Release Notes for Cisco Catalyst 9500 Series Switches, Cisco IOS XE Bengaluru 17.5.x

First Published: 2021-04-01

Release Notes for Cisco Catalyst 9500 Series Switches, Cisco IOS XE Bengaluru 17.5.x

Introduction

Cisco Catalyst 9500 Series Switches and Cisco Catalyst 9500 Series Switches - High Performance are leading, fixed, core and aggregation enterprise switching platforms and have been purpose-built to address emerging trends in security, IoT, mobility, and cloud.

These switches 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 Software-Defined Access (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 notes document, any such differences are expressly called out. If they are not, the information applies to all the models in the series.

Whats New in Cisco IOS XE Bengaluru 17.5.1

Hardware Features in Cisco IOS XE Bengaluru 17.5.1

There are no new hardware features in this release.

Software Features in Cisco IOS XE Bengaluru 17.5.1

- Software Features Introduced on All Models, on page 2
- Software Features Introduced on Cisco Catalyst 9500 Series Switches, on page 3
- Software Features Introduced on Cisco Catalyst 9500 Series Switches-High Performance, on page 3

Software Features Introduced on All Models

Feature Name	Description, Documentation Link, and License Level Information
ACL Template for IPv4 and IPv6	Allows you to configure IPv4 and IPv6 access list (ACL) in template configuration mode. Use the **ip access-group** command to apply an IPv4 access list and **ipv6 traffic-filter** command to apply an IPv6 access list in template configuration mode. (Network Essentials and Network Advantage)
Disabling USB Ports	Allows you to disable all USB ports on a standalone or stacked device using the **platform usb disable** command.
DSCP marking on RADIUS Servers	Allows you to configure Differentiated Services Code Point (DSCP) marking on RADIUS servers and RADIUS server groups using **dscp** command. The **radius-server dscp** command is used to configure DSCP marking for authentication and accounting on RADIUS servers in global configuration mode. (Network Essentials)
ERSPAN over MPLS VPN	Introduces support for Multiprotocol Label Switching (MPLS) VPN for Encapsulated Remote Switched Port Analyzer (ERSPAN). ERSPAN traffic can be transported over MPLS VPN. (Network Advantage)
Programmability • OpenFlow Breakout Port Support • YANG Data Models	The following programmability features are introduced in this release: • Introduces support for breakout cables that enable a single 40G Quad Small Form-Factor Pluggable+ (QSFP+) interface to be split into four 10G SFP+ interfaces, and a single 100G QSFP28 interface into four 25G SFP28 interfaces. • YANG Data Models: For the list of Cisco IOS XE YANG models available with this release, navigate to: https://github.com/YangModels/yang/tree/master/vendor/cisco/xe/1751. Revision statements embedded in the YANG files indicate if there has been a model revision. The README.md file in the same GitHub location highlights changes that have been made in the release. (Network Advantage)
Session Timer Enhancement	The range for number of seconds between reauthentication attempts was increased from 1 to 65535 seconds to 1 to 1073741823 seconds.
Wired Dynamic PVLAN	Introduces support for Wired Dynamic Private VLAN (PVLAN) that uses a private VLAN to isolate the clients and provide zero-trust. This feature allows you to block peer to peer communications within a subnet or a VLAN. The client is assigned to a PVLAN which isolates a single wired client connected on a port, from the other ports.

New on the Web UI
There are no new features on the Web UI in this release.

Software Features Introduced on Cisco Catalyst 9500 Series Switches

Feature Name	Description, Documentation Link, and License Level Information
Generalized PTP over Layer 3 Unicast	Introduces support for generalized Precision Time Protocol (PTP) networks connected over Layer 3 devices. (Network Advantage)
Selective Q-in-Q	Maps the specified customer VLAN-IDs (C-VLANs) entering the User Network Interface (UNI) to the specified, translated VLAN IDs (S-VLANs). The feature enables selective tunnelling or translation of C-VLANs to S-VLANs on interfaces configured as trunk ports. The egress packet is double-tagged with the C-VLAN ID and the mapped S-VLAN ID.

Software Features Introduced on Cisco Catalyst 9500 Series Switches-High Performance

Feature Name	Description, Documentation Link, and License Level Information
Enhanced NAT Scale	Allows you to enhance the Network Address Translation (NAT) scale by using the **nat scale** command in global configuration mode. The device can now support a minimum of 4000 dynamic source Sessions and 1000 static NAT sessions. (Network Advantage)
WCCP–GRE Redirect Method	Introduces Generic Routing Encapsulation (GRE) method of redirection for Web Cache Communication Protocol (WCCP). The GRE redirection mode is configured on the cache engine. (Network Advantage)
Customizable Switching Database Manager (SDM) Template for 4K VLAN	Allows you to configure a customizable SDM template for the 4K VLAN feature. In the customized template, you can increase the scale of VLAN from 1K to 4K, and the number of supported Switch Virtual Interfaces (SVI) from 1000 to 4000. See System Management →Customizable SDM Templates for 4K VLAN (Network Essentials and Network Advantage)

Important Notes

- Cisco StackWise Virtual: Supported and Unsupported Features, on page 4
- Unsupported Features: All Models, on page 4
- Unsupported Features: Cisco Catalyst 9500 Series Switches, on page 4

- Unsupported Features: Cisco Catalyst 9500 Series Switches - High Performance, on page 4
- Complete List of Supported Features, on page 5
- Accessing Hidden Commands, on page 5
- Default Behaviour—All Models, on page 6
- Default Interface Behaviour on Cisco Catalyst 9500 Series Switches - High Performance Only, on page 6

Cisco StackWise Virtual: Supported and Unsupported Features

The following is a list of features that are supported or unsupported when you enable Cisco StackWise Virtual on a device:

- Layer 2, Layer 3, Security, Quality of Service, Multicast, Application, Monitoring and Management, Multiprotocol Label Switching, High Availability, BGP EVPN VXLAN, Remote Switched Port Analyzer, and Sofware Defined Access are supported.

  Contact the Cisco Technical Support Centre for the specific list of features that are supported under each one of these technologies.

Unsupported Features: All Models

- IPsec VPN
- Performance Monitoring (PerfMon)
- Virtual Routing and Forwarding-Aware (VRF-Aware) web authentication

Unsupported Features: Cisco Catalyst 9500 Series Switches

- Border Gateway Protocol (BGP) Additional Paths
- Cisco TrustSec Network Device Admission Control (NDAC) on Uplinks
- 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
- Lawful Intercept
- PIM Bidirectional Forwarding Detection (PIM BFD), PIM Snooping.
- QinQ VLAN Mapping
- Quality of Service: Classification (Layer 3 Packet Length, Time-to-Live (TTL)), per queue policer support, sharped profile enablement for egress per port queue, L2 Miss, Ingress Packet FIFO (IPF)
- Unicast over Point-to-Multipoint (P2MP) Generic Routing Encapsulation (GRE), Multicast over P2MP GRE.

Unsupported Features: Cisco Catalyst 9500 Series Switches - High Performance

- Cisco Application Visibility and Control (AVC)
- Flexlink+

- VLAN Load Balancing for FlexLink+
- Preemption for VLAN Load Balancing
- FlexLink+ Dummy Multicast Packets
- MPLS Label Distribution Protocol (MPLS LDP) VRF-Aware Static Labels
- Network-Based Application Recognition (NBAR) and Next-Generation NBAR (NBAR2)
- QoS Options on GRE Tunnel Interfaces
- Resilient Ethernet Protocol (REP)

Complete List of Supported Features

For the complete list of features supported on a platform, see the Cisco Feature Navigator at: https://cfnng.cisco.com.

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 (32C; 32QC; 48Y4C; 24Y4C): to see all the features supported on the C9500-24Y4C, C9500-32C, C9500-32QC, and C9500-48Y4C 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 Only

From Cisco IOS XE Gibraltar 16.11.1, the default interface for all High Performance 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.

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[1]	Description
Base PIDs		
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	

Switch Model	Default License Level[1]	Description
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	
Bundled PIDs		
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	

[1] 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[2]	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	
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	

Switch Model	Default License Level[2]	Description
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	

[2] 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	Cisco Catalyst 9500 Series Network Module 8-port 1/10 Gigabit Ethernet with SFP/SFP+ Note the supported switch models (Base PIDs): • C9500-40X • C9500-16X
C9500-NM-2Q	Cisco Catalyst 9500 Series Network Module 2-port 40 Gigabit Ethernet with QSFP+ Note the supported switch models (Base PIDs): • C9500-40X • C9500-16X

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

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
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 Cisco Prime Infrastructure 3.9 → **Downloads**.
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 Cisco Prime Infrastructure 3.9 → **Downloads**.
Amsterdam 17.3.8a	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack See Cisco Prime Infrastructure 3.10 → **Downloads**.
Amsterdam 17.3.8	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack See Cisco Prime Infrastructure 3.10 → **Downloads**.
Amsterdam 17.3.7	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack See Cisco Prime Infrastructure 3.10 → **Downloads**.
Amsterdam 17.3.6	2.7	-	PI 3.10 + PI 3.10 latest maintenance release + PI 3.10 latest device pack See Cisco Prime Infrastructure 3.10 → **Downloads**.
Amsterdam 17.3.5	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → **Downloads**.
Amsterdam 17.3.4	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → **Downloads**.

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
Amsterdam 17.3.3	2.7	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → **Downloads**.
Amsterdam 17.3.2a	2.7	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See Cisco Prime Infrastructure 3.8 → **Downloads**.
Amsterdam 17.3.1	2.7	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See Cisco Prime Infrastructure 3.8 → **Downloads**.
Amsterdam 17.2.1	2.7	-	PI 3.7 + PI 3.7 latest maintenance release + PI 3.7 latest device pack See Cisco Prime Infrastructure 3.7 → **Downloads**.
Amsterdam 17.1.1	2.7	-	PI 3.6 + PI 3.6 latest maintenance release + PI 3.6 latest device pack See Cisco Prime Infrastructure 3.6 → **Downloads**.
Gibraltar 16.12.8	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → Downloads.
Gibraltar 16.12.7	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → Downloads.
Gibraltar 16.12.6	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → Downloads.

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
Gibraltar 16.12.5b	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → Downloads.
Gibraltar 16.12.5	2.6	-	PI 3.9 + PI 3.9 latest maintenance release + PI 3.9 latest device pack See Cisco Prime Infrastructure 3.9 → Downloads.
Gibraltar 16.12.4	2.6	-	PI 3.8 + PI 3.8 latest maintenance release + PI 3.8 latest device pack See Cisco Prime Infrastructure 3.8 → Downloads.
Gibraltar 16.12.3a	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See Cisco Prime Infrastructure 3.5 → **Downloads**.
Gibraltar 16.12.3	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See Cisco Prime Infrastructure 3.5 → **Downloads**.
Gibraltar 16.12.2	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See Cisco Prime Infrastructure 3.5 → **Downloads**.
Gibraltar 16.12.1	2.6	-	PI 3.5 + PI 3.5 latest maintenance release + PI 3.5 latest device pack See Cisco Prime Infrastructure 3.5 → **Downloads**.
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 Cisco Prime Infrastructure 3.4 → **Downloads**.

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.9 → **Downloads**.
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 Cisco Prime Infrastructure 3.9 → **Downloads**.
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.4→ **Downloads**.

Catalyst 9500, 9500-High Performance and 9500X	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
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 Cisco Prime Infrastructure 3.4→ **Downloads**.
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 Cisco Prime Infrastructure 3.3→ **Downloads**.
Everest 16.6.4a	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Cisco Prime Infrastructure 3.1 → **Downloads**.
Everest 16.6.4	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Cisco Prime Infrastructure 3.1 → **Downloads**.
Everest 16.6.3	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Cisco Prime Infrastructure 3.1 → **Downloads**
Everest 16.6.2	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Cisco Prime Infrastructure 3.1 → **Downloads**
Everest 16.6.1	2.2	5.4 5.5	PI 3.1.6 + Device Pack 13 See Cisco Prime Infrastructure 3.1 → **Downloads**
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[3]	512 MB[4]	256	1280 x 800 or higher	Small

[3] We recommend 1 GHz
[4] 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)

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)
Bengaluru 17.5.1	17.5.1r	17.3.1r[FC2]	-
Bengaluru 17.4.1	17.4.1r	17.3.1r[FC2]	-

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

Upgrading the Switch Software

This section covers the various aspects of upgrading or downgrading the device software.

Note You cannot use the Web UI to install, upgrade, or downgrade device software.

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 Bengaluru 17.5.1	CAT9K_IOSXE	cat9k_iosxe.17.05.01.SPA.bin
	No Payload Encryption (NPE)	cat9k_iosxe_npe.17.05.01.SPA

Upgrading the ROMMON

To know the ROMMON or bootloader version that applies to every major and maintenance release, see ROMMON Versions, on page 14.

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

  On the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the series, *you must manually upgrade* the ROMMON in the primary SPI flash device, if a new version is applicable, and the release you are upgrading *from* is Cisco IOS XE Gibraltar 16.12.1 or a later release. (So if you upgrade from Cisco IOS XE Gibraltar 16.11.1 for example, a manual upgrade does not apply; the ROMMON is automatically updated, if applicable). Enter the **upgrade rom-monitor capsule primary switch** command in privileged EXEC mode.

  On the C9500-24Y4C, C9500-32C, C9500-32QC, and C9500-48Y4C models of the series, 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 when you boot up your switch with the new image for the first time.

- 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 **Supported starting from Cisco IOS XE Everest 16.6.2 and later releases**	
To install and activate the specified file, and to commit changes to be persistent across reloads: **install add file** *filename* [**activate commit**] To separately install, activate, commit, cancel, or remove the installation file: **install ?**	
add file tftp: *filename*	Copies the install file package from a remote location to the device and performs a compatibility check for the platform and image versions.
activate [**auto-abort-timer**]	Activates the file, and reloads the device. The **auto-abort-timer** keyword automatically rolls back image activation.
commit	Makes changes persistent over reloads.
rollback to committed	Rolls back the update to the last committed version.
abort	Cancels file activation, and rolls back to the version that was running before the current installation procedure started.
remove	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 **Note** **This table of commands is not supported on Cisco Catalyst 9500 Series Switches - High Performance.**	
Device# **request platform software package ?**	
clean	Cleans unnecessary package files from media
copy	Copies package to media
describe	Describes package content
expand	Expands all-in-one package to media
install	Installs the package
uninstall	Uninstalls the package
verify	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 **request platform software** commands	Cisco IOS XE Bengaluru 17.5.1
Cisco IOS XE Everest 16.6.2 and all later releases	On Cisco Catalyst 9500 Series Switches, either **install** commands or **request platform software** commands[5]. On Cisco Catalyst 9500 Series Switches - High Performance, only install commands[6].	

[5] The **request platform software** commands are deprecated. So although they are still visible on the CLI, we recommend that you use **install** commands.
[6] Introduced in Cisco IOS XE Fuji 16.8.1a.

The sample output in this section displays upgrade from Cisco IOS XE Bengaluru 17.4.1 to Cisco IOS XE Bengaluru 17.5.1 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 Wed Mar 18 19:51:48 UTC 2021
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
    cat9k-cc_srdriver.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-espbase.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-guestshell.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-rpbase.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-rpboot.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-sipbase.17.04.01.SPA.pkg
      File is in use, will not delete.
```

```
    cat9k-sipspa.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-srdriver.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-webui.17.04.01.SPA.pkg
      File is in use, will not delete.
    cat9k-wlc.17.04.01.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.17.04.01.SPA.pkg
/flash/cat9k-espbase.17.04.01.SPA.pkg
/flash/cat9k-guestshell.17.04.01.SPA.pkg
/flash/cat9k-rpbase.17.04.01.SPA.pkg
/flash/cat9k-rpboot.17.04.01.SPA.pkg
/flash/cat9k-sipbase.17.04.01.SPA.pkg
/flash/cat9k-sipspa.17.04.01.SPA.pkg
/flash/cat9k-srdriver.17.04.01.SPA.pkg
/flash/cat9k-webui.17.04.01.SPA.pkg
/flash/cat9k-wlc.17.04.01.SPA.pkg
/flash/packages.conf

Do you want to remove the above files? [y/n]y
[R0]:
Deleting file flash:cat9k-cc_srdriver.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-webui.17.04.01.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.17.04.01.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 Wed Mar 18 19:52:25 UTC 2021
Switch#
```

Step 2 Copy new image to flash

a) **copy tftp:***[[//location]/directory]/filename***flash:**

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.17.05.01.SPA.bin flash:
destination filename [cat9k_iosxe.17.05.01.SPA.bin]?
Accessing tftp://10.8.0.6/image/cat9k_iosxe.17.05.01.SPA.bin...
Loading /cat9k_iosxe.17.05.01.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    Mar 18 2021 10:18:11 -07:00 cat9k_iosxe.17.05.01.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.17.05.01.SPA.bin activate commit`.

The following sample output displays installation of the Cisco IOS XE Bengaluru 17.5.1 software image in the flash memory:

```
Switch# install add file flash:cat9k_iosxe.17.05.01.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: 17.5.01

install_add_activate_commit: Activating PACKAGE
Following packages shall be activated:
/flash/cat9k-wlc.17.05.01.SPA.pkg
/flash/cat9k-webui.17.05.01.SPA.pkg
/flash/cat9k-srdriver.17.05.01.SPA.pkg
/flash/cat9k-sipspa.17.05.01.SPA.pkg
/flash/cat9k-sipbase.17.05.01.SPA.pkg
/flash/cat9k-rpboot.17.05.01.SPA.pkg
/flash/cat9k-rpbase.17.05.01.SPA.pkg
/flash/cat9k-guestshell.17.05.01.SPA.pkg
/flash/cat9k-espbase.17.05.01.SPA.pkg
/flash/cat9k-cc_srdriver.17.05.01.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.17.04.01.SPA.pkg
      Removed cat9k-espbase.17.04.01.SPA.pkg
      Removed cat9k-guestshell.17.04.01.SPA.pkg
      Removed cat9k-rpbase.17.04.01.SPA.pkg
      Removed cat9k-rpboot.17.04.01.SPA.pkg
      Removed cat9k-sipbase.17.04.01.SPA.pkg
```

```
      Removed cat9k-sipspa.17.04.01.SPA.pkg
      Removed cat9k-srdriver.17.04.01.SPA.pkg
      Removed cat9k-webui.17.04.01.SPA.pkg
      Removed cat9k-wlc.17.04.01.SPA.pkg
    New files list:
      Added cat9k-cc_srdriver.17.05.01.SSA.pkg
      Added cat9k-espbase.17.05.01.SSA.pkg
      Added cat9k-guestshell.17.05.01.SSA.pkg
      Added cat9k-lni.17.05.01.SSA.pkg
      Added cat9k-rpbase.17.05.01.SSA.pkg
      Added cat9k-rpboot.17.05.01.SSA.pkg
      Added cat9k-sipbase.17.05.01.SSA.pkg
      Added cat9k-sipspa.17.05.01.SSA.pkg
      Added cat9k-srdriver.17.05.01.SSA.pkg
      Added cat9k-webui.17.05.01.SSA.pkg
      Added cat9k-wlc.17.05.01.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  Wed Mar 18 12:13:05 IST 2021

Switch#Mar 18 12:13:11.023: %PMANTACTION: F0/0vp: Process manager is exiting: n requested
Mar 18 12:13:11.028: %PMAN-5-EXITACTION: C1/0: pvp: Process manager is exiting: reload fru
 action requested
Mar 18 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 30-04-2021 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   Nov 15 2020 09:52:41 -07:00 cat9k-cc_srdriver.17.04.01.SPA.pkg
475141 -rw- 70333380  Nov 15 2020 09:52:44 -07:00 cat9k-espbase.17.04.01.SPA.pkg
475142 -rw- 13256     Nov 15 2020 09:52:44 -07:00 cat9k-guestshell.17.04.01.SPA.pkg
475143 -rw- 349635524 Nov 15 2020 09:52:54 -07:00 cat9k-rpbase.17.04.01.SPA.pkg
475149 -rw- 24248187  Nov 15 2020 09:53:02 -07:00 cat9k-rpboot.17.04.01.SPA.pkg
475144 -rw- 25285572  Nov 15 2020 09:52:55 -07:00 cat9k-sipbase.17.04.01.SPA.pkg
475145 -rw- 20947908  Nov 15 2020 09:52:55 -07:00 cat9k-sipspa.17.04.01.SPA.pkg
475146 -rw- 2962372   Nov 15 2020 09:52:56 -07:00 cat9k-srdriver.17.04.01.SPA.pkg
475147 -rw- 13284288  Nov 15 2020 09:52:56 -07:00 cat9k-webui.17.04.01.SPA.pkg
475148 -rw- 13248     Nov 15 2020 09:52:56 -07:00 cat9k-wlc.17.04.01.SPA.pkg

491524 -rw- 25711568  Mar 18 2021 11:49:33 -07:00 cat9k-cc_srdriver.17.05.01.SPA.pkg
491525 -rw- 78484428  Mar 18 2021 11:49:35 -07:00 cat9k-espbase.17.05.01.SPA.pkg
491526 -rw- 1598412   Mar 18 2021 11:49:35 -07:00 cat9k-guestshell.17.05.01.SPA.pkg
491527 -rw- 404153288 Mar 18 2021 11:49:47 -07:00 cat9k-rpbase.17.05.01.SPA.pkg
491533 -rw- 31657374  Mar 18 2021 11:50:09 -07:00 cat9k-rpboot.17.05.01.SPA.pkg
491528 -rw- 27681740  Mar 18 2021 11:49:48 -07:00 cat9k-sipbase.17.05.01.SPA.pkg
491529 -rw- 52224968  Mar 18 2021 11:49:49 -07:00 cat9k-sipspa.17.05.01.SPA.pkg
491530 -rw- 31130572  Mar 18 2021 11:49:50 -07:00 cat9k-srdriver.17.05.01.SPA.pkg
491531 -rw- 14783432  Mar 18 2021 11:49:51 -07:00 cat9k-webui.17.05.01.SPA.pkg
491532 -rw- 9160      Mar 18 2021 11:49:51 -07:00 cat9k-wlc.17.05.01.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.17.05.01.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 Mar 18 2021 10:59:16 -07:00 packages.conf
516098 -rw- 7406 Mar 18 2021 10:58:08 -07:00 cat9k_iosxe.17.05.01.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 Bengaluru 17.5.1 image on the device:

```
Switch# show version
Cisco IOS XE Software, Version 17.05.01
Cisco IOS Software [Bengaluru], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 17.5.1,
 RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2021 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 Bengaluru 17.5.x	• On Cisco Catalyst 9500 Series Switches, either **install** commands or **request platform software** commands[7]. • On Cisco Catalyst 9500 Series Switches - High Performance, only **install** commands	Cisco IOS XE Bengaluru 17.4.x or earlier releases.

[7] 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 Bengaluru 17.5.1 to Cisco IOS XE Bengaluru 17.4.1, 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 Wed Mar 17 11:42:27 IST 2021

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.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-espbase.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-guestshell.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-rpbase.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-rpboot.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-sipbase.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-sipspa.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-srdriver.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-webui.17.05.01.SSA.pkg
      File is in use, will not delete.
    cat9k-wlc.17.05.01.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  Wed Mar 17 11:42:39 IST 2021
```

Step 2 Copy new image to flash

a) **copy tftp:***[[//location]/directory]/filename***flash:**

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.17.04.01.SPA.bin flash:
Destination filename [cat9k_iosxe.17.04.01.SPA.bin]?
Accessing tftp://10.8.0.6//cat9k_iosxe.17.04.01.SPA.bin...
Loading /cat9k_iosxe.17.04.01.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 Mar 17 2021 13:35:16 -07:00 cat9k_iosxe.17.04.01.SPA.bin
11353194496 bytes total (9055866880 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 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.17.04.01.SPA.bin activate commit`.

The following example displays the installation of the Cisco IOS XE Amsterdam 17.3.1 software image to flash, by using the **install add file activate commit** command.

```
Switch# install add file flash:cat9k_iosxe.17.04.01.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: 17.04.01.0.269
install_add_activate_commit: Activating PACKAGE

Following packages shall be activated:
/flash/cat9k-wlc.17.04.01.SPA.pkg
/flash/cat9k-webui.17.04.01.SPA.pkg
/flash/cat9k-srdriver.17.04.01.SPA.pkg
/flash/cat9k-sipspa.17.04.01.SPA.pkg
/flash/cat9k-sipbase.17.04.01.SPA.pkg
/flash/cat9k-rpboot.17.04.01.SPA.pkg
/flash/cat9k-rpbase.17.04.01.SPA.pkg
/flash/cat9k-guestshell.17.04.01.SPA.pkg
/flash/cat9k-espbase.17.04.01.SPA.pkg
/flash/cat9k-cc_srdriver.17.04.01.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.17.05.01.SSA.pkg
      Removed cat9k-espbase.17.05.01.SSA.pkg
      Removed cat9k-guestshell.17.05.01.SSA.pkg
      Removed cat9k-lni.17.05.01.SSA.pkg
      Removed cat9k-rpbase.17.05.01.SSA.pkg
      Removed cat9k-rpboot.17.05.01.SSA.pkg
      Removed cat9k-sipbase.17.05.01.SSA.pkg
      Removed cat9k-sipspa.17.05.01.SSA.pkg
      Removed cat9k-srdriver.17.05.01.SSA.pkg
      Removed cat9k-webui.17.05.01.SSA.pkg
      Removed cat9k-wlc.17.05.01.SSA.pkg
    New files list:
      Added cat9k-cc_srdriver.17.04.01.SPA.pkg
      Added cat9k-espbase.17.04.01.SPA.pkg
      Added cat9k-guestshell.17.04.01.SPA.pkg
      Added cat9k-rpbase.17.04.01.SPA.pkg
      Added cat9k-rpboot.17.04.01.SPA.pkg
      Added cat9k-sipbase.17.04.01.SPA.pkg
      Added cat9k-sipspa.17.04.01.SPA.pkg
      Added cat9k-srdriver.17.04.01.SPA.pkg
      Added cat9k-webui.17.04.01.SPA.pkg
      Added cat9k-wlc.17.04.01.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  Wed Mar 17 11:51:01 IST 2021

Mar 17 11:51:07.505: %PMANTvp: Process manager is exiting: ren requested
Mar 17 11:51:07.505: %PMAN-5-EXITACTION: F0/0: pvp: Process manager is exiting: reload fru
 action requested
Mar 17 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 30-04-2021 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 Amsterdam 17.3.1 image on the device:

```
Switch# show version
Cisco IOS XE Software, Version 17.04.01
Cisco IOS Software [Bengaluru], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 17.4.1,
 RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2021 by Cisco Systems, Inc.
<output truncated>
```

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.

There is no FPGA upgrade in Cisco IOS XE Bengaluru 17.5.1. To check the current FPGA version, enter the **version -v** command in ROMMON 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.

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://cfnng.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.

  For more information, see Configuring Licenses on Cisco Catalyst 9000 Series Switches.

For a more detailed overview on Cisco Licensing, go to Cisco Software Licensing Guide.

License Levels - Usage Guidelines

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

Smart Licensing Using Policy	Smart Licensing
• Perpetual: There is no expiration date for such a license. • Subscription: The license is valid only until a certain date (for a three, five, or seven year period).	• Permanent: for a license level, and without an expiration date. • Term: for a license level, and for a three, five, or seven year period. • Evaluation: a license that is not registered.

- 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 3: Permitted Combinations

	DNA Essentials	DNA Advantage
Network Essentials	Yes	No
Network Advantage	Yes[8]	Yes

[8] 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

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 autonegotation, 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 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)
  - In-Service Software Upgrade (ISSU)—On Cisco Catalyst 9500 Series Switches (C9500-12Q, C9500-16X, C9500-24Q, C9500-40X), ISSU from Cisco IOS XE Fuji 16.9.x to Cisco IOS XE Gibraltar 16.10.x or to Cisco IOS XE Gibraltar 16.11.x is 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
  - 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).

- 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
  ```

- 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.
- The File System Check (fsck) utility is not supported in install mode.
- Switch Web UI allows configuration of data VLANs only and not voice VLANs. If you remove a voice VLAN configured to an interface using the Web UI, then all data VLANs associated with the interface are also removed by default.

Caveats

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

Cisco Bug Search Tool

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 Bengaluru 17.5.x

Identifier	Applicable Models	Description
CSCvx23125	Catalyst 9500 High Performance	SVL Link Instability May Result in IOMD Exhaustion

Resolved Caveats in Cisco IOS XE Bengaluru 17.5.1

Identifier	Applicable Models	Description
CSCvw67001	All models	17.4.1 : With Macsec failover to standby switch port in portchannel causes multicast traffic drop.
CSCvx60124	All models	Traffic failed if incoming interface MPLS and 2+ outgoing interfaces (ECMP) with recursive routing

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://cfnng.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 results 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.

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED “AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

All printed copies and duplicate soft copies of this document are considered uncontrolled. See the current online version for the latest version.

Cisco has more than 200 offices worldwide. Addresses and phone numbers are listed on the Cisco website at www.cisco.com/go/offices.

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

© 2021 Cisco Systems, Inc. All rights reserved.