



## **Release Notes for Cisco Catalyst 9500 Series Switches, Cisco IOS XE Dublin 17.12.x**

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# CONTENTS

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**CHAPTER 1**

**Introduction 1**

- Supported Hardware 1
  - Cisco Catalyst 9500 Series Switches—Model Numbers 1
- Network Modules 3
- Optics Modules 4

---

**CHAPTER 2**

**What's New in Cisco IOS XE Dublin 17.12.x 5**

- Hardware Features in Cisco IOS XE Dublin 17.12.4 5
- Software Features in Cisco IOS XE Dublin 17.12.4 5
- Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.4 6
- Hardware Features in Cisco IOS XE Dublin 17.12.3 6
- Software Features in Cisco IOS XE Dublin 17.12.3 6
- Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.3 6
- Hardware Features in Cisco IOS XE Dublin 17.12.2 6
- Software Features in Cisco IOS XE Dublin 17.12.2 6
- Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.2 7
- Hardware Features in Cisco IOS XE Dublin 17.12.1 7
- Software Features in Cisco IOS XE Dublin 17.12.1 7
- Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.1 11

---

**CHAPTER 3**

**Important Notes 13**

- Important Notes 13

---

**CHAPTER 4**

**Compatibility Matrix and Web UI System Requirements 23**

Compatibility Matrix	23
Web UI System Requirements	32

---

<b>CHAPTER 5</b>	<b>Licensing and Scaling Guidelines</b>	<b>33</b>
	Licensing	33
	License Levels	33
	Available Licensing Models and Configuration Information	34
	License Levels - Usage Guidelines	34
	Scaling Guidelines	35

---

<b>CHAPTER 6</b>	<b>Limitations and Restrictions</b>	<b>37</b>
	Limitations and Restrictions	37

---

<b>CHAPTER 7</b>	<b>ROMMON Versions</b>	<b>43</b>
	ROMMON Versions	43

---

<b>CHAPTER 8</b>	<b>Upgrading the Switch Software</b>	<b>47</b>
	Finding the Software Version	47
	Software Images	47
	Upgrading the ROMMON	48
	Software Installation Commands	49
	Upgrading in Install Mode	50
	Downgrading in Install Mode	56
	In Service Software Upgrade (ISSU) with Cisco StackWise Virtual	61
	Field-Programmable Gate Array Version Upgrade	66

---

<b>CHAPTER 9</b>	<b>Caveats</b>	<b>67</b>
	Cisco Bug Search Tool	67
	Open Caveats in Cisco IOS XE Dublin 17.12.x	67
	Resolved Caveats in Cisco IOS XE Dublin 17.12.4	67
	Resolved Caveats in Cisco IOS XE Dublin 17.12.3	68
	Resolved Caveats in Cisco IOS XE Dublin 17.12.2	68
	Resolved Caveats in Cisco IOS XE Dublin 17.12.1	69

---

CHAPTER 10

**Additional Information 71**

Troubleshooting 71

Related Documentation 71

Communications, Services, and Additional Information 71



# CHAPTER 1

## Introduction

Cisco Catalyst 9500 Series Switches and Cisco Catalyst 9500 Series Switches - High Performance are Cisco's lead, fixed core and aggregation enterprise switching platforms. They have been purpose-built to address emerging trends of Security, IoT, Mobility, and Cloud.

They deliver complete convergence in terms of ASIC architecture with Unified Access Data Plane (UADP) 2.0 on Cisco Catalyst 9500 Series Switches and UADP 3.0 on Cisco Catalyst 9500 Series Switches - High Performance. The platform runs an Open Cisco IOS XE that supports model driven programmability. This series forms the foundational building block for SD-Access, which is Cisco's lead enterprise architecture.



**Note** With the introduction of the High Performance models in the series, there may be differences in the supported and unsupported features, limitations, and caveats that apply to the Cisco Catalyst 9500 Series Switches and Cisco Catalyst 9500 Series Switches - High Performance models. Throughout this release note document, any such differences are expressly called out. If they are not, the information applies to all models in the series.

- [Supported Hardware, on page 1](#)

## Supported Hardware

### Cisco Catalyst 9500 Series Switches—Model Numbers

The following table lists the supported hardware models and the default license levels they are delivered with. For more information about the available license levels, see section *License Levels*.

Base PIDs are the model numbers of the switch.

Bundled PIDs indicate the orderable part numbers for base PIDs that are bundled with a particular network module. Entering the **show version**, **show module**, or **show inventory** commands on such a switch (bundled PID), displays its base PID.

*Table 1: Cisco Catalyst 9500 Series Switches*

Switch Model	Default License Level <sup>1</sup>	Description
Base PIDs		

Switch Model	Default License Level <sup>1</sup>	Description
C9500-12Q-E	Network Essentials	12 40-Gigabit Ethernet QSFP+ ports and two power supply slots
C9500-12Q-A	Network Advantage	
C9500-16X-E	Network Essentials	16 1/10-Gigabit Ethernet SFP/SFP+ ports and two power supply slots
C9500-16X-A	Network Advantage	
C9500-24Q-E	Network Essentials	24-Port 40-Gigabit Ethernet QSFP+ ports and two power supply slots
C9500-24Q-A	Network Advantage	
C9500-40X-E	Network Essentials	40 1/10-Gigabit Ethernet SFP/SFP+ ports and two power supply slots
C9500-40X-A	Network Advantage	
<b>Bundled PIDs</b>		
C9500-16X-2Q-E	Network Essentials	16 10-Gigabit Ethernet SFP+ port switch and a 2-Port 40-Gigabit Ethernet (QSFP) network module on uplink ports
C9500-16X-2Q-A	Network Advantage	
C9500-24X-E	Network Essentials	16 10-Gigabit Ethernet SFP+ port switch and an 8-Port 10-Gigabit Ethernet (SFP) network module on uplink ports
C9500-24X-A	Network Advantage	
C9500-40X-2Q-E	Network Essentials	40 10-Gigabit Ethernet SFP+ port switch and a 2-Port 40-Gigabit Ethernet (QSFP) network module on uplink ports
C9500-40X-2Q-A	Network Advantage	
C9500-48X-E	Network Essentials	40 10-Gigabit Ethernet SFP+ port switch and an 8-Port 10-Gigabit Ethernet (SFP) network module on uplink ports
C9500-48X-A	Network Advantage	

<sup>1</sup> See section *Licensing* → *Table: Permitted Combinations*, in this document for information about the add-on licenses that you can order.

**Table 2: Cisco Catalyst 9500 Series Switches-High Performance**

Switch Model	Default License Level <sup>2</sup>	Description
C9500-24Y4C-E	Network Essentials	24 SFP28 ports that support 1/10/25-GigabitEthernet connectivity, four QSFP uplink ports that support 100/40-GigabitEthernet connectivity; two power supply slots.
C9500-24Y4C-A	Network Advantage	
C9500-32C-E	Network Essentials	32 QSFP28 ports that support 40/100 GigabitEthernet connectivity; two power supply slots.
C9500-32C-A	Network Advantage	

Switch Model	Default License Level <sup>2</sup>	Description
C9500-32QC-E	Network Essentials	32 QSFP28 ports, where you can have 24 ports that support 40-GigabitEthernet connectivity and 4 ports that support 100-GigabitEthernet connectivity, OR 32 ports that support 40-GigabitEthernet connectivity, OR 16 ports that support 100-GigabitEthernet connectivity; two power supply slots.
C9500-32QC-A	Network Advantage	
C9500-48Y4C-E	Network Essentials	48 SFP28 ports that support 1/10/25-GigabitEthernet connectivity; four QSFP uplink ports that supports up to 100/40-GigabitEthernet connectivity; two power supply slots.
C9500-48Y4C-A	Network Advantage	

<sup>2</sup> See section *Licensing* → *Table: Permitted Combinations*, in this document for information about the add-on licenses that you can order.

**Table 3: Cisco Catalyst 9500X Series Switches**

Switch Model	Default License Level <sup>3</sup>	Description
C9500X-28C8D-E	Network Essentials	28x100G QSFP28 and 8x400G QSFP-DD ports; two power supply slots
C9500X-28C8D-A	Network Advantage	
C9500X-60L4D-A	Network Advantage	60x50G SFP56 and 4x400G QSFP-DD ports; two power supply slots

<sup>3</sup> See section *Licensing* → *Table: Permitted Combinations*, in this document for information about the add-on licenses that you can order.

## Network Modules

The following table lists optional network modules for uplink ports available with some configurations .

Network Module	Description
C9500-NM-8X	<p>Cisco Catalyst 9500 Series Network Module 8-port 1/10 Gigabit Ethernet with SFP/SFP+</p> <p>Note the supported switch models (Base PIDs):</p> <ul style="list-style-type: none"> <li>• C9500-40X</li> <li>• C9500-16X</li> </ul>
C9500-NM-2Q	<p>Cisco Catalyst 9500 Series Network Module 2-port 40 Gigabit Ethernet with QSFP+</p> <p>Note the supported switch models (Base PIDs):</p> <ul style="list-style-type: none"> <li>• C9500-40X</li> <li>• C9500-16X</li> </ul>

## Optics Modules

Cisco Catalyst Series Switches support a wide range of optics and the list of supported optics is updated on a regular basis. Use the [Transceiver Module Group \(TMG\) Compatibility Matrix](#) tool, or consult the tables at this URL for the latest transceiver module compatibility information: [https://www.cisco.com/en/US/products/hw/modules/ps5455/products\\_device\\_support\\_tables\\_list.html](https://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html)





## CHAPTER 2

# What's New in Cisco IOS XE Dublin 17.12.x

- [Hardware Features in Cisco IOS XE Dublin 17.12.4, on page 5](#)
- [Software Features in Cisco IOS XE Dublin 17.12.4, on page 5](#)
- [Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.4, on page 6](#)
- [Hardware Features in Cisco IOS XE Dublin 17.12.3, on page 6](#)
- [Software Features in Cisco IOS XE Dublin 17.12.3, on page 6](#)
- [Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.3, on page 6](#)
- [Hardware Features in Cisco IOS XE Dublin 17.12.2, on page 6](#)
- [Software Features in Cisco IOS XE Dublin 17.12.2, on page 6](#)
- [Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.2, on page 7](#)
- [Hardware Features in Cisco IOS XE Dublin 17.12.1, on page 7](#)
- [Software Features in Cisco IOS XE Dublin 17.12.1, on page 7](#)
- [Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.1, on page 11](#)

## Hardware Features in Cisco IOS XE Dublin 17.12.4

There are no new hardware features in this release.

## Software Features in Cisco IOS XE Dublin 17.12.4

Feature Name	Description
Link Debounce	<p>The Link Debounce Timer delays notification of a link up or down status change. Delayed notification of a link status change can decrease traffic loss due to network reconfiguration when network ethernet port experiences minor faults in the link. The Link Debounce Up Timer is a new enhancement of the feature which delays notification of a link from down to up status change.</p> <p>The feature was implemented on C9500X-28C8D and C9500X-60L4D models of Cisco Catalyst 9500 Series Switches at the global level only. Per port configuration is not supported.</p>

Feature Name	Description
Third-Party Optics During AutoInstall	<p>During AutoInstall, the system will detect, third-party optics automatically. Unlike the default boot up process, the third-party optics will not move to err-disabled state during AutoInstall. In the default boot up process, you need to configure the <code>service unsupported-transceiver</code> command to detect the third party optics after system boot. When AutoInstall is successful, the third-party optics are enabled. In all other cases, these optics will be in the err-disabled state. The <b>service unsupported transceiver</b> command is not saved into the startup configuration, and when the configuration is saved using the write memory command, and the system is reloaded, the third-party optics will move into the err-disabled state.</p> <p>This feature is enabled by default. You can use the <b>no service unsupported-transceiver</b> command to disable the third-party optics, after the auto install is complete.</p>

## Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.4

There are no behavior changes in this release.

## Hardware Features in Cisco IOS XE Dublin 17.12.3

There are no new hardware features in this release.

## Software Features in Cisco IOS XE Dublin 17.12.3

There are no new software features in this release.

## Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.3

There are no behavior changes in this release.

## Hardware Features in Cisco IOS XE Dublin 17.12.2

There are no new hardware features in this release.

## Software Features in Cisco IOS XE Dublin 17.12.2

There are no new software features in this release.

# Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.2

There are no behavior changes in this release.

## Hardware Features in Cisco IOS XE Dublin 17.12.1

There are no new hardware features in this release.

## Software Features in Cisco IOS XE Dublin 17.12.1

Feature Name	Applicable Models	Description
BGP EVPN VXLAN <ul style="list-style-type: none"> <li>• ARP inspection and DHCP Rogue Server Protection in VXLAN Environment (L2 VNIs)</li> <li>• BGP EVPN VRF Auto RD and Auto RT</li> </ul>	All Models	<p>The following BGP EVPN VXLAN features are introduced in this release:</p> <ul style="list-style-type: none"> <li>• ARP inspection and DHCP Rogue Server Protection in VXLAN Environment (L2 VNIs): BGP EVPN VXLAN fabric now supports ARP inspection and DHCP Rogue Server Protection. To configure these features, enable ARP inspection and DHCP Snooping on the VTEPs of the EVPN VXLAN fabric.</li> <li>• BGP EVPN VRF Auto RD and Auto RT: BGP EVPN Layer 3 overlay VRF configuration is simplified with the introduction of new CLIs to auto generate the route distinguisher (RD) and route target (RT) for a VRF.</li> </ul> <p>You can enable the auto generation of RD either at a global level, using the <b>vrf rd-auto</b> command or specifically for a VRF, using the <b>rd-auto [disable]</b> command in the VRF submenu.</p> <p>To enable auto assignment of RT for a VRF, use the <b>vniid vni-id</b> command in the VRF submenu.</p> <p>You can also choose to disable the auto RD and RT features by using the <b>no</b> form of the command.</p>
DSCP marking for RADIUS packets for administrative sessions	All Models	Allows you to configure DSCP marking for RADIUS packets for administrative sessions such as SSH and Telnet.

Feature Name	Applicable Models	Description
Interface ID Option in DHCPv6 Relay Message	All Models	Introduces support for interface ID option in DHCPv6 Relay message. With this, the physical interface details of the client interface are included along with the VLAN number in the message.
Interface Template Support for IPv6 DHCP Guard	All Models	Enables you to add the <b>ipv6 dhcp guard attach-policy <i>policy_name</i></b> global configuration command to an interface template. IPv6 DHCP Guard is then enabled and the policy is applied, wherever the template is applied.
IP DHCP Server Changes to Limit IP Assignment to Next Hop only	All Models	Allows you to assign DHCP IP address only to the neighbouring device in an interface using the <b>ip dhcp restrict next hop</b> command. When this command is enabled, the DHCP server in the interface uses the MAC addresses in the DHCP packet and compares it with the addresses in the Cisco Discovery Protocol (CDP) or Link Layer Discovery Protocol (LLDP) cache table. If the MAC addresses match, then the DHCP IP address is assigned to that device.

<b>Feature Name</b>	<b>Applicable Models</b>	<b>Description</b>
Modified Trustpoints for Secure Unique Device Identity (SUDI) Certificates	All Models	

Feature Name	Applicable Models	Description
		<p>Starting from Cisco IOS XE Dublin 17.12.1, the following changes have been introduced for trustpoints.</p> <ul style="list-style-type: none"> <li>Trustpoint names for existing SUDI certificates</li> </ul> <p>If your device supports Cisco Manufacturing CA III certificate and is not disabled, the trustpoint names are as follows.</p> <ul style="list-style-type: none"> <li>For <i>Cisco Manufacturing CA III</i> certificate, the trustpoint name has changed from CISCO_IDEVID_SUDI to CISCO_IDEVID_CMCA3_SUDI</li> <li>For <i>Cisco Manufacturing CA SHA2</i> certificate, the trustpoint name has changed from CISCO_IDEVID_SUDI_LEGACY to CISCO_IDEVID_CMCA2_SUDI</li> </ul> <p>If your device does not support Cisco Manufacturing CA III certificate or if the certificate is disabled using <b>no platform sudi cmca3</b> command, the trustpoint names are as follows.</p> <ul style="list-style-type: none"> <li>For <i>Cisco Manufacturing CA SHA2</i> certificate, the trustpoint name has changed from CISCO_IDEVID_SUDI to CISCO_IDEVID_CMCA2_SUDI</li> <li>For <i>Cisco Manufacturing CA</i> certificate, the trustpoint name has changed from CISCO_IDEVID_SUDI_LEGACY to CISCO_IDEVID_CMCA_SUDI</li> </ul> <ul style="list-style-type: none"> <li>Hardware SUDI certificates <ul style="list-style-type: none"> <li>If your device supports <i>High Assurance SUDI CA</i> certificate, this certificate is loaded under CISCO_IDEVID_SUDI trustpoint.</li> <li>If your device does not support <i>High Assurance SUDI CA</i> certificate, <i>ACT2 SUDI CA</i> certificate is loaded under CISCO_IDEVID_SUDI trustpoint.</li> </ul> </li> </ul> <ul style="list-style-type: none"> <li><b>show ip http server status</b> command output</li> </ul> <p>If you configure the trustpoint for the HTTP server as CISCO_IDEVID_SUDI, the output of <b>show ip http server status</b> command displays the operating trustpoint along with the configured trustpoint.</p> <p>The following example shows a sample output of <b>show ip http server status</b> command with both the configured and the operating trustpoint names. Note that if your device does not support Cisco Manufacturing CA III certificate or if the certificate is disabled, the operating trustpoint in the below output displays CISCO_IDEVID_CMCA2_SUDI.</p> <pre>Device# show ip http server status ...</pre>

Feature Name	Applicable Models	Description
		<pre>HTTP secure server trustpoint: CISCO_IDEVID_SUDI HTTP secure server operating trustpoint: CISCO_IDEVID_CMCA3_SUDI</pre>
Optimized Layer 2 Overlay Multicast for IPv4 and IPv6 traffic	9500X	<p>Optimized Layer 2 Overlay Multicast forwards multicast traffic within the Layer 2 Virtual Network Instance (L2VNI).</p> <p>Support for optimized Layer 2 overlay multicast was introduced on the Cisco Catalyst 9500X Series Switches.</p>
Programmability: <ul style="list-style-type: none"> <li>• NETCONF-SSH Algorithms</li> <li>• YANG Data Models</li> </ul>	All Models	<p>The following programmability features are introduced in this release:</p> <ul style="list-style-type: none"> <li>• NETCONF-SSH Algorithms: The NETCONF-SSH server configuration file contains the list of all supported algorithms. From this release onwards, you can enable or disable these algorithms at runtime by using Cisco IOS commands or YANG models.</li> <li>• YANG Data Models: For the list of Cisco IOS XE YANG models available with this release, navigate to: <a href="https://github.com/YangModels/yang/tree/master/vendor/cisco/xe/17121">https://github.com/YangModels/yang/tree/master/vendor/cisco/xe/17121</a>.</li> </ul>
<b>show idprom tan</b> command	All Models	The <b>show idprom tan</b> command was introduced. It displays the top assembly part number and top assembly part revision number for the identification programmable read-only memory.
Support for NetFlow Version 5 and 32-bit Autonomous System Number Field	9500H	Support was introduced for Netflow Version 5 protocol and the 32-bit Autonomous System Number field.

#### New on the WebUI

There are no new WebUI features in this release.

## Hardware and Software Behavior Changes in Cisco IOS XE Dublin 17.12.1

Behavior Change	Description
<b>ip mtu</b> command	On the Catalyst 9500X Series Switches, the <b>ip mtu</b> command has been modified to perform IPv4 and IPv6 fragmentation on the specified IP MTU value.

Behavior Change	Description
BDPU Guard and Root Guard Syslogs	The BDPU guard and root guard syslogs have been modified to include client bridge ID information.
ROMMON and FPGA Auto-upgrade	On the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches, support for auto-upgrade of the ROMMON and field-programmable gate array (FPGA) have been introduced. Auto-upgrade to this release is supported only if the bootloader version is 17.10.1r or a later release.





## CHAPTER 3

# Important Notes

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- [Important Notes](#), on page 13

## Important Notes

- [Unsupported Features: Cisco Catalyst 9500 Series Switches](#)
- [Unsupported Features: Cisco Catalyst 9500 Series Switches - High Performance](#)
- [Unsupported Features: Cisco Catalyst 9500X Series Switches](#)
- [Complete List of Supported Features](#)
- [Accessing Hidden Commands](#)
- [Default Behaviour—All Models](#)
- [Default Interface Behaviour on Cisco Catalyst 9500 Series Switches - High Performance and Cisco Catalyst 9500X Series Switches Only](#)

### Unsupported Features: Cisco Catalyst 9500 Series Switches

- **Cisco TrustSec**
  - Cisco TrustSec Network Device Admission Control (NDAC) on Uplinks
- **Interface and Hardware**
  - Link Debounce Timer
  - M2 SATA Module
  - EnergyWise
- **IP Addressing Services**
  - GRE Redirection
  - VRRPv3: Object Tracking Integration
  - GRE IPv6 Tunnels

- HSRP and Switch Stack
- HSRP Groups and Clustering
- **IP Multicast Routing**
  - Unicast over Point-to-Multipoint (P2MP)
  - Generic Routing Encapsulation (GRE)
  - Multicast over P2MP GRE
- **IP Routing**
  - PIM Bidirectional Forwarding Detection (PIM BFD), PIM Snooping
  - Border Gateway Protocol (BGP) Additional Paths
  - OSPF NSR
  - OSPFv3 NSR
  - OSPFv2 Loop-Free Alternate IP Fast Reroute
- **Layer 2**
  - Audio Engineering Society: AES67 Timing Profile
  - Q-in-Q on a Trunk Port
- **Multiprotocol Label Switching**
  - Hierarchical VPLS with MPLS Access
- **Network Management**
  - Flexible NetFlow
    - NetFlow v5 Export Protocol
    - 4-byte (32-bit) AS Number Support
    - TrustSec NetFlow IPv4 Security Group Access Control List (SGACL) Deny and Drop Export
- **Quality of Service**
  - Classification (Layer 3 Packet Length, Time-to-Live (TTL))
  - Per queue policer support
  - L2 Miss
- **Security**
  - Lawful Intercept
- **VLAN**
  - QinQ VLAN Mapping

**Unsupported Features: Cisco Catalyst 9500 Series Switches - High Performance**

- **High Availability**
  - Switch Stacks
- **Interface and Hardware**
  - EnergyWise
- **IP Multicast Routing**
  - IPv6 Multicast and IPv6 Multicast over Point-to-Point GRE
- **IP Routing**
  - Unicast and Multicast over Point-to-Multipoint GRE
  - BFD Multihop Support for IPv4 Static Routes
- **Layer 2**
  - Flexlink+
  - VLAN Load Balancing for FlexLink+
  - Preemption for VLAN Load Balancing
  - FlexLink+ Dummy Multicast Packets
  - Resilient Ethernet Protocol (REP)
- **Multiprotocol Label Switching**
  - MPLS Label Distribution Protocol (MPLS LDP) VRF-Aware Static Labels
  - VPLS Routed Pseudowire IRB(v4) Unicast
- **Network Management**
  - Cisco Application Visibility and Control (AVC)
- **Security**
  - Wake-on-LAN (WoL)
- **System Management**
  - Network-Based Application Recognition (NBAR) and Next-Generation NBAR (NBAR2)

**Unsupported Features: Cisco Catalyst 9500X Series Switches**

- **BGP EVPN VXLAN**
  - Layer 2 Broadcast, Unknown Unicast, and Multicast (BUM) Traffic Forwarding using Ingress Replication
  - BUM Traffic Rate Limiting

- Dynamic ARP inspection (DAI) and DHCP Rogue Server Protection
  - EVPN VXLAN Centralized Default Gateway
  - VXLAN-Aware Flexible Netflow
  - MPLS Layer 3 VPN Border Leaf Handoff
  - MPLS Layer 3 VPN Border Spine Handoff
  - VPLS over MPLS Border Leaf Handoff
  - VPLS over MPLS Border Spine Handoff
  - Interworking of Layer 3 TRM with MVPN Networks for IPv4 Traffic
  - Private VLANs (PVLANS)
  - BGP EVPN VXLAN with IPv6 in the Underlay (VXLANv6)
  - EVPN Microsegmentation
  - VRF aware NAT64 EVPN Fabric
  - Multihoming Single Active
- **Cisco TrustSec**
    - Cisco TrustSec Manual Configuration
    - Cisco TrustSec Security Association Protocol (SAP)
    - Cisco TrustSec Metadata Header Encapsulation
    - Cisco TrustSec VLAN to SGT Mapping
    - Local Device SGT Mapping
    - Cisco TrustSec SGT Caching
    - TrustSec SGT Handling: L2 SGT Imposition and Forwarding
    - Cisco TrustSec SGT Inline Tagging
- **High Availability**
    - Secure StackWise Virtual
    - Cisco Nonstop Forwarding with Stateful Switchover
    - Graceful Insertion and Removal
    - Switch Stacks
- **Interface and Hardware**
    - Link Debounce Timer
    - EnergyWise
- **IP Addressing Services**

- Next Hop Resolution Protocol (NHRP)
- Network Address Translation (NAT)
- Gateway Load Balancing Protocol (GLBP)
- Web Cache Communication Protocol (WCCP)
- Switchport Block Unknown Unicast and Switchport Block Unknown Multicast
- Message Session Relay Protocol (MSRP)
- TCP MSS Adjustment
- GRE IPv6 Tunnels
- IP Fast Reroute (IP FRR)
  
- **IP Multicast Routing**
  - Multicast Routing over GRE Tunnel
  - Multicast VLAN Registration (MVR) for IGMP Snooping
  - IPv6 Multicast over Point-to-Point GRE
  - IGMP Proxy
  - Bidirectional PIM
  - Multicast VPN
  - MVPNv6
  - mVPN Extranet Support
  - MLDP-Based VPN
  - PIM Snooping
  - PIM Dense Mode
  
- **IP Routing**
  - OSPFv2 Loop-Free Alternate IP Fast Reroute
  - EIGRP Loop-Free Alternate IP Fast Reroute
  - Policy-Based Routing (PBR) for IPv6
  - VRF-Aware PBR
  - PBR for Object-Group Access Control List (OGACL) Based Matching
  - Multipoint GRE
  - Web Cache Communication Protocol (WCCP)
  
- **Layer 2**
  - Multi-VLAN Registration Protocol (MVRP)

- Loop Detection Guard
  - Cross-Stack UplinkFast
  - Optional Spanning Tree Protocol
  - Precision Time Protocol (PTP)
  - Audio Engineering Society: AES67 Timing Profile
  - PTPv2 on Cisco StackWise Virtual
  - Fast UniDirectional Link Detection
  - UniDirectional Link Detection (UDLD)
  - IEEE 802.1Q Tunneling
  - One-to-One VLAN Mapping
  - Selective Q-in-Q
  - Q-in-Q on a Trunk Port
  - Audio Video Bridging (AVB): IEEE 802.1BA
  - Flexlink+
  - VLAN Load Balancing for FlexLink+
  - Preemption for VLAN Load Balancing
  - FlexLink+ Dummy Multicast Packets
  - Resilient Ethernet Protocol
- **Multiprotocol Label Switching**
- LAN MACsec over Multiprotocol Label Switching (MPLS)
  - BGP Multipath Load Sharing for Both eBGP and iBGP in an MPLS VPN
  - MPLS over GRE
  - MPLS Layer 2 VPN over GRE
  - MPLS Layer 3 VPN over GRE
  - Virtual Private LAN Service (VPLS)
  - VPLS Autodiscovery, BGP-based
  - VPLS Layer 2 Snooping: Internet Group Management Protocol or Multicast Listener Discovery
  - Hierarchical VPLS with Multiprotocol Label Switching Access
  - VPLS Routed Pseudowire IRB(v4) Unicast
  - MPLS VPN Inter-AS Options (options B and AB)
  - MPLS VPN Inter-AS IPv4 BGP Label Distribution
  - Seamless Multiprotocol Label Switching

**• Network Management**

- ERSPAN
- Flow-Based Switch Port Analyser
- FRSPAN
- Egress Netflow
- IP Aware MPLS Netflow
- NetFlow Version 5

**• Quality of Service**

- QoS Ingress Shaping
- VPLS QoS
- Microflow Policers
- Per VLAN Policy and Per Port Policer
- Mixed COS/DSCP Threshold in a QoS LAN-queueing Policy
- Easy QoS: match-all Attributes
- Classify: Packet Length
- Class-Based Shaping for DSCP/Prec/COS/MPLS Labels
- CoPP Microflow Policing
- Egress Policing
- Egress Microflow Destination-Only Policing
- Ethertype Classification
- Packet Classification Based on Layer3 Packet-Length
- PACLs
- Per IP Session QoS
- Per Queue Policer
- QoS Data Export
- QoS L2 Missed Packets Policing

**• Security**

- Lawful Intercept
- MACsec:
  - Switch-to-host MACsec
  - Cisco TrustSec Security Association Protocol

- Fallback Key
- MACsec EAP-TLS
  
- MAC ACLs
- Port ACLs
- VLAN ACLs
- IP Source Guard
- IPv6 Source Guard
- Web-based Authentication
- Port Security
- Weighted Random Early Detection mechanism (WRED) Based on DSCP, PREC, or COS
- IEEE 802.1x Port-Based Authentication
- Dynamic ARP Inspection
- Dynamic ARP Inspection Snooping
  
- **System Management**
  - Unicast MAC Address Filtering
  
- **VLAN**
  - Wired Dynamic PVLAN
  - Private VLANs

### Complete List of Supported Features

For the complete list of features supported on a platform, see [Cisco Feature Navigator](#).

Choose the following in the context of the Cisco Catalyst 9500 Series Switches:

- CAT9500: to see all the features supported on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models
- CAT9500 High Performance: to see all the features supported on the C9500-24Y4C, C9500-32C, C9500-32QC, and C9500-48Y4C models
- CAT9500X: to see all the features supported on the C9500X-28C8D and C9500X-60L4D models

### Accessing Hidden Commands

From Cisco IOS XE Fuji 16.8.1a, as an improved security measure, the way in which hidden commands can be accessed has changed.

Hidden commands have always been present in Cisco IOS XE, but were not equipped with CLI help. That is, entering a question mark (?) at the system prompt did not display the list of available commands. Hidden commands are only meant to assist Cisco TAC in advanced troubleshooting, and are not documented either.



From Cisco IOS XE Fuji 16.8.1a, hidden commands are available under:

- Category 1: Hidden commands in Privileged or User EXEC mode. Enter the **service internal** command to access these commands.
- Category 2: Hidden commands in one of the configuration modes (global, interface, and so on).

Further, the following points apply to hidden commands under Category 1 and 2:

- The commands have CLI help. Enter a question mark (?) at the system prompt to display the list of available commands.

Note: For Category 1, enter the **service internal** command before you enter the question mark; you do not have to do this for Category 2.

- The system generates a %PARSER-5-HIDDEN syslog message when a hidden command is used. The following is an example:

```
*Feb 14 10:44:37.917: %PARSER-5-HIDDEN: Warning!!! 'show processes memory old-header '
is a hidden command.
Use of this command is not recommended/supported and will be removed in future.
```

Apart from categories 1 and 2, there are other internal commands displayed on the CLI, for which the system does *not* generate the %PARSER-5-HIDDEN syslog message.



---

**Note** We recommend that you use any hidden command only under TAC supervision.

If you find that you need to use a hidden command, open a TAC case for help with finding another way of collecting the same information as the hidden command (for a hidden EXEC mode command), or to configure the same functionality (for a hidden configuration mode command) using nonhidden commands.

---

### Default Behaviour—All Models

Beginning from Cisco IOS XE Gibraltar 16.12.5 and later, do not fragment bit (DF bit) in the IP packet is always set to 0 for all outgoing RADIUS packets (packets that originate from the device towards the RADIUS server).

### Default Interface Behaviour on Cisco Catalyst 9500 Series Switches - High Performance and Cisco Catalyst 9500X Series Switches Only

From Cisco IOS XE Gibraltar 16.11.1, the default interface for all High Performance and 9500X models in the series changes from Layer 3 to Layer 2. Use the **no switchport** command to change the Layer 2 interface into Layer 3 mode.

The startup configuration has explicit configuration of the **switchport** command for Layer 2 interfaces and the **no switchport** command for Layer 3 interfaces to address this change in behaviour and to support seamless migration.





## CHAPTER 4

# Compatibility Matrix and Web UI System Requirements

- [Compatibility Matrix](#), on page 23
- [Web UI System Requirements](#), on page 32

## Compatibility Matrix

The following table provides software compatibility information between Cisco Catalyst 9500 Series Switches, Cisco Identity Services Engine, Cisco Access Control Server, and Cisco Prime Infrastructure.

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
Dublin 17.12.4	3.2 3.1 + Patch 3 3.0 + Patch 6 2.7 + Patch 7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads</b> .
Dublin 17.12.3	3.2 3.1 + Patch 3 3.0 + Patch 6 2.7 + Patch 7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads</b> .
Dublin 17.12.2	3.2 3.1 + Patch 3 3.0 + Patch 6 2.7 + Patch 7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads</b> .

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Dublin 17.12.1	3.2 3.1 + Patch 3 3.0 + Patch 6 2.7 + Patch 7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Dublin 17.11.1	3.2 3.1 + Patch 3 3.0 + Patch 6 2.7 + Patch 7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Dublin 17.10.1	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.9.5	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.9.4	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Cupertino 17.9.3	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.9.2	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.9.1	3.2 3.1 + Patch 1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.8.1	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Cupertino 17.7.1	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Bengaluru 17.6.7	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.6a	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.6	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.5	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.4	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.3	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Bengaluru 17.6.2	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Bengaluru 17.6.1	3.1 3.0 latest patch 2.7 latest patch 2.6 latest patch 2.4 latest patch	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Bengaluru 17.5.1	3.0 Patch 1 2.7 Patch 2 2.6 Patch 7 2.4 Patch 13	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Bengaluru 17.4.1	3.0 2.7 Patch 2	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Amsterdam 17.3.8a	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Amsterdam 17.3.8	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Amsterdam 17.3.7	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Amsterdam 17.3.6	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack See <a href="#">Cisco Prime Infrastructure 3.10</a> → <b>Downloads.</b>
Amsterdam 17.3.5	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Amsterdam 17.3.4	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Amsterdam 17.3.3	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Amsterdam 17.3.2a	2.7	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See <a href="#">Cisco Prime Infrastructure 3.8</a> → <b>Downloads.</b>
Amsterdam 17.3.1	2.7	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See <a href="#">Cisco Prime Infrastructure 3.8</a> → <b>Downloads.</b>
Amsterdam 17.2.1	2.7	-	PI 3.7 + PI 3.7 latest maintenance release + PI 3.7 latest device pack See <a href="#">Cisco Prime Infrastructure 3.7</a> → <b>Downloads.</b>
Amsterdam 17.1.1	2.7	-	PI 3.6 + PI 3.6 latest maintenance release + PI 3.6 latest device pack See <a href="#">Cisco Prime Infrastructure 3.6</a> → <b>Downloads.</b>



Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
Gibraltar 16.12.8	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → Downloads.
Gibraltar 16.12.7	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → Downloads.
Gibraltar 16.12.6	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → Downloads.
Gibraltar 16.12.5b	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → Downloads.
Gibraltar 16.12.5	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See <a href="#">Cisco Prime Infrastructure 3.9</a> → Downloads.
Gibraltar 16.12.4	2.6	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See <a href="#">Cisco Prime Infrastructure 3.8</a> → Downloads.
Gibraltar 16.12.3a	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See <a href="#">Cisco Prime Infrastructure 3.5</a> → Downloads.
Gibraltar 16.12.3	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See <a href="#">Cisco Prime Infrastructure 3.5</a> → Downloads.

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Gibraltar 16.12.2	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.5</a> → <b>Downloads.</b>
Gibraltar 16.12.1	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.5</a> → <b>Downloads.</b>
Gibraltar 16.11.1	2.6 2.4 Patch 5	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Gibraltar 16.10.1	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.9.8	2.5 2.1	5.4 5.5	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Fuji 16.9.7	2.5 2.1	5.4 5.5	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.9</a> → <b>Downloads.</b>
Fuji 16.9.6	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.9.5	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>

<b>Catalyst 9500, 9500-High Performance and 9500X</b>	<b>Cisco Identity Services Engine</b>	<b>Cisco Access Control Server</b>	<b>Cisco Prime Infrastructure</b>
Fuji 16.9.4	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.9.3	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.9.2	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest maintenance release + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.9.1	2.3 Patch 1 2.4 Patch 1	5.4 5.5	PI 3.4 + PI 3.4 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.4</a> → <b>Downloads.</b>
Fuji 16.8.1a	2.3 Patch 1 2.4	5.4 5.5	PI 3.3 + PI 3.3 latest maintenance release + PI 3.3 latest device pack  See <a href="#">Cisco Prime Infrastructure 3.3</a> → <b>Downloads.</b>
Everest 16.6.4a	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13  See <a href="#">Cisco Prime Infrastructure 3.1</a> → <b>Downloads.</b>
Everest 16.6.4	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13  See <a href="#">Cisco Prime Infrastructure 3.1</a> → <b>Downloads.</b>
Everest 16.6.3	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13  See <a href="#">Cisco Prime Infrastructure 3.1</a> → <b>Downloads</b>
Everest 16.6.2	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13  See <a href="#">Cisco Prime Infrastructure 3.1</a> → <b>Downloads</b>

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
Everest 16.6.1	2.2	5.4 5.5	PI 3.1.6 + Device Pack 13 See <a href="#">Cisco Prime Infrastructure 3.1</a> → <b>Downloads</b>
Everest 16.5.1a	2.1 Patch 3	5.4 5.5	-

## Web UI System Requirements

The following subsections list the hardware and software required to access the Web UI:

### Minimum Hardware Requirements

Processor Speed	DRAM	Number of Colors	Resolution	Font Size
233 MHz minimum <sup>4</sup>	512 MB <sup>5</sup>	256	1280 x 800 or higher	Small

<sup>4</sup> We recommend 1 GHz

<sup>5</sup> We recommend 1 GB DRAM

### Software Requirements

#### Operating Systems

- Windows 10 or later
- Mac OS X 10.9.5 or later

#### Browsers

- Google Chrome—Version 59 or later (On Windows and Mac)
- Microsoft Edge
- Mozilla Firefox—Version 54 or later (On Windows and Mac)
- Safari—Version 10 or later (On Mac)



## CHAPTER 5

# Licensing and Scaling Guidelines

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- [Licensing, on page 33](#)
- [Scaling Guidelines, on page 35](#)

## Licensing

This section provides information about the licensing packages for features available on Cisco Catalyst 9000 Series Switches.

## License Levels

The software features available on Cisco Catalyst 9500 Series Switches and Cisco Catalyst 9500 Series Switches - High Performance fall under these base or add-on license levels.

### Base Licenses

- Network Essentials
- Network Advantage—Includes features available with the Network Essentials license and more.

### Add-On Licenses

Add-On Licenses require a Network Essentials or Network Advantage as a pre-requisite. The features 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).

- DNA Essentials
- DNA Advantage— Includes features available with the DNA Essentials license and more.

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 <https://cfng.cisco.com>. An account on cisco.com is not required.

## Available Licensing Models and Configuration Information

- Cisco IOS XE Fuji 16.8.x and earlier: RTU Licensing is the default and the only supported method to manage licenses.
- Cisco IOS XE Fuji 16.9.1 to Cisco IOS XE Amsterdam 17.3.1: Smart Licensing is the default and the only supported method to manage licenses.



**Note** On the Cisco Catalyst 9500 Series Switches-High Performance, it is from Cisco IOS XE Fuji 16.8.1a to Cisco IOS XE Amsterdam 17.3.1.

In the [software configuration guide](#) of the required release, see **System Management** → **Configuring Smart Licensing**.

- Cisco IOS XE Amsterdam 17.3.2a and later: Smart Licensing Using Policy, which is an enhanced version of Smart Licensing, is the default and the only supported method to manage licenses.

In the [software configuration guide](#) of the required release (17.3.x onwards), see **System Management** → **Smart Licensing Using Policy**.

For a more detailed overview on Cisco Licensing, go to [cisco.com/go/licensingguide](https://cisco.com/go/licensingguide).

## License Levels - Usage Guidelines

- The duration or term for which a purchased license is valid:

Smart Licensing Using Policy	Smart Licensing
<ul style="list-style-type: none"> <li>• Perpetual: There is no expiration date for such a license.</li> <li>• Subscription: The license is valid only until a certain date (for a three, five, or seven year period).</li> </ul>	<ul style="list-style-type: none"> <li>• Permanent: for a license level, and without an expiration date.</li> <li>• Term: for a license level, and for a three, five, or seven year period.</li> <li>• Evaluation: a license that is not registered.</li> </ul>

- Base licenses (Network Essentials and Network-Advantage) are ordered and fulfilled only with a perpetual or permanent license type.
- Add-on licenses (DNA Essentials and DNA Advantage) are ordered and fulfilled only with a subscription or term license type.
- An add-on license level is included when you choose a network license level. If you use DNA features, renew the license before term expiry, to continue using it, or deactivate the add-on license and then reload the switch to continue operating with the base license capabilities.
- When ordering an add-on license with a base license, note the combinations that are permitted and those that are not permitted:

**Table 4: Permitted Combinations**

	DNA Essentials	DNA Advantage
Network Essentials	Yes	No
Network Advantage	Yes <sup>6</sup>	Yes

<sup>6</sup> You will be able to purchase this combination only at the time of the DNA license renewal and not when you purchase DNA-Essentials the first time.

- Evaluation licenses cannot be ordered. They are not tracked via Cisco Smart Software Manager and expire after a 90-day period. Evaluation licenses can be used only once on the switch and cannot be regenerated. Warning system messages about an evaluation license expiry are generated only 275 days after expiration and every week thereafter. An expired evaluation license cannot be reactivated after reload. This applies only to *Smart Licensing*. The notion of evaluation licenses does not apply to *Smart Licensing Using Policy*.

## Scaling Guidelines

For information about feature scaling guidelines, see the Cisco Catalyst 9500 Series Switches datasheet at:

<https://www.cisco.com/c/en/us/products/collateral/switches/catalyst-9500-series-switches/datasheet-c78-738978.html>







## CHAPTER 6

# Limitations and Restrictions

- [Limitations and Restrictions, on page 37](#)

## Limitations and Restrictions

With Cisco Catalyst 9500 Series Switches and Cisco Catalyst 9500 Series Switches - High Performance—If a feature is not supported on a switch model, you do not have to factor in any limitations or restrictions that may be listed here. If limitations or restrictions are listed for a feature that is supported, check if model numbers are specified, to know if they apply. If model numbers are not specified, the limitations or restrictions apply to all models in the series.

- Auto negotiation

Auto negotiation (the **speed auto** command) and half duplex (the **duplex half** command) are not supported on GLC-T or GLC-TE transceivers for 10 Mbps and 100 Mbps speeds. This applies only to the C9500-48Y4C and C9500-24Y4C models of the series.

We recommend not changing Forward Error Correction (FEC) when auto negotiation is ON. This is applicable to 100G/40G/25G CU cables on the C9500-32C, C9500-32QC, C9500-24Y4C and C9500-48Y4C models of the series.

- Control Plane Policing (CoPP)—The **show run** command does not display information about classes configured under `system-cpp policy`, when they are left at default values. Use the **show policy-map system-cpp-policy** or the **show policy-map control-plane** commands in privileged EXEC mode instead.
- Cisco StackWise Virtual
  - On Cisco Catalyst 9500 Series Switches, when Cisco StackWise Virtual is configured, breakout ports using 4X10G breakout cables, or the Cisco QSFP to SFP or SFP+ Adapter (QSA) module can only be used as data ports; they cannot be used to configure StackWise Virtual links (SVLs) or dual-active detective (DAD) links.
  - On Cisco Catalyst 9500 Series Switches - High Performance,
    - When Cisco StackWise Virtual is configured, breakout ports using 4X25G or 4X10G breakout cables can only be used as data ports; they cannot be used to configure SVLs or DAD links.
    - When Cisco StackWise Virtual is configured, Cisco QSA module with 10G SFP modules can be used as data ports and to configure SVLs or DAD links.

- When Cisco StackWise Virtual is configured, Cisco QSA module with 1G SFP modules can be used as data ports and to configure DAD links; they cannot be used to configure SVLs since SVLs are not supported on 1G interfaces.
- Cisco TrustSec restrictions—Cisco TrustSec can be configured only on physical interfaces, not on logical interfaces.
- Flexible NetFlow limitations
  - You cannot configure NetFlow export using the Ethernet Management port (GigabitEthernet0/0).
  - You can not configure a flow monitor on logical interfaces, such as layer 2 port-channels, loopback, tunnels.
  - You can not configure multiple flow monitors of same type (ipv4, ipv6 or datalink) on the same interface for same direction.
- Hardware Limitations—Optics:
  - 1G with Cisco QSA Module (CVR-QSFP-SFP10G) is not supported on the uplink ports of the C9500-24Y4C and C9500-48Y4C models.
  - Installation restriction for SFP-10G-T-X module on C9500-24Y4C and C9500-48Y4C— Only eight SFP-10G-T-X modules are supported at a time. If you insert a ninth SFP-10G-T-X module in a lower numbered port than the existing active eight SFP-10G-T-X module, a reload will bring up the ninth transceiver and moves the last existing port with SFP-10G-T-X module to error disabled state. This happens due to the order of sequence ports link bring up where the lower numbered port brings up the link first. This limitation applies in standalone and in Cisco StackWise Virtual setup with two C9500-24Y4C or C9500-48Y4C switches. Each switch can have eight SFP-10G-T-X modules.  
  
The following error displays on the console if you insert a ninth module with eight active modules:  

```

"%IOMD_ETHER_GEIM-4-MAX_LIMIT_XCVR: R0/0: iomd: Number of
SFP-10G-T-X that can be supported has reached the max limit of 8,
transceiver is err-disabled. Unplug the transceiver in interface
TwentyFiveGigE1/0/29
```
  - SFP-10G-T-X supports 100Mbps/1G/10G speeds based on auto negotiation with the peer device. You cannot force speed settings from the transceiver.
- Hardware Limitations:
  - Use the MODE button to switch-off the beacon LED.
  - All port LED behavior is undefined until interfaces are fully initialized.
  - The following limitations apply to Cisco QSA Module (CVR-QSFP-SFP10G) when Cisco 1000Base-T Copper SFP (GLC-T) or Cisco 1G Fiber SFP Module for Multimode Fiber are plugged into the QSA module:
    - 1G Fiber modules over QSA do not support autonegotiation. Auto-negotiation should be disabled on the far-end devices.
    - Although visible in the CLI, the command **[no] speed nonegotiate** is not supported with 1G Fiber modules over QSA.

- Only GLC-T over QSA supports auto-negotiation.
- GLC-T supports only port speed of 1000 Mb/s over QSA. Port speeds of 10/100-Mb/s are not supported due to hardware limitation.
- When you use Cisco QSFP-4SFP10G-CUxM Direct-Attach Copper Cables, autonegotiation is enabled by default. If the other end of the line does not support autonegotiation, the link does not come up.
- Autonegotiation is not supported on HundredGigabitEthernet1/0/49 to HundredGigabitEthernet1/0/52 uplink ports of the C9500-48Y4C models, and HundredGigabitEthernet1/0/25 to HundredGigabitEthernet1/0/28 uplink ports of the C9500-24Y4C models. Disable autonegotiation on the peer device if you are using QSFP-H40G-CUxx and QSFP-H40G-ACUxx cables.
- For QSFP-H100G-CUxx cables, the C9500-48Y4C and C9500-24Y4C models support the cables only if both sides of the connection are either C9500-48Y4C or C9500-24Y4C.
- For C9500-32C model, the power supply with serial number starting with POG has two fans and the power supply with serial number starting with QCS has a single fan. When you use **show environment status** command, the fan status of one fan is always displayed as N/A when the power supply with single fan is installed into the power supply slot. See [Configuring Internal Power Supplies](#).
- Interoperability limitations—When you use Cisco QSFP-4SFP10G-CUxM Direct-Attach Copper Cables, if one end of the 40G link is a Catalyst 9400 Series Switch and the other end is a Catalyst 9500 Series Switch, the link does not come up, or comes up on one side and stays down on the other. To avoid this interoperability issue between devices, apply the **speed nonegotiate** command on the Catalyst 9500 Series Switch interface. This command disables autonegotiation and brings the link up. To restore autonegotiation, use the **no speed nonegotiation** command.
- In-Service Software Upgrade (ISSU)
  - Within a major release train (16.x or 17.x or 18.x ), ISSU is supported between any two EMs that are released not more than 3 years apart.
  - Within a major release train, ISSU is supported from:
    - Any EM (EM1, EM2, EM3) to another EM (EM1, EM2, EM3)  
Example: 16.9.x to 16.12.x, 17.3.x to 17.6.x, 17.6.x to 17.9.x
    - Any release within the same EM  
Example: 16.9.2 to 16.9.3 or 16.9.4 or 16.9.x, 16.12.1 to 16.12.2 or 16.12.3 or 16.12.x, 17.3.1 to 17.3.2 or 17.3.3 or 17.3.x
  - Between major release trains, ISSU is not supported from:
    - An EM of a major release train to an EM of another major release train  
Example: 16.x.x to 17.x.x or 17.x.x to 18.x.x is not supported
    - An SM to EM or EM to SM  
Example: 16.10.x or 16.11.x to 16.12.x is not supported
- ISSU is not supported on engineering special releases and .s (or similar) images.

- ISSU is not supported between Licensed Data Payload Encryption (LDPE) and No Payload Encryption (NPE) Cisco IOS XE software images.
- ISSU downgrades are not supported.
- On Cisco Catalyst 9500 Series Switches - High Performance (C9500-24Y4C, C9500-32C, C9500-32QC, and C9500-48Y4C), ISSU with Cisco StackWise Virtual is supported only starting from Cisco IOS XE Gibraltar 16.12.1. Therefore, ISSU upgrades can be performed only starting from this release to a later release.
- While ISSU allows you to perform upgrades with zero downtime, we recommend you to do so during a maintenance window only.
- If a new feature introduced in a software release requires a change in configuration, the feature should not be enabled during ISSU.
- If a feature is not available in the downgraded version of a software image, the feature should be disabled before initiating ISSU.

- QoS restrictions

The following restrictions apply to UADP-powered Catalyst 9500 and Catalyst 9500 High Performance models only.

- When configuring QoS queuing policy, the sum of the queuing buffer should not exceed 100%.
- Policing and marking policy on sub interfaces is supported.
- Marking policy on switched virtual interfaces (SVI) is supported.
- QoS policies are not supported for port-channel interfaces, tunnel interfaces, and other logical interfaces.

- Secure Shell (SSH)

- Use SSH Version 2. SSH Version 1 is not supported.
- When the device is running SCP and SSH cryptographic operations, expect high CPU until the SCP read process is completed. SCP supports file transfers between hosts on a network and uses SSH for the transfer.

Since SCP and SSH operations are currently not supported on the hardware crypto engine, running encryption and decryption process in software causes high CPU. The SCP and SSH processes can show as much as 40 or 50 percent CPU usage, but they do not cause the device to shutdown.

- Smart Licensing Using Policy: Starting with Cisco IOS XE Amsterdam 17.3.2a, with the introduction of Smart Licensing Using Policy, even if you configure a hostname for a product instance or device, only the Unique Device Identifier (UDI) is displayed. This change in the display can be observed in all licensing utilities and user interfaces where the hostname was displayed in earlier releases. It does not affect any licensing functionality. There is no workaround for this limitation.

The licensing utilities and user interfaces that are affected by this limitation include only the following: Cisco Smart Software Manager (CSSM), Cisco Smart License Utility (CSLU), and Smart Software Manager On-Prem (SSM On-Prem).

This limitation is removed from Cisco IOS XE Cupertino 17.9.1. If you configure a hostname and disable hostname privacy (**no license smart privacy hostname** global configuration command), hostname

information is sent from the product instance and displayed on the applicable user interfaces (CSSM, CSLU, SSM On-Prem). For more information, see the command reference for this release.

- TACACS legacy command: Do not configure the legacy **tacacs-server host** command; this command is deprecated. If the software version running on your device is Cisco IOS XE Gibraltar 16.12.2 or a later release, using the legacy command can cause authentication failures. Use the **tacacs server** command in global configuration mode.
- USB Authentication—When you connect a Cisco USB drive to the switch, the switch tries to authenticate the drive against an existing encrypted preshared key. Since the USB drive does not send a key for authentication, the following message is displayed on the console when you enter **password encryption aes** command:

```
Device(config)# password encryption aes  
Master key change notification called without new or old key
```

- Catalyst 9000 Series Switches support MACsec switch-to-switch connections. We do not recommend configuring MACsec switch-to-host connections in an overlay network. For assistance with an existing switch-to-host MACsec implementation or a design review, contact your Cisco Sales Representative or Channel Partner.
- VLAN Restriction—It is advisable to have well-defined segregation while defining data and voice domain during switch configuration and to maintain a data VLAN different from voice VLAN across the switch stack. If the same VLAN is configured for data and voice domains on an interface, the resulting high CPU utilization might affect the device.
- Wired Application Visibility and Control limitations:
  - NBAR2 (QoS and Protocol-discovery) configuration is allowed only on wired physical ports. It is not supported on virtual interfaces, for example, VLAN, port channel nor other logical interfaces.
  - NBAR2 based match criteria ‘match protocol’ is allowed only with marking or policing actions. NBAR2 match criteria will not be allowed in a policy that has queuing features configured.
  - ‘Match Protocol’: up to 256 concurrent different protocols in all policies.
  - NBAR2 and Legacy NetFlow cannot be configured together at the same time on the same interface. However, NBAR2 and wired AVC Flexible NetFlow can be configured together on the same interface.
  - Only IPv4 unicast (TCP/UDP) is supported.
  - AVC is not supported on management port (Gig 0/0)
  - NBAR2 attachment should be done only on physical access ports. Uplink can be attached as long as it is a single uplink and is not part of a port channel.
  - Performance—Each switch member is able to handle 500 connections per second (CPS) at less than 50% CPU utilization. Above this rate, AVC service is not guaranteed.
  - Scale—Able to handle up to 5000 bi-directional flows per 24 access ports and 10000 bi-directional flows per 48 access ports.
- YANG data modeling limitation—A maximum of 20 simultaneous NETCONF sessions are supported.
- Embedded Event Manager—Identity event detector is not supported on Embedded Event Manager.

- On the C9500X-28C8D model of the Cisco Catalyst 9500 Series Switches, TCAM space will not be reserved for different features. The available TCAM space will be shared across the features.
- The File System Check (fsck) utility is not supported in install mode.



# CHAPTER 7

## ROMMON Versions

- [ROMMON Versions](#), on page 43

### ROMMON Versions

ROMMON, also known as the boot loader, is firmware that runs when the device is powered up or reset. It initializes the processor hardware and boots the operating system software (Cisco IOS XE software image). The ROMMON is stored on the following Serial Peripheral Interface (SPI) flash devices on your switch:

- **Primary:** The ROMMON stored here is the one the system boots every time the device is powered-on or reset.
- **Golden:** The ROMMON stored here is a backup copy. If the one in the primary is corrupted, the system automatically boots the ROMMON in the golden SPI flash device.

ROMMON upgrades may be required to resolve firmware defects, or to support new features, but there may not be new versions with every release.

The following table provides ROMMON version information for the Cisco Catalyst 9500 Series Switches. For ROMMON version information of Cisco IOS XE 16.x.x releases, refer to the corresponding Cisco IOS XE 16.x.x release notes of the respective platform.

Release	ROMMON Version (C9500-12Q, C9500-24Q, C9500-16X, C9500-40X)	ROMMON Version (C9500-32C, C9500-32QC, C9500-24Y4C, C9500-48Y4C)	ROMMON Version (C9500X)
Dublin 17.12.4	17.12.1r	17.8.1r[FC1]	17.11.1r
Dublin 17.12.3	17.12.1r	17.8.1r[FC1]	17.11.1r
Dublin 17.12.2	17.12.1r	17.8.1r[FC1]	17.11.1r
Dublin 17.12.1	17.12.1r	17.8.1r[FC1]	17.11.1r
Dublin 17.11.1	17.11.1r[FC1]	17.8.1r[FC1]	17.11.1r
Dublin 17.10.1	17.10.1r	17.8.1r[FC1]	17.8.1r
Cupertino 17.9.5	17.9.2r	17.8.1r[FC1]	17.8.1r

Release	ROMMON Version (C9500-12Q, C9500-24Q, C9500-16X, C9500-40X)	ROMMON Version (C9500-32C, C9500-32QC, C9500-24Y4C, C9500-48Y4C)	ROMMON Version (C9500X)
Cupertino 17.9.4	17.9.2r	17.8.1r[FC1]	17.8.1r
Cupertino 17.9.3	17.9.2r	17.8.1r[FC1]	17.8.1r
Cupertino 17.9.2	17.9.1r	17.8.1r[FC1]	17.8.1r
Cupertino 17.9.1	17.9.1r	17.8.1r[FC1]	17.8.1r
Cupertino 17.8.1	17.8.1r	17.7.1r[FC3]	17.8.1r
Cupertino 17.7.1	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.7	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.6a	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.6	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.5	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.4	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.3	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.2	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.6.1	17.6.1r[FC1]	17.6.1r	-
Bengaluru 17.5.1	17.5.1r	17.3.1r[FC2]	-
Bengaluru 17.4.1	17.4.1r	17.3.1r[FC2]	-
Amsterdam 17.3.8a	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.8	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.7	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.6	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.5	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.4	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.3	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.2a	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.3.1	17.3.1r[FC2]	17.3.1r[FC2]	-
Amsterdam 17.2.1	17.2.1r[FC1]	17.1.1[FC2]	-



<b>Release</b>	<b>ROMMON Version (C9500-12Q, C9500-24Q, C9500-16X, C9500-40X)</b>	<b>ROMMON Version (C9500-32C, C9500-32QC, C9500-24Y4C, C9500-48Y4C)</b>	<b>ROMMON Version (C9500X)</b>
Amsterdam 17.1.1	17.1.1r [FC1]	17.1.1[FC1]	-





## CHAPTER 8

# Upgrading the Switch Software

- [Finding the Software Version, on page 47](#)
- [Software Images, on page 47](#)
- [Upgrading the ROMMON, on page 48](#)
- [Software Installation Commands, on page 49](#)
- [Upgrading in Install Mode, on page 50](#)
- [Downgrading in Install Mode, on page 56](#)
- [In Service Software Upgrade \(ISSU\) with Cisco StackWise Virtual, on page 61](#)
- [Field-Programmable Gate Array Version Upgrade, on page 66](#)

## Finding the Software Version

The package files for the Cisco IOS XE software are stored on the system board flash device (flash:).

You can use the **show version** privileged EXEC command to see the software version that is running on your switch.



**Note** Although the **show version** output always shows the software image running on the switch, the model name shown at the end of this display is the factory configuration and does not change if you upgrade the software license.

You can also use the **dir filesystem:** privileged EXEC command to see the directory names of other software images that you might have stored in flash memory.

## Software Images

Release	Image Type	File Name
Cisco IOS XE Dublin 17.12.4	CAT9K_IOSXE	cat9k_iosxe.17.12.04.SPA.bin
	No Payload Encryption (NPE)	cat9k_iosxe_npe.17.12.04.SPA.bin

Release	Image Type	File Name
Cisco IOS XE Dublin 17.12.3	CAT9K_IOSXE	cat9k_iosxe.17.12.03.SPA.bin
	No Payload Encryption (NPE)	cat9k_iosxe_npe.17.12.03.SPA.bin
Cisco IOS XE Dublin 17.12.2	CAT9K_IOSXE	cat9k_iosxe.17.12.02.SPA.bin
	No Payload Encryption (NPE)	cat9k_iosxe_npe.17.12.02.SPA.bin
Cisco IOS XE Dublin 17.12.1	CAT9K_IOSXE	cat9k_iosxe.17.12.01.SPA.bin
	No Payload Encryption (NPE)	cat9k_iosxe_npe.17.12.01.SPA.bin

## Upgrading the ROMMON

To know the ROMMON or bootloader version that applies to every major and maintenance release, see [ROMMON Versions, on page 43](#).

You can upgrade the ROMMON before, or, after upgrading the software version. If a new ROMMON version is available for the software version you are upgrading to, proceed as follows:

- Upgrading the ROMMON in the primary SPI flash device

This ROMMON is upgraded automatically. When you upgrade from an existing release on your switch to a later or newer release for the first time, and there is a new ROMMON version in the new release, the system automatically upgrades the ROMMON in the primary SPI flash device, based on the hardware version of the switch.

- Upgrading the ROMMON in the golden SPI flash device

You must manually upgrade this ROMMON. The manual upgrade applies to all models in the series. Enter the **upgrade rom-monitor capsule golden switch** command in privileged EXEC mode.



### Note

- In case of a Cisco StackWise Virtual setup, upgrade the active and standby switch.

After the ROMMON is upgraded, it will take effect on the next reload. If you go back to an older release after this, the ROMMON is not downgraded. The updated ROMMON supports all previous releases.

# Software Installation Commands

Summary of Software Installation Commands	
<b>Supported starting from Cisco IOS XE Everest 16.6.2 and later releases</b>	
To install and activate the specified file, and to commit changes to be persistent across reloads: <b>install add file</b> <i>filename</i> [ <b>activate commit</b> ]	
To separately install, activate, commit, cancel, or remove the installation file: <b>install ?</b>	
<b>add file tftp:</b> <i>filename</i>	Copies the install file package from a remote location to the device and performs a compatibility check for the platform and image versions.
<b>activate</b> [ <b>auto-abort-timer</b> ]	Activates the file, and reloads the device. The <b>auto-abort-timer</b> keyword automatically rolls back image activation.
<b>commit</b>	Makes changes persistent over reloads.
<b>rollback to committed</b>	Rolls back the update to the last committed version.
<b>abort</b>	Cancels file activation, and rolls back to the version that was running before the current installation procedure started.
<b>remove</b>	Deletes all unused and inactive software installation files.



**Note** The **request platform software** commands are deprecated starting from Cisco IOS XE Gibraltar 16.10.1. The commands are visible on the CLI in this release and you can configure them, but we recommend that you use the **install** commands to upgrade or downgrade.

Summary of request platform software Commands	
<b>Note</b> This table of commands is not supported on Cisco Catalyst 9500 Series Switches - High Performance.	
Device# <b>request platform software package ?</b>	
<b>clean</b>	Cleans unnecessary package files from media
<b>copy</b>	Copies package to media
<b>describe</b>	Describes package content
<b>expand</b>	Expands all-in-one package to media
<b>install</b>	Installs the package
<b>uninstall</b>	Uninstalls the package
<b>verify</b>	Verifies In Service Software Upgrade (ISSU) software package compatibility

# Upgrading in Install Mode

Follow these instructions to upgrade from one release to another, using **install** commands, in install mode. To perform a software image upgrade, you must be booted into IOS through **boot flash:packages.conf**.

## Before you begin

When upgrading from ...	Use these commands...	To upgrade to...
Cisco IOS XE Everest 16.5.1a or Cisco IOS XE Everest 16.6.1	Only <b>request platform software</b> commands	Cisco IOS XE Dublin 17.12.x
Cisco IOS XE Everest 16.6.2 and all later releases	On Cisco Catalyst 9500 Series Switches, either <b>install</b> commands or <b>request platform software</b> commands <sup>7</sup> .  On Cisco Catalyst 9500 Series Switches - High Performance, only <b>install</b> commands <sup>8</sup> .	

<sup>7</sup> The **request platform software** commands are deprecated. So although they are still visible on the CLI, we recommend that you use **install** commands.

<sup>8</sup> Introduced in Cisco IOS XE Fuji 16.8.1a.

The sample output in this section displays upgrade from Cisco IOS XE Dublin 17.11.1 to Cisco IOS XE Dublin 17.12.1 using **install** commands only.

## Procedure

### Step 1

Clean-up

#### **install remove inactive**

Use this command to clean-up old installation files in case of insufficient space and to ensure that you have at least 1GB of space in flash, to expand a new image.

The following sample output displays the cleaning up of unused files, by using the **install remove inactive** command:

```
Switch# install remove inactive

install_remove: START Mon Jul 24 19:51:48 UTC 2023
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
  cat9k-cc_srdriver.17.11.01.SPA.pkg
    File is in use, will not delete.
  cat9k-espbase.17.11.01.SPA.pkg
    File is in use, will not delete.
  cat9k-guestshell.17.11.01.SPA.pkg
    File is in use, will not delete.
  cat9k-rpbase.17.11.01.SPA.pkg
    File is in use, will not delete.
  cat9k-rpboot.17.11.01.SPA.pkg
```

```

File is in use, will not delete.
cat9k-sipbase.17.11.01.SPA.pkg
File is in use, will not delete.
cat9k-sipspa.17.11.01.SPA.pkg
File is in use, will not delete.
cat9k-srdriver.17.11.01.SPA.pkg
File is in use, will not delete.
cat9k-webui.17.11.01.SPA.pkg
File is in use, will not delete.
cat9k-wlc.17.11.01.SPA.pkg
File is in use, will not delete.
packages.conf
File is in use, will not delete.
done.
The following files will be deleted:
[R0]:
/flash/cat9k-cc_srdriver.17.11.01.SPA.pkg
/flash/cat9k-espbase.17.11.01.SPA.pkg
/flash/cat9k-guestshell.17.11.01.SPA.pkg
/flash/cat9k-rpbase.17.11.01.SPA.pkg
/flash/cat9k-rpboot.17.11.01.SPA.pkg
/flash/cat9k-sipbase.17.11.01.SPA.pkg
/flash/cat9k-sipspa.17.11.01.SPA.pkg
/flash/cat9k-srdriver.17.11.01.SPA.pkg
/flash/cat9k-webui.17.11.01.SPA.pkg
/flash/cat9k-wlc.17.11.01.SPA.pkg
/flash/packages.conf

Do you want to remove the above files? [y/n]y
[R0]:
Deleting file flash:cat9k-cc_srdriver.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-webui.17.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.17.11.01.SPA.pkg ... done.
Deleting file flash:packages.conf ... done.
SUCCESS: Files deleted.
--- Starting Post_Remove_Cleanup ---
Performing Post_Remove_Cleanup on all members
[1] Post_Remove_Cleanup package(s) on switch 1
[1] Finished Post_Remove_Cleanup on switch 1
Checking status of Post_Remove_Cleanup on [1]
Post_Remove_Cleanup: Passed on [1]
Finished Post_Remove_Cleanup

SUCCESS: install_remove Mon Jul 24 19:52:25 UTC 2023
Switch#

```

## Step 2 Copy new image to flash

### a) **copy tftp://[location]/directory/filenameflash:**

Use this command to copy the new image from a TFTP server to flash memory. The location is either an IP address or a host name. The filename is specified relative to the directory used for file transfers. Skip this step if you want to use the new image from a TFTP server.

```

Switch# copy tftp://10.8.0.6/image/cat9k_iosxe.17.12.01.SPA.bin flash:
destination filename [cat9k_iosxe.17.12.01.SPA.bin]?
Accessing tftp://10.8.0.6/image/cat9k_iosxe.17.12.01.SPA.bin...

```

```

Loading /cat9k_iosxe.17.12.01.SPA.bin from 10.8.0.6 (via GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 601216545 bytes]

601216545 bytes copied in 50.649 secs (11870255 bytes/sec)

```

b) **dir flash:**

Use this command to confirm that the image has been successfully copied to flash.

```

Switch# dir flash:*.bin
Directory of flash:/*.bin

Directory of flash:/

434184 -rw- 601216545   Jul 24 2023 10:18:11 -07:00 cat9k_iosxe.17.12.01.SPA.bin
11353194496 bytes total (8976625664 bytes free)

```

**Step 3** Set boot variable

a) **boot system flash:packages.conf**

Use this command to set the boot variable to **flash:packages.conf**.

```
Switch(config)# boot system flash:packages.conf
```

b) **no boot manual**

Use this command to configure the switch to auto-boot. Settings are synchronized with the standby switch, if applicable.

```
Switch(config)# no boot manual
Switch(config)# exit
```

c) **write memory**

Use this command to save boot settings.

```
Switch# write memory
```

d) **show bootvar** or **show boot**

Use this command to verify the boot variable (packages.conf) and manual boot setting (no):

```

Switch# show bootvar                               <<on the C9500-24Y4C,C9500-32C, C9500-32QC, and
C9500-48Y4C models
BOOT variable = bootflash:packages.conf
MANUAL_BOOT variable = no
BAUD variable = 9600
ENABLE_BREAK variable = yes
BOOTMODE variable does not exist
IPXE_TIMEOUT variable does not exist
CONFIG_FILE variable =

Standby BOOT variable = bootflash:packages.conf
Standby MANUAL_BOOT variable = no
Standby BAUD variable = 9600
Standby ENABLE_BREAK variable = yes
Standby BOOTMODE variable does not exist
Standby IPXE_TIMEOUT variable does not exist
Standby CONFIG_FILE variable =

```



```

Switch# show boot                                     <<on the C9500-12Q,C9500-16X C9500-24Q, and
C9500-40X models
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:
BOOT variable = flash:packages.conf;
Manual Boot = no
Enable Break = yes
Boot Mode = DEVICE
iPXE Timeout = 0

```

#### Step 4 Install image to flash

##### **install add file activate commit**

Use this command to install the image.

We recommend that you point to the source image on your TFTP server or the flash drive of the *active* switch, if you have copied the image to flash memory. If you point to an image on the flash or USB drive of a member switch (instead of the active), you must specify the exact flash or USB drive - otherwise installation fails. For example, if the image is on the flash drive of member switch 3 (flash-3): Switch# **install add file flash-3:cat9k\_iosxe.17.12.01.SPA.bin activate commit**.

The following sample output displays installation of the Cisco IOS XE Dublin 17.12.1 software image in the flash memory:

```

Switch# install add file flash:cat9k_iosxe.17.12.01.SPA.bin activate commit
install_add_activate_commit: Adding PACKAGE
install_add_activate_commit: Checking whether new add is allowed ....
--- Starting Add ---
Performing Add on Active/Standby
 [1] Add package(s) on R0
 [1] Finished Add on R0

Checking status of Add on [R0]
Add: Passed on [R0]
Finished Add

Image added. Version: 17.12.01

install_add_activate_commit: Activating PACKAGE
Following packages shall be activated:
/flash/cat9k-wlc.17.12.01.SPA.pkg
/flash/cat9k-webui.17.12.01.SPA.pkg
/flash/cat9k-srdriver.17.12.01.SPA.pkg
/flash/cat9k-sipsa.17.12.01.SPA.pkg
/flash/cat9k-sipbase.17.12.01.SPA.pkg
/flash/cat9k-rpboot.17.12.01.SPA.pkg
/flash/cat9k-rpbase.17.12.01.SPA.pkg
/flash/cat9k-guestshell.17.12.01.SPA.pkg
/flash/cat9k-espbase.17.12.01.SPA.pkg
/flash/cat9k-cc_srdriver.17.12.01.SPA.pkg

```

**This operation may require a reload of the system. Do you want to proceed? [y/n] y**

```

--- Starting Activate ---

Performing Activate on Active/Standby
[1] Activate package(s) on R0
--- Starting list of software package changes ---
Old files list:
  Removed cat9k-cc_srdriver.17.11.01.SPA.pkg
  Removed cat9k-espbase.17.11.01.SPA.pkg

```

```

Removed cat9k-guestshell.17.11.01.SPA.pkg
Removed cat9k-rpbase.17.11.01.SPA.pkg
Removed cat9k-rpboot.17.11.01.SPA.pkg
Removed cat9k-sipbase.17.11.01.SPA.pkg
Removed cat9k-sipspa.17.11.01.SPA.pkg
Removed cat9k-srdriver.17.11.01.SPA.pkg
Removed cat9k-webui.17.11.01.SPA.pkg
Removed cat9k-wlc.17.11.01.SPA.pkg
New files list:
Added cat9k-cc_srdriver.17.12.01.SSA.pkg
Added cat9k-espbases.17.12.01.SSA.pkg
Added cat9k-guestshell.17.12.01.SSA.pkg
Added cat9k-lni.17.12.01.SSA.pkg
Added cat9k-rpbase.17.12.01.SSA.pkg
Added cat9k-rpboot.17.12.01.SSA.pkg
Added cat9k-sipbase.17.12.01.SSA.pkg
Added cat9k-sipspa.17.12.01.SSA.pkg
Added cat9k-srdriver.17.12.01.SSA.pkg
Added cat9k-webui.17.12.01.SSA.pkg
Added cat9k-wlc.17.12.01.SSA.pkg
Finished list of software package changes
[1] Finished Activate on R0
Checking status of Activate on [R0]
Activate: Passed on [R0]
Finished Activate

--- Starting Commit ---
Performing Commit on Active/Standby
[1] Commit package(s) on R0
[1] Finished Commit on R0
Checking status of Commit on [R0]
Commit: Passed on [R0]
Finished Commit
Send model notification for install_add_activate_commit before reload
Install will reload the system now!
SUCCESS: install_add_activate_commit Mon Jul 24 12:13:05 IST 2023

Switch#Jul 24 12:13:11.023: %PMANTACTION: F0/0vp: Process manager is exiting: n requested
Jul 24 12:13:11.028: %PMAN-5-EXITACTION: C1/0: pvp: Process manager is exiting: reload fru
action requested
Jul 24 12:13:11.825: %PMAN-5-EXITACTION: R0/0: pvp: Process manager is exiting: reload
action requested

Initializing Hardware...
System Bootstrap, Version 17.4.1r[FC2], RELEASE SOFTWARE (P)

Compiled 18-07-2022 12:00:00.00 by rel
Current ROMMON image : Primary Rommon Image
Last reset cause:LocalSoft
C9500-32QC platform with 16777216 Kbytes of main memory
Preparing to autoboot. [Press Ctrl-C to interrupt] 5 5 /-\\/-\\/-4 \\/-\\/-\\|3
/\\/-\\/-2 \\/-\\/-\\|1 /-\\/-\\/-0

boot: attempting to boot from [bootflash:packages.conf]

boot: reading file packages.conf
<output truncated>

```

**Note** The system reloads automatically after executing the **install add file activate commit** command. You do not have to manually reload the system.

## Step 5 Verify installation

After the software has been successfully installed, use the **dir flash:** command to verify that the flash partition has ten new .pkg files and two .conf files.

a) **dir flash:\*.pkg**

The following is sample output of the **dir flash:\*.pkg** command:

```
Switch# dir flash:*.pkg

Directory of flash:/
475140 -rw- 2012104   Mar 9 2023 09:52:41 -07:00 cat9k-cc_srdriver.17.11.01.SPA.pkg
475141 -rw- 70333380  Mar 9 2023 09:52:44 -07:00 cat9k-espbase.17.11.01.SPA.pkg
475142 -rw- 13256     Mar 9 2023 09:52:44 -07:00 cat9k-guestshell.17.11.01.SPA.pkg
475143 -rw- 349635524  Mar 9 2023 09:52:54 -07:00 cat9k-rpbase.17.11.01.SPA.pkg
475149 -rw- 24248187   Mar 9 2023 09:53:02 -07:00 cat9k-rpboot.17.11.01.SPA.pkg
475144 -rw- 25285572   Mar 9 2023 09:52:55 -07:00 cat9k-sipbase.17.11.01.SPA.pkg
475145 -rw- 20947908  Mar 9 2023 09:52:55 -07:00 cat9k-sipspa.17.11.01.SPA.pkg
475146 -rw- 2962372   Mar 9 2023 09:52:56 -07:00 cat9k-srdriver.17.11.01.SPA.pkg
475147 -rw- 13284288  Mar 9 2023 09:52:56 -07:00 cat9k-webui.17.11.01.SPA.pkg
475148 -rw- 13248     Mar 9 2023 09:52:56 -07:00 cat9k-wlc.17.11.01.SPA.pkg

491524 -rw- 25711568  Jul 24 2023 11:49:33 -07:00 cat9k-cc_srdriver.17.12.01.SPA.pkg
491525 -rw- 78484428  Jul 24 2023 11:49:35 -07:00 cat9k-espbase.17.12.01.SPA.pkg
491526 -rw- 1598412  Jul 24 2023 11:49:35 -07:00 cat9k-guestshell.17.12.01.SPA.pkg
491527 -rw- 404153288  Jul 24 2023 11:49:47 -07:00 cat9k-rpbase.17.12.01.SPA.pkg
491533 -rw- 31657374   Jul 24 2023 11:50:09 -07:00 cat9k-rpboot.17.12.01.SPA.pkg
491528 -rw- 27681740   Jul 24 2023 11:49:48 -07:00 cat9k-sipbase.17.12.01.SPA.pkg
491529 -rw- 52224968  Jul 24 2023 11:49:49 -07:00 cat9k-sipspa.17.12.01.SPA.pkg
491530 -rw- 31130572  Jul 24 2023 11:49:50 -07:00 cat9k-srdriver.17.12.01.SPA.pkg
491531 -rw- 14783432  Jul 24 2023 11:49:51 -07:00 cat9k-webui.17.12.01.SPA.pkg
491532 -rw- 9160     Jul 24 2023 11:49:51 -07:00 cat9k-wlc.17.12.01.SPA.pkg
11353194496 bytes total (9544245248 bytes free)
Switch#
```

b) **dir flash:\*.conf**

The following is sample output of the **dir flash:\*.conf** command. It displays the .conf files in the flash partition; note the two .conf files:

- packages.conf—the file that has been re-written with the newly installed .pkg files
- cat9k\_iosxe.17.12.01.SPA.conf—a backup copy of the newly installed packages.conf file

```
Switch# dir flash:*.conf

Directory of flash:/*.conf
Directory of flash:/

434197 -rw- 7406 Jul 24 2023 10:59:16 -07:00 packages.conf
516098 -rw- 7406 Jul 24 2023 10:58:08 -07:00 cat9k_iosxe.17.12.01.SPA.conf
11353194496 bytes total (8963174400 bytes free)
```

## Step 6 show version

After the image boots up, use this command to verify the version of the new image.

The following sample output of the **show version** command displays the Cisco IOS XE Dublin 17.12.1 image on the device:

```
Switch# show version

Cisco IOS XE Software, Version 17.12.01
```

```
Cisco IOS Software [Dublin], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 17.12.1,
RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2023 by Cisco Systems, Inc.
<output truncated>
```

## Downgrading in Install Mode

Follow these instructions to downgrade from one release to another, in install mode.

### Before you begin

Note that you can use this procedure for the following downgrade scenarios:

When downgrading from ...	Use these commands...	To downgrade to...
Cisco IOS XE Dublin 17.12.x	<ul style="list-style-type: none"> <li>On Cisco Catalyst 9500 Series Switches, either <b>install</b> commands or <b>request platform software</b> commands<sup>9</sup>.</li> <li>On Cisco Catalyst 9500 Series Switches - High Performance, only <b>install</b> commands</li> </ul>	Cisco IOS XE Dublin 17.11.x or earlier releases.

<sup>9</sup> The **request platform software** commands are deprecated. So although they are still visible on the CLI, we recommend that you use **install** commands.



**Note** New switch models that are introduced in a release cannot be downgraded. The release in which a switch model is introduced is the minimum software version for that model.

The sample output in this section shows downgrade from Cisco IOS XE Dublin 17.12.1 to Cisco IOS XE Dublin 17.11.1, using **install** commands.

### Procedure

#### Step 1

Clean-up

**install remove inactive**

Use this command to clean-up old installation files in case of insufficient space and to ensure that you have at least 1GB of space in flash, to expand a new image.

The following sample output displays the cleaning up of unused files, by using the **install remove inactive** command:

```
Switch# install remove inactive
install_remove: START Mon Jul 24 11:42:27 IST 2023
```

```

Cleaning up unnecessary package files

No path specified, will use booted path bootflash:packages.conf

Cleaning bootflash:
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat9k-cc_srdriver.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-espbase.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-guestshell.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-rpbase.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-rpboot.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-sipbase.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-sipspa.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-srdriver.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-webui.17.12.01.SSA.pkg
      File is in use, will not delete.
    cat9k-wlc.17.12.01.SSA.pkg
      File is in use, will not delete.
    packages.conf
      File is in use, will not delete.
  done.
SUCCESS: No extra package or provisioning files found on media. Nothing to clean.

SUCCESS: install_remove Mon Jul 24 11:42:39 IST 2023

```

**Step 2****Copy new image to flash****a) copy tftp:[[/location]/directory]/filenameflash:**

Use this command to copy the new image from a TFTP server to flash memory. The location is either an IP address or a host name. The filename is specified relative to the directory used for file transfers. Skip this step if you want to use the new image from a TFTP server.

```

Switch# copy tftp://10.8.0.6/image/cat9k_iosxe.17.11.01.SPA.bin flash:
Destination filename [cat9k_iosxe.17.11.01.SPA.bin]?
Accessing tftp://10.8.0.6//cat9k_iosxe.17.11.01.SPA.bin...
Loading /cat9k_iosxe.17.11.01.SPA.bin from 10.8.0.6 (via GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 508584771 bytes]
508584771 bytes copied in 101.005 secs (5035244 bytes/sec)

```

**b) dir flash:**

Use this command to confirm that the image has been successfully copied to flash.

```

Switch# dir flash:*.bin
Directory of flash:/*.bin

Directory of flash:/

434184 -rw- 508584771 Jul 24 2023 13:35:16 -07:00 cat9k_iosxe.17.11.01.SPA.bin
11353194496 bytes total (9055866880 bytes free)

```

**Step 3** Set boot variablea) **boot system flash:packages.conf**

Use this command to set the boot variable to **flash:packages.conf**.

```
Switch(config)# boot system flash:packages.conf
```

b) **no boot manual**

Use this command to configure the switch to auto-boot. Settings are synchronized with the standby switch, if applicable.

```
Switch(config)# no boot manual
Switch(config)# exit
```

c) **write memory**

Use this command to save boot settings.

```
Switch# write memory
```

d) **show bootvar** or **show boot**

Use this command to verify the boot variable (packages.conf) and manual boot setting (no):

```
Switch# show bootvar <<on the C9500-24Y4C,C9500-32C, C9500-32QC, and
C9500-48Y4C models
BOOT variable = bootflash:packages.conf
MANUAL_BOOT variable = no
BAUD variable = 9600
ENABLE_BREAK variable = yes
BOOTMODE variable does not exist
IPXE_TIMEOUT variable does not exist
CONFIG_FILE variable =

Standby BOOT variable = bootflash:packages.conf
Standby MANUAL_BOOT variable = no
Standby BAUD variable = 9600
Standby ENABLE_BREAK variable = yes
Standby BOOTMODE variable does not exist
Standby IPXE_TIMEOUT variable does not exist
Standby CONFIG_FILE variable =

Switch# show boot <<on the C9500-12Q,C9500-16X C9500-24Q, and
C9500-40X models
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:
BOOT variable = flash:packages.conf;
Manual Boot = no
Enable Break = yes
Boot Mode = DEVICE
iPXE Timeout = 0
```

**Step 4** Downgrade software image**install add file activate commit**

Use this command to install the image.

We recommend that you point to the source image on your TFTP server or the flash drive of the *active* switch, if you have copied the image to flash memory. If you point to an image on the flash or USB drive of a member switch (instead of the active), you must specify the exact flash or USB drive - otherwise installation fails. For

example, if the image is on the flash drive of member switch 3 (flash-3): `Switch# install add file flash-3:cat9k_iosxe.17.11.01.SPA.bin activate commit`.

The following example displays the installation of the Cisco IOS XE Dublin 17.11.1 software image to flash, by using the `install add file activate commit` command.

```
Switch# install add file flash:cat9k_iosxe.17.11.01.SPA.bin activate commit
install_add_activate_commit: Adding PACKAGE
install_add_activate_commit: Checking whether new add is allowed ....
--- Starting Add ---
Performing Add on Active/Standby
[1] Add package(s) on R0
[1] Finished Add on R0
Checking status of Add on [R0]
Add: Passed on [R0]
Finished Add
Image added. Version: 17.11.01.0.269
install_add_activate_commit: Activating PACKAGE

Following packages shall be activated:
/flash/cat9k-wlc.17.11.01.SPA.pkg
/flash/cat9k-webui.17.11.01.SPA.pkg
/flash/cat9k-srdriver.17.11.01.SPA.pkg
/flash/cat9k-sipspa.17.11.01.SPA.pkg
/flash/cat9k-sibase.17.11.01.SPA.pkg
/flash/cat9k-rpboot.17.11.01.SPA.pkg
/flash/cat9k-rpbase.17.11.01.SPA.pkg
/flash/cat9k-guestshell.17.11.01.SPA.pkg
/flash/cat9k-espbase.17.11.01.SPA.pkg
/flash/cat9k-cc_srdriver.17.11.01.SPA.pkg
```

**This operation may require a reload of the system. Do you want to proceed? [y/n] y**

```
Performing Activate on Active/Standby
1) Activate package(s) on R0
--- Starting list of software package changes ---
Old files list:
  Removed cat9k-cc_srdriver.17.12.01.SSA.pkg
  Removed cat9k-espbase.17.12.01.SSA.pkg
  Removed cat9k-guestshell.17.12.01.SSA.pkg
  Removed cat9k-lni.17.12.01.SSA.pkg
  Removed cat9k-rpbase.17.12.01.SSA.pkg
  Removed cat9k-rpboot.17.12.01.SSA.pkg
  Removed cat9k-sibase.17.12.01.SSA.pkg
  Removed cat9k-sipspa.17.12.01.SSA.pkg
  Removed cat9k-srdriver.17.12.01.SSA.pkg
  Removed cat9k-webui.17.12.01.SSA.pkg
  Removed cat9k-wlc.17.12.01.SSA.pkg
New files list:
  Added cat9k-cc_srdriver.17.11.01.SPA.pkg
  Added cat9k-espbase.17.11.01.SPA.pkg
  Added cat9k-guestshell.17.11.01.SPA.pkg
  Added cat9k-rpbase.17.11.01.SPA.pkg
  Added cat9k-rpboot.17.11.01.SPA.pkg
  Added cat9k-sibase.17.11.01.SPA.pkg
  Added cat9k-sipspa.17.11.01.SPA.pkg
  Added cat9k-srdriver.17.11.01.SPA.pkg
  Added cat9k-webui.17.11.01.SPA.pkg
  Added cat9k-wlc.17.11.01.SPA.pkg
  Finished list of software package changes
[1] Finished Activate on R0
Checking status of Activate on [R0]
Activate: Passed on [R0]
```

```

Finished Activate

--- Starting Commit ---
Performing Commit on Active/Standby
  [1] Commit package(s) on R0
  [1] Finished Commit on R0
Checking status of Commit on [R0]
Commit: Passed on [R0]
Finished Commit

Send model notification for install_add_activate_commit before reload
Install will reload the system now!
SUCCESS: install_add_activate_commit Mon Jul 24 11:51:01 IST 2023

Jul 24 11:51:07.505: %PMANTvp: Process manager is exiting: ren requested
Jul 24 11:51:07.505: %PMAN-5-EXITACTION: F0/0: pvp: Process manager is exiting: reload fru
  action requested
Jul 24 11:51:07.834: %PMAN-5-EXITACTION: R0/0: pvp: Process manager is exiting: reload
  action requested

Initializing Hardware...

System Bootstrap, Version 17.3.1r[FC2], RELEASE SOFTWARE (P)
Compiled 30-03-2023 12:00:00.00 by rel
Current ROMMON image : Primary Rommon Image

Last reset cause:LocalSoft
C9500-32QC platform with 16777216 Kbytes of main memory
Preparing to autoboot. [Press Ctrl-C to interrupt] 5 5 /-\\|/-\\|/-4 \\|/-\\|/-\\|3
  /-\\|/-\\|/-2 \\|/-\\|/-\\|1 /-\\|/-\\|/-0
boot: attempting to boot from [bootflash:packages.conf]
boot: reading file packages.conf

<output truncated>

```

**Note** The system reloads automatically after executing the **install add file activate commit** command. You do not have to manually reload the system.

## Step 5 Verify version

### show version

After the image boots up, use this command to verify the version of the new image.

**Note** When you downgrade the software image, the ROMMON version does not downgrade. It remains updated.

The following sample output of the **show version** command displays the Cisco IOS XE Dublin 17.11.1 image on the device:

```

Switch# show version
Cisco IOS XE Software, Version 17.11.01
Cisco IOS Software [Dublin], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 17.11.1,
RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2023 by Cisco Systems, Inc.
<output truncated>

```



# In Service Software Upgrade (ISSU) with Cisco StackWise Virtual

Follow the instructions described here to perform an In Service Software Upgrade (ISSU) upgrade. Use the procedure described here, only for the releases indicated in the table below. For more general information about ISSU release support and recommended releases, see this technical reference document: [In-Service Software Upgrade \(ISSU\)](#).

## Before you begin

Note that you can use this ISSU procedure only for the following scenarios:

When upgrading from...	Use these commands...	To...
Cisco IOS XE Cupertino 17.9.x	<b>install add file activate issu commit</b>	Cisco IOS XE Dublin 17.12.x
Not applicable	ISSU does not support downgrade. To downgrade, see <a href="#">Downgrading in Install Mode</a> , on page 56.	Not applicable

## Procedure

### Step 1

#### enable

Enables privileged EXEC mode. Enter your password if prompted.

```
Switch# enable
```

### Step 2

#### show version | in INSTALL or show version | in System image

On the Catalyst 9500 Series Switches, use **show version | in INSTALL** command to check the boot mode. ISSU is supported only in install mode. You cannot perform ISSU if the switch is booted in bundle mode.

```
Switch# show version | in INSTALL
Switch Ports Model          SW Version        SW Image          Mode
-----
*   1 12    C9500-12Q          17.12.1           CAT9K_IOSXE      INSTALL
   2 12    C9500-12Q          17.12.1           CAT9K_IOSXE      INSTALL
```

On Catalyst 9500 Series Switches - High Performance, use **show version | in System image** to check if the switch booted into IOS via “ boot flash:packages.conf”. The output should display the following:

```
Switch# show version | in System image
System image file is "flash:packages.conf"
```

You cannot perform ISSU if the switch is booted in bundle mode. If you perform ISSU in bundle mode, you will see the following error.

```
*Jul 10 14:55:57.338: %INSTALL-5-INSTALL_START_INFO: Chassis 1 R1/0: install_engine: Started
install one-shot ISSU flash:cat9k_iosxe.17.12.01.SPA.bininstall_add_activate_commit: Adding
ISSU
ERROR: install_add_activate_commit: One-Shot ISSU operation is not supported in bundle boot
mode
FAILED: install_add_activate_commit exit(1) Tue Jul 10 14:56:03 UTC 2023
```

**Step 3**      **dir flash: | in free**

Use this command to check if there is sufficient available memory on flash. Ensure that you have at least 1GB of space in flash to expand a new image.

```
Switch# dir flash: | in free
11353194496 bytes total (8565174272 bytes free)
```

**Step 4**      **show redundancy**

Use this command to check if the switch is in SSO mode.

```
Switch# show redundancy
Redundant System Information :
-----
      Available system uptime = 4 minutes
Switchovers system experienced = 0
      Standby failures = 0
      Last switchover reason = none

      Hardware Mode = Duplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = sso
      Maintenance Mode = Disabled
      Communications = Up
<output truncated>
```

**Step 5**      **show boot system**

Use this command to verify that the manual boot variable is set to **no**.

```
Switch# show boot system
Current Boot Variables:
BOOT variable = flash:packages.conf;
MANUAL_BOOT variable = no

Boot Variables on next reload:
BOOT variable = flash:packages.conf;
MANUAL_BOOT variable = no
Enable Break = no
Boot Mode = DEVICE
iPXE Timeout = 0
```

If the manual boot variable is set to **yes**, use the **no boot manual** command in global configuration mode to set the switch for autoboot.

**Step 6**      **show issu state [detail]**

Use this command to verify that no other ISSU process is in progress.

```
Switch# show issu state detail
--- Starting local lock acquisition on chassis 2 ---
Finished local lock acquisition on chassis 2

No ISSU operation is in progress

Switch#
```

**Step 7**      **show install summary**

Use this command to verify that the state of the image is *Activated & Committed*. Clear the install state if the state is not *Activated & Committed*.

```
Switch# show install summary
[ Switch 1 2 ] Installed Package(s) Information:
```

```

State (St): I - Inactive, U - Activated & Uncommitted,
           C - Activated & Committed, D - Deactivated & Uncommitted
-----
Type  St   Filename/Version
-----
IMG   C    17.12.1.0.2433

```

## Step 8 install add file activate issu commit

Use this command to automate the sequence of all the upgrade procedures, including downloading the images to both the switches, expanding the images into packages, and upgrading each switch as per the procedures.

```
Switch# install add file tftp:cat9k_iosxe.17.12.01.SPA.bin activate issu commit
```

The following sample output displays installation of Cisco IOS XE Dublin 17.12.1 software image with ISSU procedure.

```

Switch# install add file tftp:cat9k_iosxe.17.12.01.SPA.bin activate issu commit
install_add_activate_commit: START Thu Jul 19 06:16:32 UTC 2023
Downloading file tftp://172.27.18.5//cat9k_iosxe.17.12.01.SPA.bin

*Jul 19 06:16:34.064: %INSTALL-5-INSTALL_START_INFO: Switch 1 R0/0: install_engine: Started
  install_one-shot ISSU tftp://172.27.18.5//cat9k_iosxe.17.12.01.SPA.bin
Finished downloading file tftp://172.27.18.5//cat9k_iosxe.17.12.01.SPA.bin to
flash:cat9k_iosxe.17.12.01.SPA.bin
install_add_activate_commit: Adding ISSU

--- Starting initial file syncing ---
[1]: Copying flash:cat9k_iosxe.17.12.01.SPA.bin from switch 1 to switch 2
[2]: Finished copying to switch 2
Info: Finished copying flash:cat9k_iosxe.17.12.01.SPA.bin to the selected switch(es)
Finished initial file syncing

--- Starting Add ---
Performing Add on all members
  [1] Add package(s) on switch 1
  [1] Finished Add on switch 1
  [2] Add package(s) on switch 2
  [2] Finished Add on switch 2
Checking status of Add on [1 2]
Add: Passed on [1 2]
Finished Add

install_add_activate_commit: Activating ISSU

NOTE: Going to start Oneshot ISSU install process

STAGE 0: Initial System Level Sanity Check before starting ISSU
=====
--- Verifying install_issu supported ---
--- Verifying standby is in Standby Hot state ---
--- Verifying booted from the valid media ---
--- Verifying AutoBoot mode is enabled ---
Finished Initial System Level Sanity Check

STAGE 1: Installing software on Standby
=====
--- Starting install_remote ---
Performing install_remote on Chassis remote
[2] install_remote package(s) on switch 2
[2] Finished install_remote on switch 2
install_remote: Passed on [2]
Finished install_remote

```

```

STAGE 2: Restarting Standby
=====
--- Starting standby reload ---
Finished standby reload

--- Starting wait for Standby to reach terminal redundancy state ---

*Jul 19 06:24:16.426: %SMART_LIC-5-EVAL_START: Entering evaluation period
*Jul 19 06:24:16.426: %SMART_LIC-5-EVAL_START: Entering evaluation period
*Jul 19 06:24:16.466: %HMANRP-5-CHASSIS_DOWN_EVENT: Chassis 2 gone DOWN!
*Jul 19 06:24:16.497: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault (PEER_NOT_PRESENT)
*Jul 19 06:24:16.498: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault (PEER_DOWN)
*Jul 19 06:24:16.498: %REDUNDANCY-3-STANDBY_LOST: Standby processor fault
(Peer_Redundancy_State_Change)
*Jul 19 06:24:16.674: %RF-5-RF_RELOAD: Peer reload. Reason: EHSA standby down
*Jul 19 06:24:16.679: %IOSXE_REDUNDANCY-6-PEER_LOST: Active detected switch 2 is no longer
standby
*Jul 19 06:24:16.416: %NIF_MGR-6-PORT_LINK_DOWN: Switch 1 R0/0: nif_mgr: Port 1 on front
side stack link 0 is DOWN.
*Jul 19 06:24:16.416: %NIF_MGR-6-PORT_CONN_DISCONNECTED: Switch 1 R0/0: nif_mgr: Port 1 on
front side stack link 0 connection has DISCONNECTED: Conn_Err_Port_Link_Down_Event
*Jul 19 06:24:16.416: %NIF_MGR-6-STACK_LINK_DOWN: Switch 1 R0/0: nif_mgr: Front side stack
link 0 is DOWN.
*Jul 19 06:24:16.416: %STACKMGR-6-STACK_LINK_CHANGE: Switch 1 R0/0: stack_mgr: Stack port
1 on Switch 1 is down

<output truncated>

*Jul 19 06:29:36.393: %IOSXE_REDUNDANCY-6-PEER: Active detected switch 2 as standby.
*Jul 19 06:29:36.392: %STACKMGR-6-STANDBY_ELECTED: Switch 1 R0/0: stack_mgr: Switch 2 has
been elected STANDBY.
*Jul 19 06:29:41.397: %REDUNDANCY-5-PEER_MONITOR_EVENT: Active detected a standby insertion
(raw-event=PEER_FOUND(4))
*Jul 19 06:29:41.397: %REDUNDANCY-5-PEER_MONITOR_EVENT: Active detected a standby insertion
(raw-event=PEER_REDUNDANCY_STATE_CHANGE(5))
*Jul 19 06:29:42.257: %REDUNDANCY-3-IPC: IOS versions do not match.
*Jul 19 06:30:24.323: %HA_CONFIG_SYNC-6-BULK_CFGSYNC_SUCCEED: Bulk Sync succeededFinished
wait for Standby to reach terminal redundancy state

*Jul 19 06:30:25.325: %RF-5-RF_TERMINAL_STATE: Terminal state reached for (SSO)
STAGE 3: Installing software on Active
=====
--- Starting install_active ---
Performing install_active on Chassis 1

<output truncated>

[1] install_active package(s) on switch 1
[1] Finished install_active on switch 1
install_active: Passed on [1]
Finished install_active

STAGE 4: Restarting Active (switchover to standby)
=====
--- Starting active reload ---
New software will load after reboot process is completed
SUCCESS: install_add_activate_commit Thu Jul 19 23:06:45 UTC 2023
Jul 19 23:06:45.731: %INSTALL-5-INSTALL_COMPLETED_INFO: R0/0: install_engine: Completed
install one-shot ISSU flash:cat9k_iosxe.17.12.01.SPA.bin
Jul 19 23:06:47.509: %PMAN-5-EXITACTION: F0/0: pvp: Process manager is exiting: reload fp
action requested

```

```

Jul 19 23:06:48.776: %PM

Initializing Hardware...

System Bootstrap, Version 17.12.1r[FC2], RELEASE SOFTWARE (P)
Compiled Fri 07/19/2023 10:48:42.68 by rel

Current ROMMON image : Primary
Last reset cause      : PowerOn
C9500-40X platform with 16777216 Kbytes of main memory

boot: attempting to boot from [flash:packages.conf]
boot: reading file packages.conf
#
=====

Jul 19 23:08:30.238: %PMAN-5-EXITACTION: C0/0: pvp: Process manager is exiting:

Waiting for 120 seconds for other switches to boot
#####
Switch number is 1
All switches in the stack have been discovered. Accelerating discovery

Switch console is now available

Press RETURN to get started.

Jul 19 23:14:17.080: %INSTALL-5-INSTALL_START_INFO: R0/0: install_engine: Started install
commit
Jul 19 23:15:48.445: %INSTALL-5-INSTALL_COMPLETED_INFO: R0/0: install_engine: Completed
install commit ISSU

```

**Step 9**     **show version**

Use this command to verify the version of the new image.

The following sample output of the **show version** command displays the Cisco IOS XE Dublin 17.12.1 image on the device:

```

Switch# show version
Cisco IOS XE Software, Version 17.12.01
Cisco IOS Software [Amsterdam], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 17.12.1,
  RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2023 by Cisco Systems, Inc.
<output truncated>

```

**Step 10**     **show issu state [detail]**

Use this command to verify that no ISSU process is in pending state.

```

Switch# show issu state detail
--- Starting local lock acquisition on chassis 2 ---
Finished local lock acquisition on chassis 2

```

```
No ISSU operation is in progress  
Switch#
```

**Step 11****exit**

Exits privileged EXEC mode and returns to user EXEC mode.

---

## Field-Programmable Gate Array Version Upgrade

A field-programmable gate array (FPGA) is a type of programmable memory device that exists on Cisco switches. They are re-configurable logic circuits that enable the creation of specific and dedicated functions.

To check the current FPGA version, enter the **version -v** command in ROMMON mode. For Cisco Catalyst 9500X Series Switches, enter the **show firmware version all** command in privileged EXEC mode.

**Note**

- Not every software release has a change in the FPGA version.
  - The version change occurs as part of the regular software upgrade and you do not have to perform any other additional steps.
-



## CHAPTER 9

# Caveats

- [Cisco Bug Search Tool](#), on page 67
- [Open Caveats in Cisco IOS XE Dublin 17.12.x](#), on page 67
- [Resolved Caveats in Cisco IOS XE Dublin 17.12.4](#), on page 67
- [Resolved Caveats in Cisco IOS XE Dublin 17.12.3](#), on page 68
- [Resolved Caveats in Cisco IOS XE Dublin 17.12.2](#), on page 68
- [Resolved Caveats in Cisco IOS XE Dublin 17.12.1](#), on page 69

## Cisco Bug Search Tool

The Cisco [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 in Cisco IOS XE Dublin 17.12.x

Identifier	Applicable Models	Headline
<a href="#">CSCwh35728</a>	All models	Need switch to host macsec support in Sda overlay network
<a href="#">CSCwk20408</a>	C9500	9500-12q:SWIM unpacking fails from older image such as 16.8.1 or 16.9.3 to newer image like 17.9.x

## Resolved Caveats in Cisco IOS XE Dublin 17.12.4

Identifier	Applicable Models	Headline
<a href="#">CSCwj91408</a>	C9500	C9500 may experience crash when performing upgrade using DNAC

Identifier	Applicable Models	Headline
<a href="#">CSCwk05808</a>	C9500	PTP port state is incorrect on active switch SVL link

## Resolved Caveats in Cisco IOS XE Dublin 17.12.3

Identifier	Applicable Models	Headline
<a href="#">CSCwi83012</a>	C9500H	SNMP results still contain 4 lanes for 100G optics which do not have multiple lanes
<a href="#">CSCwi59993</a>	C9500	Memory leak due to pubd process when connection is terminated from the receiver side
<a href="#">CSCwh91796</a>	C9500	BUM not forwarding while the L2 vni is down
<a href="#">CSCwi47390</a>	All Models	C9500X: If one PSU loses power, both PSUs are declared as bad-input status yet switch operates fine
<a href="#">CSCwi28679</a>	All Models	9500X/9600X - 224.0.0.1 packets received on a portchannel are sent back through the same portchannel
<a href="#">CSCwi06404</a>	C9500	PKI crash after failing a CRL Fetch

## Resolved Caveats in Cisco IOS XE Dublin 17.12.2

Identifier	Applicable Models	Headline
<a href="#">CSCwf87624</a>	C9500H	Observing LED Status as Green after removing Fan tray for 9500X
<a href="#">CSCwh87343</a>	All models	Cisco IOS XE Software Web UI Privilege Escalation Vulnerability  For more information, see Security Advisory: <a href="#">cisco-sa-iosxe-webui-privesc-j22SaA4z</a> .
<a href="#">CSCwf91450</a>	C9500X	C9500X/C9600X - Stackwise-Virtual: Unexpected Reload with Last reload reason: CPUReset
<a href="#">CSCwe20900</a>	C9500X	C9500X/C9600X - Stackwise Virtual May Fail to Program Own MAC Address In Hardware
<a href="#">CSCwe48591</a>	All models	SPAN Tx traffic could not be mirrored when preferred SDM Template is set as NAT
<a href="#">CSCwh55164</a>	All models	Cat9k: ICMP TTL expired error incorrectly forwarded via global table instead of VRF
<a href="#">CSCwh81650</a>	C9500X	9500X/9600X - memory leak under LEABA_MAIN_DB



## Resolved Caveats in Cisco IOS XE Dublin 17.12.1

Identifier	Applicable Models	Headline
<a href="#">CSCwd50137</a>	C9500X	9500X/9600X NG-SVL/Standalone: Incorrect reload reason for ISSU/Install upgrade
<a href="#">CSCwe05764</a>	C9500X	C9500X-28C8D switches show the "motherboard serial number" instead of the "system serial number"
<a href="#">CSCwf22599</a>	C9500X	C9500X / C9600X Routing Traffic to Incorrect Next-Hop MAC Address
<a href="#">CSCwf87624</a>	C9500X	Observing LED Status as Green after removing Fan tray with Latest Polaris dev





## CHAPTER 10

# Additional Information

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- [Troubleshooting](#), on page 71
- [Related Documentation](#), on page 71
- [Communications, Services, and Additional Information](#), on page 71

## Troubleshooting

For the most up-to-date, detailed troubleshooting information, see the Cisco TAC website at this URL:

<https://www.cisco.com/en/US/support/index.html>

Go to **Product Support** and select your product from the list or enter the name of your product. Look under **Troubleshoot** and **Alerts**, to find information for the problem that you are experiencing.

## Related Documentation

Information about Cisco IOS XE at this URL: <https://www.cisco.com/c/en/us/products/ios-nx-os-software/ios-xe/index.html>

All support documentation for Cisco Catalyst 9500 Series Switches is at this URL: <https://www.cisco.com/c/en/us/support/switches/catalyst-9500-series-switches/tsd-products-support-series-home.html>

Cisco Validated Designs documents at this URL: <https://www.cisco.com/go/designzone>

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <https://cfmg.cisco.com/mibs>

## Communications, Services, and Additional Information

- To receive timely, relevant information from Cisco, sign up at [Cisco Profile Manager](#).
- To get the business impact you're looking for with the technologies that matter, visit [Cisco Services](#).
- To submit a service request, visit [Cisco Support](#).
- To discover and browse secure, validated enterprise-class apps, products, solutions and services, visit [Cisco DevNet](#).

- To obtain general networking, training, and certification titles, visit [Cisco Press](#).
- To find warranty information for a specific product or product family, access [Cisco Warranty Finder](#).

### **Cisco Bug Search Tool**

[Cisco Bug Search Tool](#) (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



