on Activation / Deactivation of License |
| CSCvf45419 | Deactivation is not deactivating DNA License |
| CSCvf45426 | There is not way to change EULA status once accepted |
| CSCvf45562 | DNA Advantage License is shown up for IP Base License on Cat4k - Chassis |
| CSCvf07961 | Expected isis routes are not seen after clearing isis authentication |

Resolved Caveats in Cisco IOS XE Release 3.10.0E

| Identifier | Description |
|----------------------------|--|
| CSCvd34819 | Cat4500 SGACL is not applied correctly for SGT-to-subnet map within the same VLAN |
| CSCvd36820 | Smart Install client feature should auto-disable when not in use |
| CSCvd37517 | CDP will keep sending untagged frames after certain switchport interface configuration order |
| CSCvd50307 | H/W learn wrong mac address on C4500 VSS(Sup8E) with Flexlink |
| CSCvd64171 | Inability to configure static MAC address entries above 0007.b4xx.xxxx |
| CSCvd69060 | Packets received from VSS standby are not forwarded(NLB igmp mode) |
| CSCve49487 | 4500 Memory Leak under CMI IOSd Task or Malloclite |

| Identifier | Description |
|----------------------------|--|
| CSCvd68472 | CPU on 2960X pegged at 100% after configuring 'privilege configure level 7 switch' |
| CSCvd23476 | One port on LC WS-X4748-UPOE+E PoE function failure |
| CSCvd19614 | SFP port displaying inactive state after SSO redundancy force-switchover |
| CSCve54486 | Crash when attempting to assign nonexistent/shutdown VLAN to 802.1x port |
| CSCvd88213 | Crash while polling cafSessionEntry |
| CSCva74457 | Sticky Interface template not working per requirement |
| CSCvc65604 | VNET global vrf neighbor is down after an interface flap |
| CSCuz55580 | privilege exec command causes VSS crash |
| CSCvd13306 | "no default-information originate" doesnt work unless "default-information originate" is added first |
| CSCvd21509 | Cat3k: High CPU and Memory utilization seen after deleting eid-table on fabric edge node |
| CSCve03563 | LISP to OSPF redistribution failing |
| CSCvc96456 | LISP: Discovered dynamic-eid is deleted after one missed eid-notify |
| CSCvb64727 | "no ntp allow mode control" does not seem to be working |
| CSCva38391 | CVE-2016-1550: NTP security against buffer comparison timing attacks |
| CSCvd78456 | Span config lost after reboot when using interface ranges |
| CSCve60467 | snmp crash if we remove one of the informs host CLI when traps are pending for that host |
| CSCvc62441 | The VRF specific sysUpTimeInstance (1.3.6.1.2.1.1.3.0) is not available in WS-C4500X-32 |

Related Documentation

Refer to the Cisco Catalyst 4500-X Series Switches Documentation Home for information:

<https://www.cisco.com/c/en/us/support/switches/catalyst-4500-x-series-switches/tsd-products-support-series-home.html>

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
- 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
- Catalyst 4500-X hardware installation information is available at:
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
- Guides—The Catalyst 4500-X Series Switches, and the Catalyst 4500-E Series Switches, leverage the same software configuration guide and command reference guide:
 - Software Configuration Guides:
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

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>

Notices

The following notices pertain to this software license.

OpenSSL/Open SSL Project

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

License Issues

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See below for the actual license texts. Actually both licenses are BSD-style Open Source licenses. In case of any license issues related to OpenSSL please contact openssl-core@openssl.org.

OpenSSL License:

Copyright © 1998-2007 The OpenSSL Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment: “This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>)”.
4. The names “OpenSSL Toolkit” and “OpenSSL Project” must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org.
5. Products derived from this software may not be called “OpenSSL” nor may “OpenSSL” appear in their names without prior written permission of the OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following acknowledgment:
 “This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>)”.

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT “AS IS” AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This product includes cryptographic software written by Eric Young (ey@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

Original SSLeay License:

Copyright © 1995-1998 Eric Young (ey@cryptsoft.com). All rights reserved.

This package is an SSL implementation written by Eric Young (ey@cryptsoft.com).

The implementation was written so as to conform with Netscapes SSL.

This library is free for commercial and non-commercial use as long as the following conditions are adhered to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com).

Copyright remains Eric Young’s, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment:

“This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)”.

The word ‘cryptographic’ can be left out if the routines from the library being used are not cryptography-related.

4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgment: “This product includes software written by Tim Hudson (tjh@cryptsoft.com)”.

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The license and distribution terms for any publicly available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU Public License].

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What’s New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What’s New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com/go/trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1721R)

© 2015-2017 Cisco Systems, Inc. All rights reserved.

