Release Notes for Cisco Catalyst 9500 Series Switches, Cisco IOS XE Everest 16.6.x

First Published: July 31, 2017
Last Updated: March 01, 2021

This release note gives an overview of the hardware and software with the Cisco IOS XE Everest 16.6.x, on the Cisco Catalyst 9500 Series Switches.

Unless otherwise noted, the terms *switch* and *device* refer to a standalone switch.

- For information about unsupported features, see Important Notes, page 9
- For information about software and hardware restrictions and limitations, see Limitations and Restrictions, page 32.
- For information about open issues with the software, see Caveats, page 35.

Introduction

Cisco Catalyst 9500 Series Switches are Cisco's lead purpose-built fixed core and aggregation enterprise switching platform built for security, IoT and Cloud.

These switches deliver complete convergence in terms of ASIC architecture with a Unified Access Data Plane (UADP) 2.0. The platform runs an Open Cisco IOS XE that supports model driven programmability, has the capacity to host containers, and run 3rd party applications and scripts natively within the switch (by virtue of x86 CPU architecture, local storage, and a higher memory footprint). The series forms the foundational building block for Software Defined-Access (SD-Access), which is Cisco's lead enterprise architecture.

Cisco Catalyst 9500 Series Switches are purpose-built 40 Gigabit switches, targeted for enterprise campus, delivering unmatched table scales (MAC/route/ACL) and buffering for enterprise applications. It offers non-blocking 40G (QSFP) switches with granular port densities that fit diverse campus needs. The series also supports all the foundational high availability capabilities, and redundant platinum rated power supplies and fans.

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Whats New in Cisco IOS XE Everest 16.6.10

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.9

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.8

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.7

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.6

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.5

There are no new hardware or software features in this release

Whats New in Cisco IOS XE Everest 16.6.4a

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.4

There are no new hardware or software features in this release.

Whats New in Cisco IOS XE Everest 16.6.3

There are no new hardware and software features in this release.

Whats New in Cisco IOS XE Everest 16.6.2

Software Features in Cisco IOS XE Everest 16.6.2

Feature Name	Description
Software Install	The Software Install feature facilitates moving from one version of the software to another version in install mode. See System Management -> Performing Device Setup Configuration.
YANG Data Models	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/1662. 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 Essentials)

Whats New in Cisco IOS XE Everest 16.6.1

Hardware Features in Cisco IOS XE Everest 16.6.1

Feature Name	Description
40-Gigabit Ethernet QSFP and 10-Gigabit Ethernet SFP Switch Models • C9500-12Q • C9500-40X-2Q • C9500-40X • C9500-48X	These Cisco Catalyst 9500 Series Switches are supported: • C9500-12Q—12 40-Gigabit Ethernet QSFP ports and two power supply slots • C9500-40X-2Q—40 10-Gigabit Ethernet SFP ports and a 2-Port 40-Gigabit Ethernet (QSFP) network module on uplink ports; and two power supply slots • C9500-40X—40 10-Gigabit Ethernet SFP ports and two power supply slots; support for optional network modules on uplink ports — 8-Port 10 Gigabit Ethernet (SFP) and 2-Port 40 Gigabit Ethernet (QSFP) • C9500-48X—40 10-Gigabit Ethernet SFP ports and an 8-Port 10-Gigabit Ethernet (SFP) network module on uplink ports; and two power supply slots See the Cisco Catalyst 9500 Series Switches Hardware Installation Guide.
Cisco QSFP to SFP or SFP+ Adapter (Cisco QSA Module) —CVR-QSFP-SFP10G	The Cisco Catalyst 9500 Series Switches support the Cisco QSA Module, which is a pluggable adapter that converts a QSFP port in to an SFP+ port. You can connect only an SFP+ module. See SFP and QSFP Module Ports.

Software Features in Cisco IOS XE Everest 16.6.1

Feature Name	Description and License Level Information
New in Wired Switching	
Cisco Discovery Protocol Bypass	A backward compatible mode, equivalent to not having Cisco Discovery Protocol support. When the feature is enabled, Cisco Discovery Protocol packets are received and transmitted unchanged. Received packets are not processed. No packets are generated. In this mode, 'bump-in-the-wire' behavior is applied to Cisco Discovery Protocol packets. See Security -> Cisco Discovery Protocol Bypass. (Network Essentials and Network Advantage)

Cisco Nonstop Forwarding (NSF) Support for IPv6	Cisco NSF is now supported for IPv6 traffic. Cisco NSF works with the Stateful switchover (SSO) feature to minimize the amount of time a network is unavailable to its users following a switchover. See High Availability -> Configuring NSF with SSO. (Network Advantage)
Cisco StackWise Virtual • Minimum Latency Load Balancing • Dual-active-detection using Enhanced Port Aggregation Protocol (ePAGP)	A network system virtualization technology that pairs two switches into one virtual switch to simplify operational efficiency with a single control and management plane. The feature supports: • Minimum Latency Load Balancing—Here, in a Cisco StackWise Virtual setup, Multichassis EtherChannel forwards traffic over the local link, irrespective of the hash result. • Dual-active-detection using ePAgP—Involves detection of a dual-active scenario using on Multichassis EtherChannel, between the switches in a Cisco StackWise Virtual setup. **Note** On the Cisco Catalyst 9500 Series Switches, this feature is supported only on the C9500-24Q switch model See High Availability -> Configuring Cisco StackWise Virtual. (Network Advantage)
High Availability— Graceful Insertion and Removal (GIR)	Uses a maintenance mode to isolate the switch from the network in order to perform debugging, or an upgrade. GIR is supported for Layer 2 interface shutdown and the Intermediate System to Intermediate System (IS-IS) routing protocol. When you place the switch in maintenance mode, supported protocols are isolated, and Layer 2 interfaces are shut down. When normal mode is restored, the supported protocols and ports are brought back up. See High Availability -> Configuring Graceful Insertion and Removal (GIR). (Network Advantage)
Internet Group Management Protocol (IGMP) Explicit Tracking	Enables a multicast device to explicitly track the membership of all multicast hosts in a particular multiaccess network. The explicit tracking of hosts, groups, and channels enables the device to keep track of each individual host that is joined to a particular group or channel. See IP Multicast Routing -> IGMP Explicit Tracking. (Network Essentials and Network Advantage)

IPv6 Multicast with Virtual Private Networks (VPN) Routing Forwarding Table (VRF-Lite)	Allows a service provider to support two or more VPNs with overlapping IP addresses using one interface. VRF-Lite uses input interfaces to distinguish routes for different VPNs and forms virtual packet-forwarding tables by associating one or more Layer 3 interfaces with each VRF. See IP Multicast Routing -> Configuring VRF-lite. (Network Advantage)
Locator ID Separator Protocol (LISP) Extranet Support and Source Group Access Control List (SGACL) Cell Statistics	• LISP Extranet Support—Refers to subscriber to provider communication across instance IDs in a LISP network. With LISP Extranet support, hosts in VRF "A", for example, can access shared resources in VRF "B". • SGACL Cell Statistics—An enhancement in the **show cts role-based counters ipv4** command, to display all SGACL enforcement statistics for IPv4, providing visibility at the cell level. See Campus Fabric. (DNA Advantage)

Multiprotocol Label Switching • Ethernet over MPLS (EoMPLS) • Virtual Private LAN Services (VPLS) • EIGRP MPLS VPN PE-CE Site of Origin (SoO) • Route Target Rewrite • external BGP (eBGP) and internal BGP (iBGP) OR eiBGP • IPv6 Provider Edge over MPLS (6PE) • IPv6 VPN Provider Edge over MPLS (6VPE)	The following MPLS features are introduced in this release: • EoMPLS—One of the Any Transport over MPLS (AToM) transport types. EoMPLS provides a tunneling mechanism for Ethernet traffic through an MPLS-enabled Layer 3 core. It encapsulates Ethernet protocol data units (PDUs) inside MPLS packets and uses label stacking to forward them across the MPLS network. • VPLS—A class of VPN that supports the connection of multiple sites in a single bridged domain over a managed IP/MPLS network. VPLS uses the provider core to join multiple attachment circuits together, to simulate a virtual bridge that connects the multiple attachment circuits together. • EIGRP MPLS VPN PE-CE SoO—Introduces the capability to filter MPLS Virtual Private Network (VPN) traffic on a per-site basis for Enhanced Interior Gateway Routing Protocol (EIGRP) networks. SoO filtering is configured at the interface level and is used to manage MPLS VPN traffic, and to prevent transient routing loops from occurring in complex and mixed network topologies. • Route Target Rewrite—Allows the replacement of route targets on incoming and outgoing Border Gateway Protocol (BGP) updates. Route targets are carried as extended community attributes in BGP Virtual Private Network IP Version 4 (VPNv4) updates. Route target extended community attributes are used to identify a set of sites and VPN routing and forwarding (VRF) instances that can receive routes with a configured route target. • eiBGP— Enables you to configure multipath load balancing with both eBGP and iBGP paths in Border Gateway Protocol (BGP) networks that are configured to use MPLS VPNs. The feature provides improved load balancing deployment and service offering capabilities and is useful for multi-homed autonomous systems and Provider Edge (PE) routers that import both eBGP and iBGP paths from multihomed and stub networks. • 6PE—A technique that provides global IPv6 reachability over IPv4 MPLS. It allows one shared routing table for all other devices. 6PE allows IPv6 domains to communicate with one another over the IPv4 without an explicit tunnel setup, requiring only one IPv4 address per IPv6 domain. • 6VPE—A mechanism to use the IPv4 backbone to provide VPN IPv6 services. 6VPE is like a regular IPv4 MPLS-VPN provider edge, with an addition of IPv6 support within VRF. It provides logically separate routing table entries for VPN member devices. See Multiprotocol Label Switching. (Network Advantage)

Programmability • Zero-Touch Provisioning (ZTP): HTTP Download. • Model-Driven Telemetry • Preboot Execution Environment Client (iPXE) • YANG Data Models	Programmability features introduced or enhanced in this release: • ZTP—Now supports HTTP file download along with TFTP file download. • Model-Driven Telemetry—Provides a mechanism to stream data from a Model-Driven Telemetry-capable device, to a destination. The data to be streamed is driven through subscription. The feature is enabled automatically, when NETCONF-YANG is started on a device. • iPXE—An open Preboot eXecution Environment (PXE) client that allows a device to boot from a network boot image. iPXE is supported with IPv4 only. • 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/1661. 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. See the Programmability Configuration Guide, Cisco IOS XE Everest 16.6.1. (Network Essentials and Network Advantage)
Software Maintenance Upgrade (SMU)	SMU is a package that can be installed on a system, to provide a patch fix or security resolution to a released image. See System Management -> Software Maintenance Upgrade. (DNA Advantage)
Stateful Switchover (SSO) Support for IPv6	SSO is now supported for IPv6 traffic. With this feature, when an active switch fails, the standby switch starts up in a fully-initialized state and synchronizes with the persistent configuration and the running configuration of the active switch. The new active switch uses existing Layer 2 switching information to continue forwarding traffic. See High Availability -> Configuring NSF with SSO. (Network Essentials and Network Advantage)
Virtual Private Network Routing and Forwarding-Aware (VRF-Aware) Generic Routing Encapsulation (GRE)	Enables you to configure the source and destination of a GRE IP tunnel to belong to any VRF table. See Routing -> Configuring Generic Routing Encapsulation (GRE) Tunnel IP Source and Destination VRF Membership. (Network Advantage)

New on the Web User Interface	
Web UI support for DNS Proxy and troubleshooting	Features introduced and updated on the Web UI in this release: • DNS Proxy Support • Troubleshooting- Audit Device Configuration • Troubleshooting- Debug Bundle

Important Notes

The following are the unsupported hardware and software features for the Cisco Catalyst 9500 Series Switches. For the list of supported features, go to http://www.cisco.com/go/cfn.

- Unsupported Hardware Features
  - The rear USB 3.0 Port
  - Breakout cables and breakout LED
- Unsupported Software Features:
  - IPsec with FIPS

  The following features are supported on the Cisco Catalyst 3850 Series Switches, but not on the Cisco Catalyst 9500 Series Switches:
  - 128-bit and 256-bit AES MACsec (IEEE 802.1AE) host link encryption (downlinks) with MACsec Key Agreement (MKA)
  - Audio Video Bridging (including IEEE802.1AS, IEEE 802.1Qat, and IEEE 802.1Qav)
  - Bluetooth
  - Cisco Plug-in for OpenFlow 1.3
  - Gateway Load Balancing Protocol (GLBP)
  - IPsec VPN
  - Multicast—Bidirectional PIM

Supported Hardware

Cisco Catalyst 9500 Series Switches—Model Numbers

Table 1 lists the supported hardware models and the default license levels they are delivered with.

The Base PIDs are the model numbers of the switch.

The 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** on such a (bundled PID) switch displays its base PID.

More information about licensing is in section License Levels, page 30

Table 1 Cisco Catalyst 9500 Series Switches—Model Numbers

Switch Model	Default License[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	
C9500-24Q-E	Network Essentials	Cisco Catalyst 9500 Series 24-Port 40 Gigabit Ethernet.
C9500-24Q-A	Network Advantage	
C9500-40X-E	Network Essentials	40 10-Gigabit Ethernet SFP ports and two power supply slots; support for optional network modules on uplink ports — 8-Port 10 Gigabit Ethernet(SFP) and 2-Port 40 Gigabit Ethernet(QSFP)
C9500-40X-A	Network Advantage	
Bundled PIDs		
C9500-40X-2Q-E	Network Essentials	40 10-Gigabit Ethernet SFP ports and a 2-Port 40-Gigabit Ethernet (QSFP) network module on uplink ports; and two power supply slots
C9500-40X-2Q-A	Network Advantage	
C9500-48X-E	Network Essentials	40 10-Gigabit Ethernet SFP ports and an 8-Port 10-Gigabit Ethernet (SFP) network module on uplink ports; and two power supply slots
C9500-48X-E	Network Advantage	

1. See Table 8 Permitted Combinations, for information about the add-on licenses that you can order

Optics Modules

Catalyst switches support a wide range of optics. Because the list of supported optics is updated on a regular basis, consult the tables at this URL for the latest (SFP) compatibility information:

http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html

Compatibility Matrix

Table 2 Software Compatibility Matrix

Catalyst 9500	Cisco Identity Services Engine	Cisco Access Control Server	Prime Infrastructure
Everest 16.6.10	2.4	5.4 5.5	PI 3.9 See Prime Infrastructure 3.9 on cisco.com
Everest 16.6.9	2.4	5.4 5.5	PI 3.9 See Prime Infrastructure 3.9 on cisco.com
Everest 16.6.8	2.4	5.4 5.5	PI 3.8 See Prime Infrastructure 3.8 on cisco.com
Everest 16.6.7	2.2 2.3 2.4	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.6	2.2 2.3 2.4	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.5	2.2 2.3 2.4	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.4a	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.4	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.3	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.2	2.2 2.3	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.6.1	2.2	5.4 5.5	PI 3.1.6 + Device Pack 13 See Prime Infrastructure 3.1 on cisco.com.
Everest 16.5.1a	2.1 Patch 3	5.4 5.5	-

Web UI System Requirements

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

Hardware Requirements

Table 3 Minimum Hardware Requirements

Processor Speed	DRAM	Number of Colors	Resolution	Font Size
233 MHz minimum[1]	512 MB[2]	256	1024 x 768	Small

1. We recommend 1 GHz.
2. We recommend 1 GB DRAM.

Software Requirements

- Operating Systems
  - Windows 10 or later
  - Mac OS X 10.11 or later
- Browsers
  - Google Chrome—Version 38 and later (On Windows and Mac)
  - Microsoft Internet Explorer—Version 11 or later (On Windows 7 and Windows XP), and Microsoft Edge (On Windows 10)
  - Mozilla Firefox—Version 33 and later (On Windows and Mac)
  - Safari—Version 7 and later (On Mac)

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.

Table 4 Software Images

Release	Image	File Name
Cisco IOS XE Everest 16.6.10	CAT9K_IOSXE	cat9k_iosxe.16.06.10.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.10.SPA.bin
Cisco IOS XE Everest 16.6.9	CAT9K_IOSXE	cat9k_iosxe.16.06.09.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.09.SPA.bin
Cisco IOS XE Everest 16.6.8	CAT9K_IOSXE	cat9k_iosxe.16.06.08.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.08.SPA.bin
Cisco IOS XE Everest 16.6.7	CAT9K_IOSXE	cat9k_iosxe.16.06.07.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.07.SPA.bin
Cisco IOS XE Everest 16.6.6	CAT9K_IOSXE	cat9k_iosxe.16.06.06.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.06.SPA.bin
Cisco IOS XE Everest 16.6.5	CAT9K_IOSXE	cat9k_iosxe.16.06.05.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.05.SPA.bin
Cisco IOS XE Everest 16.6.4a	CAT9K_IOSXE	cat9k_iosxe.16.06.04a.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.04a.SPA.bin
Cisco IOS XE Everest 16.6.4	CAT9K_IOSXE	cat9k_iosxe.16.06.04.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.04.SPA.bin
Cisco IOS XE Everest 16.6.3	CAT9K_IOSXE	cat9k_iosxe.16.06.03.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.03.SPA.bin
Cisco IOS XE Everest 16.6.2	CAT9K_IOSXE	cat9k_iosxe.16.06.02.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.02.SPA.bin
Cisco IOS XE Everest 16.6.1	CAT9K_IOSXE	cat9k_iosxe.16.06.01.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.06.01.SPA.bin

Upgrading the Switch Software

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

This section covers the following:

- Automatic Boot Loader Upgrade
- Upgrading in Install Mode
- Downgrading in Install Mode

Note From Cisco IOS XE Everest 16.6.2 onwards, we support new **install** commands. These **install** commands are supported along with the previously supported **request platform software** commands. Both set of commands are supported at present.

Table 5 request platform software Commands to Upgrade or Downgrade Switch Software

Switch# **request platform software package?**	
clean	Cleans unnecessary package files from media.
copy	Copies package to media.
describe	Describes package contents.
expand	Expands all-in-one package to media.
install	Installs package.
uninstall	Uninstalls package.
verify	Verifies ISSU software package compatibility.

Table 6 install Commands to Upgrade or Downgrade Switch Software

Switch# **install add file** *filename* [**activate commit**]—Use this command to install and activate the specified file, and to commit changes to be persistent across reloads.	
Switch# **install ?** —You can also use the **install** command to separately install, activate, commit, abort, or remove the installation file.	
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 the image activation.
commit	Makes changes persistent over reloads.
rollback to committed	Rolls back the update to the last committed version.
abort	Aborts the 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.

Automatic Boot Loader Upgrade

When you upgrade from the existing release on your switch to a later or newer release for the first time, the boot loader may be automatically upgraded, based on the hardware version of the switch. If the boot loader is automatically upgraded, it will take effect on the next reload. If you go back to the older release after this, the boot loader is not downgraded. The updated boot loader supports all previous releases.

For subsequent IOS XE 16.x.x releases, if there is a new boot loader in that release, it may be automatically upgraded based on the hardware version of the switch when you boot up your switch with the new image for the first time.

Caution Do not power cycle your switch during the upgrade.

Table 7 Automatic Boot Loader Response

Scenario	Automatic Boot Loader Response

If you boot Cisco IOS XE Everest 16.6.2,
or Cisco IOS XE Everest 16.6.3,
or Cisco IOS XE Everest 16.6.4,
or Cisco IOS XE Everest 16.6.4a,
or Cisco IOS XE Everest 16.6.5,
or Cisco IOS XE Everest 16.6.6,
or Cisco IOS XE Everest 16.6.7,
or Cisco IOS XE Everest 16.6.8,
or Cisco IOS XE Everest 16.6.9,
or Cisco IOS XE Everest 16.6.10
for the first time
	The boot loader may be upgraded to version 16.6.1r [FC1]. For example:
	`ROM: IOS-XE ROMMON`
	`BOOTLDR: System Bootstrap, Version 16.6.1r [FC1], RELEASE SOFTWARE (P)`
	If the automatic boot loader upgrade occurs while booting, you will see the following on the console:
	`%IOSXEBOOT-Wed-###: (rp/0): Nov 03 18:57:44 Universal 2017 PLEASE DO NOT POWER CYCLE ###BOOT LOADER UPGRADING 4`
	`Both links down, not waiting for other switches`
	`Switch number is 1`
	`%IOSXEBOOT-loader-boot: (rp/0): upgrade successful 4`

If you boot Cisco IOS XE Everest 16.6.1 the first time	The boot loader may be upgraded to version 16.6.1r [FC1]. For example:
	`ROM: IOS-XE ROMMON`
	`BOOTLDR: System Bootstrap, Version 16.6.1r [FC1], RELEASE SOFTWARE (P)`
	If the automatic boot loader upgrade occurs while booting Cisco IOS XE Everest 16.6.1, you will see the following on the console:
	`%IOSXEBOOT-Wed-###: (rp/0): Jul 26 16:57:44 Universal 2017 PLEASE DO NOT POWER CYCLE ###BOOT LOADER UPGRADING 4`
	`Both links down, not waiting for other switches`
	`Switch number is 1`
	`%IOSXEBOOT-loader-boot: (rp/0): upgrade successful 4`

Upgrading in Install Mode

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

In Cisco IOS XE Everest 16.6.2, a new set of **install** commands have been introduced for the install and upgrade of images in install mode. You can either use the **install** commands or the **request platform software** commands for install, upgrade, and downgrade of software images. For more information, see the Software Install chapter of the *System Management Configuration Guide*.

Note The **install** commands are available only from Cisco IOS XE Everest 16.6.2.

The sample output in this section covers upgrade from Cisco IOS XE Everest 16.5.1a to Cisco IOS XE Everest 16.6.1 and from Cisco IOS XE Everest 16.6.1 to Cisco IOS XE Everest 16.6.2 in Install Mode.

This section provides examples of both **request platform software** and **install** commands.

Summary Steps—Clean Up > Copy New Image to Flash > Set Boot Variable> Set Boot Variable > Reload

Clean Up

Step 1 Ensure that you have at least 1GB of space in flash to expand a new image. Clean up old installation files in case of insufficient space. The following sample output displays the cleaning up of Cisco IOS XE Everest 16.5.1a files

```
Switch# request platform software package clean

Running command on switch 1
Cleaning up unnecessary package files
No path specified, will use booted path flash:packages.conf
Cleaning flash:
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat9k-cc_srdriver.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-espbase.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-guestshell.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-rpbase.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-rpboot.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-sipbase.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-sipspa.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-srdriver.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-webui.16.05.01a.SPA.pkg
      File is in use, will not delete.
    cat9k-wlc.16.05.01a.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:
[1]:
/flash/cat9k-cc_srdriver.2017-07-26_17.04.SPA.pkg
/flash/cat9k-espbase.2017-07-26_17.04.SPA.pkg
/flash/cat9k-guestshell.2017-07-26_17.04.SPA.pkg
/flash/cat9k-rpbase.2017-07-26_17.04.SPA.pkg
/flash/cat9k-rpboot.2017-07-26_17.04.SPA.pkg
/flash/cat9k-sipbase.2017-07-26_17.04.SPA.pkg
/flash/cat9k-sipspa.2017-07-26_17.04.SPA.pkg
/flash/cat9k-srdriver.2017-07-26_17.04.SPA.pkg
/flash/cat9k-webui.2017-07-26_17.04.SPA.pkg
```

```
/flash/cat9k_iosxe.16.05.01a.SPA.conf
/flash/cat9k_iosxe.16.06.01.SPA.bin
/flash/packages.conf.00-

Do you want to proceed? [y/n]y
[1]:
Deleting file flash:cat9k-cc_srdriver.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k-webui.2017-07-26_17.04.SPA.pkg ... done.
Deleting file flash:cat9k_iosxe.16.05.01a.SPA.conf ... done.
Deleting file flash:cat9k_iosxe.16.06.01.SPA.bin ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
Switch#
```

You can also use the **install remove inactive** command to clean up old installation files in case of insufficient space. The following sample output displays the cleaning up of Cisco IOS XE Everest 16.6.1 files:

```
Switch# install remove inactive

    install_remove: START Mon Oct 30 19:51:48 UTC 2017
    Cleaning up unnecessary package files
      Scanning boot directory for packages ... done.
      Preparing packages list to delete ...
      done.

    The following files will be deleted:
    [switch 1]:
    /flash/cat9k-cc_srdriver.16.06.01.SPA.pkg
    /flash/cat9k-espbase.16.06.01.SPA.pkg
    /flash/cat9k-guestshell.16.06.01.SPA.pkg
    /flash/cat9k-rpbase.16.06.01.SPA.pkg
    /flash/cat9k-rpboot.16.06.01.SPA.pkg
    /flash/cat9k-sipbase.16.06.01.SPA.pkg
    /flash/cat9k-sipspa.16.06.01.SPA.pkg
    /flash/cat9k-srdriver.16.06.01.SPA.pkg
    /flash/cat9k-webui.16.06.01.SPA.pkg
    /flash/cat9k-wlc.16.06.01.SPA.pkg
    /flash/packages.conf

    Do you want to remove the above files? [y/n]y
    [switch 1]:
    Deleting file flash:cat9k-cc_srdriver.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-espbase.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-guestshell.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-rpbase.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-rpboot.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-sipbase.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-sipspa.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-srdriver.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-webui.16.06.01.SPA.pkg ... done.
    Deleting file flash:cat9k-wlc.16.06.01.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 Oct 30 19:52:25 UTC 2017
Switch#
```

Copy New Image to Flash

Step 2 Copy the new image to flash: (or skip this step if you want to use the new image from your TFTP server)

```
Switch# copy tftp://10.8.0.6//cat9k_iosxe.16.06.01.SPA.bin flash:
Destination filename [cat9k_iosxe.16.06.01.SPA.bin]?

Accessing tftp://10.8.0.6//cat9k_iosxe.16.06.01.SPA.bin...
Loading /cat9k_iosxe.16.06.01.SPA.bin from 10.8.0.6 (via GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 601216545 bytes]

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

Step 3 Use the **dir flash** 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 26 2017 10:18:11 -07:00  cat9k_iosxe.16.06.01.SPA.bin
11353194496 bytes total (8976625664 bytes free)
```

Set Boot Variable

Step 4 Use the boot system flash:packages.conf command to set the boot variable.

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

Use the write memory command to save boot settings.

```
Switch# write memory
```

Use this command to verify **BOOT variable = flash:packages.conf**

```
Switch# show boot system
```

Software Install Image to Flash

Use the **request platform software package install switch all file flash:** command to install the target image to flash. You can point to the source image on your TFTP server or in flash if you have it copied to flash.

Note On a device where the Cisco StackWise Virtual feature is configured, we recommend copying the image to a TFTP server or the flash drive of the active switch. If you point to an image on the flash or USB drive of the standby (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 standby switch 2(flash-2):

```
Switch# request platform software package install switch all file
flash-2:cat9k_iosxe.16.06.01.SPA.bin
<output truncated>
Expanding image file: flash-2: cat9k_iosxe.16.06.01.SPA.bin
[3]: Copying flash-2: cat9k_iosxe.16.06.01.SPA.bin from switch 2 to switch 1
<output truncated>
```

The following example displays the installation of Cisco IOS XE Everest 16.6.1 software image:

```
Switch# request platform software package install switch all file
flash:cat9k_iosxe.16.06.01.SPA.bin

--- Starting install local lock acquisition on switch 1 ---
Finished install local lock acquisition on switch 1

Expanding image file: flash:cat9k_iosxe.16.06.01.SPA.bin
[]: Finished copying to switch
[1]: Expanding file
[1]: Finished expanding all-in-one software package in switch 1
SUCCESS: Finished expanding all-in-one software package.
[1]: Performing install
  SUCCESS: install finished
[1]: install package(s) on switch 1
--- Starting list of software package changes ---
Old files list:
  Removed cat9k-cc_srdriver.16.05.01a.SPA.pkg
  Removed cat9k-espbase.16.05.01a.SPA.pkg
  Removed cat9k-guestshell.16.05.01a.SPA.pkg
  Removed cat9k-rpbase.16.05.01a.SPA.pkg
  Removed cat9k-rpboot.16.05.01a.SPA.pkg
  Removed cat9k-sipbase.16.05.01a.SPA.pkg
  Removed cat9k-sipspa.16.05.01a.SPA.pkg
  Removed cat9k-srdriver.16.05.01a.SPA.pkg
  Removed cat9k-webui.16.05.01a.SPA.pkg
  Removed cat9k-wlc.16.05.01a.SPA.pkg
New files list:
  Added cat9k-cc_srdriver.16.06.01.SPA.pkg
  Added cat9k-espbase.16.06.01.SPA.pkg
  Added cat9k-guestshell.16.06.01.SPA.pkg
  Added cat9k-rpbase.16.06.01.SPA.pkg
  Added cat9k-rpboot.16.06.01.SPA.pkg
  Added cat9k-sipbase.16.06.01.SPA.pkg
  Added cat9k-sipspa.16.06.01.SPA.pkg
  Added cat9k-srdriver.16.06.01.SPA.pkg
  Added cat9k-webui.16.06.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned.  New software will load on reboot.
[1]: Finished install successful on switch 1
Checking status of install on [1]
[1]: Finished install in switch 1
SUCCESS: Finished install: Success on [1]
```

Note Old files listed in the logs will not be removed from flash.

You can also use the **install add file activate commit** command to install the target image to flash. This example displays the upgrade to Cisco IOS XE Everest 16.6.2.

```
Switch# install add file flash:cat9k_iosxe.16.06.02.SPA.bin activate commit

install_add_activate_commit: START Mon Oct 30 19:54:51 UTC 2017

System configuration has been modified.
Press Yes(y) to save the configuration and proceed.
Press No(n) for proceeding without saving the configuration.
Press Quit(q) to exit, you may save configuration and re-enter the command.
[y/n/q]yBuilding configuration...

[OK]Modified configuration has been saved
```

```
*Oct 30 19:54:55.633: %IOSXE-5-PLATFORM: Switch 1 R0/0: Oct 30 19:54:55
install_engine.sh: %INSTALL-5-INSTALL_START_INFO: Started install one-shot
flash:cat9k_iosxe.16.06.02.SPA.bininstall_add_activate_commit: Adding PACKAGE

This operation requires a reload of the system. Do you want to proceed?
Please confirm you have changed boot config to flash:packages.conf [y/n]y

--- Starting initial file syncing ---
Info: Finished copying flash:cat9k_iosxe.16.06.02.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
Checking status of Add on [1]
Add: Passed on [1]
Finished Add

install_add_activate_commit: Activating PACKAGE
Following packages shall be activated:
/flash/cat9k-wlc.16.06.02.SPA.pkg
/flash/cat9k-webui.16.06.02.SPA.pkg
/flash/cat9k-srdriver.16.06.02.SPA.pkg
/flash/cat9k-sipspa.16.06.02.SPA.pkg
/flash/cat9k-sipbase.16.06.02.SPA.pkg
/flash/cat9k-rpboot.16.06.02.SPA.pkg
/flash/cat9k-rpbase.16.06.02.SPA.pkg
/flash/cat9k-guestshell.16.06.02.SPA.pkg
/flash/cat9k-espbase.16.06.02.SPA.pkg
/flash/cat9k-cc_srdriver.16.06.02.SPA.pkg

This operation requires a reload of the system. Do you want to proceed? [y/n]y
--- Starting Activate ---
Performing Activate on all members
  [1] Activate package(s) on switch 1
  [1] Finished Activate on switch 1
Checking status of Activate on [1]
Activate: Passed on [1]
Finished Activate

--- Starting Commit ---
Performing Commit on all members

*Oct 30 19:57:41.145: %IOSXE-5-PLATFORM: Switch 1 R0/0: Oct 30 19:57:41
rollback_timer.sh: %INSTALL-5-INSTALL_AUTO_ABORT_TIMER_PROGRESS: Install auto abort
timer will expire in 7200 seconds  [1] Commit package(s) on switch 1
  [1] Finished Commit on switch 1
Checking status of Commit on [1]
Commit: Passed on [1]
Finished Commit

Install will reload the system now!
SUCCESS: install_add_activate_commit  Mon Oct 30 19:57:48 UTC 2017

Switch#
```

Note The system reloads automatically after executing the **install add file activate commit** command. There is no need to manually reload the system.

Step 5 After the software has been successfully installed, verify that the flash partition has nine new .pkg files and three .conf files. See sample output below. The following is sample output from the **dir flash:** command in Cisco IOS XE Everest 16.6.1:

```
Switch# dir flash:*.pkg

Directory of flash:/*.pkg

Directory of flash:/

475140 -rw-   2012104 Jul 26 2017 09:52:41 -07:00  cat9k-cc_srdriver.16.05.01a.SPA.pkg
475141 -rw-  70333380 Jul 26 2017 09:52:44 -07:00  cat9k-espbase.16.05.01a.SPA.pkg
475142 -rw-     13256 Jul 26 2017 09:52:44 -07:00  cat9k-guestshell.16.05.01a.SPA.pkg
475143 -rw- 349635524 Jul 26 2017 09:52:54 -07:00  cat9k-rpbase.16.05.01a.SPA.pkg
475149 -rw-  24248187 Jul 26 2017 09:53:02 -07:00  cat9k-rpboot.16.05.01a.SPA.pkg
475144 -rw-  25285572 Jul 26 2017 09:52:55 -07:00  cat9k-sipbase.16.05.01a.SPA.pkg
475145 -rw-  20947908 Jul 26 2017 09:52:55 -07:00  cat9k-sipspa.16.05.01a.SPA.pkg
475146 -rw-   2962372 Jul 26 2017 09:52:56 -07:00  cat9k-srdriver.16.05.01a.SPA.pkg
475147 -rw-  13284288 Jul 26 2017 09:52:56 -07:00  cat9k-webui.16.05.01a.SPA.pkg
475148 -rw-     13248 Jul 26 2017 09:52:56 -07:00  cat9k-wlc.16.05.01a.SPA.pkg
516099 -rw-   5297096 Oct 30 2017 10:57:44 -07:00  cat9k-cc_srdriver.16.06.01.SPA.pkg
516100 -rw-  80946116 Oct 30 2017 10:57:46 -07:00  cat9k-espbase.16.06.01.SPA.pkg
516101 -rw-   1536964 Oct 30 2017 10:57:47 -07:00  cat9k-guestshell.16.06.01.SPA.pkg
516102 -rw- 376865728 Oct 30 2017 10:57:57 -07:00  cat9k-rpbase.16.06.01.SPA.pkg
516107 -rw-  29545049 Oct 30 2017 10:58:08 -07:00  cat9k-rpboot.16.06.01.SPA.pkg
516103 -rw-  27669444 Oct 30 2017 10:57:58 -07:00  cat9k-sipbase.16.06.01.SPA.pkg
516104 -rw-  55440320 Oct 30 2017 10:58:00 -07:00  cat9k-sipspa.16.06.01.SPA.pkg
516105 -rw-  11813828 Oct 30 2017 10:58:00 -07:00  cat9k-srdriver.16.06.01.SPA.pkg
516106 -rw-  12248000 Oct 30 2017 10:58:00 -07:00  cat9k-webui.16.06.01.SPA.pkg
11353194496 bytes total (8963174400 bytes free)
```

The following is sample output from the **dir flash:** command in Cisco IOS XE Everest 16.6.2:

```
Switch# dir flash:

Directory of flash:/

253956  -rw-   2097152 Nov 3  2017 21:37:04  -07:00 nvram_config
253955  -rw-   2097152 Nov 3  2017 21:37:04  -07:00 nvram_config_bkup
253954  -rw-       239 Nov 3  2017 21:28:47  -07:00 boothelper.log
253957  -rw-        78 Oct 27 2017 14:28:43  -07:00 tam_client_app.log
303110  -rw-   5297096 Nov 1  2017 23:27:26  -07:00 cat9k-cc_srdriver.16.06.01.SPA.pkg
253961  -rw-      7523 Nov 1  2017 23:56:25  -07:00 packages.conf
344067  -rw-   5186504 Nov 1  2017 23:54:10  -07:00 cat9k-cc_srdriver.16.06.02.SPA.pkg
303111  -rw-  80946116 Nov 1  2017 23:27:29  -07:00 cat9k-espbase.16.06.01.SPA.pkg
303112  -rw-   1536964 Nov 1  2017 23:27:29  -07:00 cat9k-guestshell.16.06.01.SPA.pkg
303113  -rw- 376865728 Nov 1  2017 23:27:40  -07:00 cat9k-rpbase.16.06.01.SPA.pkg
303118  -rw-  29545049 Nov 1  2017 23:27:53  -07:00 cat9k-rpboot.16.06.01.SPA.pkg
303114  -rw-  27669444 Nov 1  2017 23:27:41  -07:00 cat9k-sipbase.16.06.01.SPA.pkg
294913  drwx      4096 Nov 3  2017 21:28:25  -07:00 .installer
253966  -rw-     16280 Nov 3  2017 21:28:42  -07:00 bootloader_evt_handle.log
303105  drwx      4096 Oct 26 2017 20:57:12  -07:00 core
311297  drwx      4096 Nov 2  2017 23:41:45  -07:00 .prst_sync
327681  drwx      4096 Nov 1  2017 23:56:42  -07:00 .rollback_timer
335873  drwx      4096 Nov 3  2017 21:28:46  -07:00 dc_profile_dir
335875  drwx      4096 Oct 26 2017 20:48:50  -07:00 gs_script
253959  -rw-       556 Nov 2  2017 23:42:12  -07:00 vlan.dat
253968  -rw-     98869 Nov 3  2017 21:28:59  -07:00 memleak.tcl
294914  drwx      4096 Oct 26 2017 21:19:34  -07:00 tech_support
303107  drwx      4096 Oct 26 2017 21:27:19  -07:00 onep
319490  drwx      4096 Oct 26 2017 21:27:19  -07:00 CRDU
303115  -rw-  55440320 Nov 1  2017 23:27:43  -07:00 cat9k-sipspa.16.06.01.SPA.pkg
303116  -rw-  11813828 Nov 1  2017 23:27:43  -07:00 cat9k-srdriver.16.06.01.SPA.pkg
303117  -rw-  12248000 Nov 1  2017 23:27:43  -07:00 cat9k-webui.16.06.01.SPA.pkg
```

```
344068  -rw-  76649412 Nov 1  2017 23:54:13  -07:00 cat9k-espbase.16.06.02.SPA.pkg
344069  -rw-   1536964 Nov 1  2017 23:54:13  -07:00 cat9k-guestshell.16.06.02.SPA.pkg
344070  -rw- 380625856 Nov 1  2017 23:54:24  -07:00 cat9k-rpbase.16.06.02.SPA.pkg
344076  -rw-  29580684 Nov 1  2017 23:54:39  -07:00 cat9k-rpboot.16.06.02.SPA.pkg
344071  -rw-  27612100 Nov 1  2017 23:54:24 -07:00  cat9k-sipbase.16.06.02.SPA.pkg
344072  -rw-  54981568 Nov 1  2017 23:54:26 -07:00  cat9k-sipspa.16.06.02.SPA.pkg
344073  -rw-   6521796 Nov 1  2017 23:54:26 -07:00  cat9k-srdriver.16.06.02.SPA.pkg
344074  -rw-  12268480 Nov 1  2017 23:54:26 -07:00  cat9k-webui.16.06.02.SPA.pkg
344075  -rw-   1536960 Nov 1  2017 23:54:26 -07:00  cat9k-wlc.16.06.02.SPA.pkg
344066  -rw-      7523 Nov 1  2017 23:54:39 -07:00  cat9k_iosxe.16.06.02.SPA.conf
253960  -rw-      7406 Nov 1  2017 23:56:25 -07:00  packages.conf.00-
11353194496 bytes total (9544245248 bytes free)
Switch#
```

In the following sample output that displays the .conf files in the flash partition, note the three .conf files:

- packages.conf— the file that has been re-written with the newly installed .pkg files.
- packages.conf.00—backup file of the previously installed image.
- cat9k_iosxe.16.06.01.SPA.conf— a copy of packages.conf and not used by the system.

```
Switch# dir flash:*.conf

Directory of flash:/*.conf

Directory of flash:/

434197 -rw- 7406 Jul 26 2017 10:59:16 -07:00 packages.conf
434196 -rw- 7504 Jul 26 2017 10:59:16 -07:00 packages.conf.00-
516098 -rw- 7406 Jul 26 2017 10:58:08 -07:00 cat9k_iosxe.16.06.01.SPA.conf
11353194496 bytes total (8963174400 bytes free)
```

Reload

Step 6 Reload the switch

```
Switch# reload
```

Step 7 If your switches are configured with auto boot, then the stack will automatically boot up with the new image. If not, you can manually boot flash:packages.conf

```
Switch: boot flash:packages.conf
```

When the new image boots up, verify the version of the new image, using the **show version** command:

Note When you boot the new image, it will automatically update the boot loader, but the new bootloader version is not displayed in the output until the next reload.

The following **show version** command displays the Cisco IOS XE Everest 16.6.1 image on the device:

```
Switch# show version

Cisco IOS XE Software, Version 16.06.01
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version
16.6.1, RELEASESOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Sat 22-Jul-17 05:51 by mcpre
```

The following **show version** command displays the Cisco IOS XE Everest 16.6.2 image on the device:

```
Switch# show version

Cisco IOS XE Software, Version 16.06.02
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version
16.6.2, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Sat 28-Oct-17 06:38 by mcpre
```

Downgrading in Install Mode

Note New switch models that are introduced in a release cannot be downgraded, so if you add a new switch to an existing stack, we recommend upgrading all existing switches. For the list of models introduced in a release, see the list of hardware features in that release.

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

The sample output in this section covers downgrade from Cisco IOS XE Everest 16.6.1 to Cisco IOS XE Everest 16.5.1a and from Cisco IOS XE Everest 16.6.2 to Cisco IOS XE Everest 16.6.1 in Install Mode.

This section provides examples of both **request platform software** and **install** commands.

Summary Steps—Clean Up > Copy New Image to Flash > Downgrade Software Image > Reload

Clean Up

Step 1 Ensure that you have at least 1GB of space in flash to expand a new image. Clean up old installation files in case of insufficient space. The following sample output displays the cleaning up of Cisco IOS XE Everest 16.6.1 files:

```
Switch# request platform software package clean

This operation may take several minutes...
Running command on switch 1
Cleaning up unnecessary package files
No path specified, will use booted path flash:packages.conf
Cleaning flash:
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat9k-cc_srdriver.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-espbase.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-guestshell.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-rpbase.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-rpboot.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-sipbase.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-sipspa.16.06.01.SPA.pkg
      File is in use, will not delete.
```

```
    cat9k-srdriver.16.06.01.SPA.pkg
      File is in use, will not delete.
    cat9k-webui.16.06.01.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:
[switch 1]:
/flash/cat9k-cc_srdriver.16.05.01a.SPA.pkg
/flash/cat9k-espbase.16.05.01a.SPA.pkg
/flash/cat9k-guestshell.16.05.01a.SPA.pkg
/flash/cat9k-rpbase.16.05.01a.SPA.pkg
/flash/cat9k-rpboot.16.05.01a.SPA.pkg
/flash/cat9k-sipbase.16.05.01a.SPA.pkg
/flash/cat9k-sipspa.16.05.01a.SPA.pkg
/flash/cat9k-srdriver.16.05.01a.SPA.pkg
/flash/cat9k-webui.16.05.01a.SPA.pkg
/flash/cat9k-wlc.16.05.01a.SPA.pkg
/flash/cat9k_iosxe.16.06.01.SPA.conf
/flash/packages.conf.00-

Do you want to proceed? [y/n]y
[switch 1]:
Deleting file flash:cat9k-cc_srdriver.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-webui.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.16.05.01a.SPA.pkg ... done.
Deleting file flash:cat9k_iosxe.16.06.01.SPA.conf ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
```

You can also use the **install remove inactive** command to clean up old installation files in case of insufficient space. The following sample output displays the cleaning up of Cisco IOS XE Everest 16.6.2 files:

```
Switch# install remove inactive

install_remove: START Mon Oct 30 19:51:48 UTC 2017
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
  done.

The following files will be deleted:
[switch 1]:
/flash/cat9k-cc_srdriver.16.06.02.SPA.pkg
/flash/cat9k-espbase.16.06.02.SPA.pkg
/flash/cat9k-guestshell.16.06.02.SPA.pkg
/flash/cat9k-rpbase.16.06.02.SPA.pkg
/flash/cat9k-rpboot.16.06.02.SPA.pkg
/flash/cat9k-sipbase.16.06.02.SPA.pkg
/flash/cat9k-sipspa.16.06.02.SPA.pkg
/flash/cat9k-srdriver.16.06.02.SPA.pkg
/flash/cat9k-webui.16.06.02.SPA.pkg
/flash/cat9k-wlc.16.06.02.SPA.pkg
/flash/packages.conf
```

```
Do you want to remove the above files? [y/n]y
[switch 1]:
Deleting file flash:cat9k-cc_srdriver.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-webui.16.06.02.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.16.06.02.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 Oct 30 19:52:25 UTC 2017

Switch#
```

Copy New Image to Flash

Step 2 Copy the target Cisco IOS XE Everest 16.5.1a image to flash: (you can skip this step if you want to use the image from your TFTP server).

```
Switch# copy tftp://10.8.0.6//cat9k_iosxe.16.05.01a.SPA.bin flash:
Destination filename [cat9k_iosxe.16.05.01a.SPA.bin]?

Accessing tftp://10.8.0.6//cat9k_iosxe.16.05.01a.SPA.bin...
Loading /cat9k_iosxe.16.05.01a.SPA.bin from 10.8.0.6 (via GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 508584771 bytes]

508584771 bytes copied in 101.005 secs (5035244 bytes/sec)
```

Step 3 Use the **dir flash** 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 26 2017 13:35:16 -07:00 cat9k_iosxe.16.05.01a.SPA.bin
11353194496 bytes total (9055866880 bytes free))
```

Downgrade Software Image

Step 4 Use the **request platform software package install** command, to downgrade your stack. You can point to the source image on your tftp server or in flash if you have it copied to flash. The following example displays the installation of Cisco IOS XE Everest 16.5.1a software image:

```
Switch# request platform software package install switch all file
flash:cat9k_iosxe.16.05.01a.SPA.bin

--- Starting install local lock acquisition on switch 1 ---
Finished install local lock acquisition on switch 1
Expanding image file: flash:cat9k_iosxe.16.05.01a.SPA.bin
[1]: Expanding file
[1]: Finished expanding all-in-one software package in switch 1
SUCCESS: Finished expanding all-in-one software package.
[1]: Performing install
  SUCCESS: install finished
[1]: install package(s) on switch 1
--- Starting list of software package changes ---
Old files list:
  Removed cat9k-cc_srdriver.16.06.01.SPA.pkg
  Removed cat9k-espbase.16.06.01.SPA.pkg
  Removed cat9k-guestshell.16.06.01.SPA.pkg
  Removed cat9k-rpbase.16.06.01.SPA.pkg
  Removed cat9k-rpboot.16.06.01.SPA.pkg
  Removed cat9k-sipbase.16.06.01.SPA.pkg
  Removed cat9k-sipspa.16.06.01.SPA.pkg
  Removed cat9k-srdriver.16.06.01.SPA.pkg
  Removed cat9k-webui.16.06.01.SPA.pkg
New files list:
  Added cat9k-cc_srdriver.16.05.01a.SPA.pkg
  Added cat9k-espbase.16.05.01a.SPA.pkg
  Added cat9k-guestshell.16.05.01a.SPA.pkg
  Added cat9k-rpbase.16.05.01a.SPA.pkg
  Added cat9k-rpboot.16.05.01a.SPA.pkg
  Added cat9k-sipbase.16.05.01a.SPA.pkg
  Added cat9k-sipspa.16.05.01a.SPA.pkg
  Added cat9k-srdriver.16.05.01a.SPA.pkg
  Added cat9k-webui.16.05.01a.SPA.pkg
  Added cat9k-wlc.16.05.01a.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned.  New software will load on reboot.
[1]: Finished install successful on switch 1
Checking status of install on [1]
[1]: Finished install in switch 1
SUCCESS: Finished install: Success on [1]
```

You can also use the **install add file activate commit** command to install the target image to flash. This example displays the installation of Cisco IOS XE Everest 16.6.1:

```
Switch# install add file flash:cat9k_iosxe.16.06.01.SPA.bin activate commit

install_add_activate_commit: START Mon Oct 30 19:54:51 UTC 2017

System configuration has been modified.
Press Yes(y) to save the configuration and proceed.
Press No(n) for proceeding without saving the configuration.
Press Quit(q) to exit, you may save configuration and re-enter the command.
[y/n/q]yBuilding configuration...

[OK]Modified configuration has been saved
```

```
*Oct 30 19:54:55.633: %IOSXE-5-PLATFORM: Switch 1 R0/0: Oct 30 19:54:55
install_engine.sh: %INSTALL-5-INSTALL_START_INFO: Started install one-shot
flash:cat9k_iosxe.16.06.01.SPA.bininstall_add_activate_commit: Adding PACKAGE

This operation requires a reload of the system. Do you want to proceed?
Please confirm you have changed boot config to flash:packages.conf [y/n]y

--- Starting initial file syncing ---
Info: Finished copying flash:cat9k_iosxe.16.06.01.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
Checking status of Add on [1]
Add: Passed on [1]
Finished Add

install_add_activate_commit: Activating PACKAGE
Following packages shall be activated:
/flash/cat9k-wlc.16.06.01.SPA.pkg
/flash/cat9k-webui.16.06.01.SPA.pkg
/flash/cat9k-srdriver.16.06.01.SPA.pkg
/flash/cat9k-sipspa.16.06.01.SPA.pkg
/flash/cat9k-sipbase.16.06.01.SPA.pkg
/flash/cat9k-rpboot.16.06.01.SPA.pkg
/flash/cat9k-rpbase.16.06.01.SPA.pkg
/flash/cat9k-guestshell.16.06.01.SPA.pkg
/flash/cat9k-espbase.16.06.01.SPA.pkg
/flash/cat9k-cc_srdriver.16.06.01.SPA.pkg

This operation requires a reload of the system. Do you want to proceed? [y/n]y
--- Starting Activate ---
Performing Activate on all members
  [1] Activate package(s) on switch 1
  [1] Finished Activate on switch 1
Checking status of Activate on [1]
Activate: Passed on [1]
Finished Activate

--- Starting Commit ---
Performing Commit on all members

*Oct 30 19:57:41.145: %IOSXE-5-PLATFORM: Switch 1 R0/0: Oct 30 19:57:41
rollback_timer.sh: %INSTALL-5-INSTALL_AUTO_ABORT_TIMER_PROGRESS: Install auto abort
timer will expire in 7200 seconds  [1] Commit package(s) on switch 1
  [1] Finished Commit on switch 1
Checking status of Commit on [1]
Commit: Passed on [1]
Finished Commit

Install will reload the system now!
SUCCESS: install_add_activate_commit  Mon Oct 30 19:57:48 UTC 2017

Switch#
```

Note The system reloads automatically after executing the **install add file activate commit** command. There is no need to manually reload the system.

Reload

Step 5 Reload the switch

```
Switch# reload
```

Step 6 If your switches are configured with auto boot, then the stack will automatically boot up with the new image. If not, you can manually boot flash:packages.conf

```
Switch: boot flash:packages.conf
```

Step 7 When the new image boots up, you can verify the version of the new image, by checking **show version**

Note In the output, note that the boot loader is not automatically downgraded.

The following **show version** command displays the Cisco IOS XE Everest 16.5.1a image on the device:

```
Switch# show version

Cisco IOS XE Software, Version 16.05.01a
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version
16.5.1a, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Tue 30-May-17 00:36 by mcpre
```

The following **show version** command displays the Cisco IOS XE Everest 16.6.1 image on the device:

```
Switch# show version

Cisco IOS XE Software, Version 16.06.01
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version
16.6.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Sat 28-Oct-17 06:38 by mcpre
```

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 fall under the 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—Require a Network Essentials or 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 http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

License Types

The following license types are available:

- 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—for a license level, preinstalled on the device, and for a 90-day trial period only.

Ordering with Smart Accounts

We recommend that you use Smart Accounts to order devices as well as licenses. Smart Accounts enable you to manage all of your software licenses for switches, routers, firewalls, access-points or tools from one centralized website. To create Smart Accounts, use the Cisco Smart Software Manager (Cisco SSM).

Note This is especially relevant to the term licenses that you order, because information about the expiry of term licenses is available only through the Cisco SSM website.

For information more information about Cisco SSM, see:
http://www.cisco.com/c/en/us/buy/smart-accounts/software-licensing.html

The possible deployment modes are:

- Right-to-use (RTU) licensing mode—Supported on Cisco Catalyst 9000 Series Switches, in Cisco IOS XE Everest 16.5.1a. See The RTU Licensing Mode, page 31.

- Smart Licensing mode—Currently not supported on Cisco Catalyst 9000 Series Switches. It is on the roadmap for future releases.

The RTU Licensing Mode

This is the currently supported licensing mode for Cisco Catalyst 9000 Series Switches.

Right-to-use (RTU) licensing allows you to order and activate a specific license type for a given license level, and then to manage license usage on your switch.

Note The RTU licensing structure has been modified to match the packaging model that will be used with Smart Licensing mode in the future. Unified licensing structures across the RTU and Smart Licensing modes, along with usage reports, will simplify migration and reduce the implementation time required for Smart Licensing.

The **license right-to-use** command (privilege EXEC mode) provides options to activate or deactivate any license supported on the platform.

Options for Base Licenses

license right-to-use [**activate** | **deactivate**] [**network-essentials** | **network-advantage**] [**all** | **evaluation** | **subscription** {**all** | **slot** <*1-8*>}] [**acceptEULA**]

Options for Add-On Licenses

license right-to-use [**activate** | **deactivate**] **addon** [**dna-essentials** | **dna-advantage**] [**all** | **evaluation** | **subscription** {**all** | **slot** <*1-8*>}] [**acceptEULA**]

Usage Guidelines for the RTU Licensing Mode

- Licenses may be activated on a standalone device.
- Base licenses (Network Essentials and Network-Advantage) may be ordered only with a permanent license type.
- Add-on licenses (DNA Essentials and DNA Advantage) may be ordered only with a term license type.

  You can set up Cisco SSM to receive daily e-mail alerts, to be notified of expiring add-on licenses that you want to renew.

  You must order an add-on license in order to purchase a switch. On term expiry, you can either renew the add-on license 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 8 Permitted Combinations

	DNA Essentials	DNA Advantage
Network Essentials	Yes	No
Network Advantage	Yes[1]	Yes

1. For this combination, the DNA-Essentials license must be ordered separately using Cisco SSM.

- The following features are currently available only at the Network Advantage license level. However, the correct minimum license level for these features is Network Essentials and the CFN reflects this correct license level.

  You will be able to configure the feature with a Network Essentials license level after the correction is made in an upcoming release.

  - IPv6 Multicast
  - IPv6 ACL Support for HTTP Servers
- Evaluation licenses cannot be ordered. They can be activated temporarily, without purchase. Warning system messages about the evaluation license expiry are generated 10 and 5 days before the 90-day window. Warning system messages are generated every day after the 90-day period. An expired evaluation license cannot be reactivated after reload.

For more information about using the RTU Licensing Mode, see the *System Management* > *Configuring Right-To-Use Licenses* chapter in the software configuration guide.

Scaling Guidelines

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

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

Limitations and Restrictions

- Hardware
  - Use the MODE button to switch-off the beacon LED.
  - All port LED behavior is undefined until interfaces are fully initialized.
- Cisco TrustSec restrictions—Cisco TrustSec can be configured only on physical interfaces, not on logical interfaces.
- Control Plane Policing (CoPP)—Starting with Cisco IOS XE Everest 16.6.4, 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 s**how policy-map control-plane** commands in privileged EXEC mode instead.
- Flexible NetFlow (FNF) 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 switched virtual interfaces (SVIs), port-channel, loopback, and tunnels.
- You can not configure multiple flow monitors of the same type (ipv4, ipv6 or datalink) on the same interface, and in the same direction.
- Hardware limitations:

  - For all the devices running Cisco IOS XE Everest 16.6.1 or Cisco IOS XE Everest 16.6.2 or Cisco IOS XE Everest 16.6.3, autonegotiation is disabled by default when you use Cisco 40GBASE-CR4 QSFP Direct-Attach Copper Cables, If the other end of the link has autonegotation enabled, the link does not come up.

Note There is no option to turn on autonegotiation on the ports which connect to Cisco 40GBASE-CR4 QSFP cable.

  - For all the Catalyst 9500 Series Switches running Cisco IOS XE Everest 16.6.4 and later, autonegotiation is enabled by default when you use Cisco 40GBASE-CR4 QSFP Direct-Attach Copper Cables. If the other end of the link does not support autonegotiation, the link does not come up. You can turn autonegotiation off on the ports which connect to Cisco 40GBASE-CR4 QSFP cable. Use the **speed nonegotiate** command at the interface. This command disables autonegotiation and brings the link up. To restore autonegotiation, use the **no speed nonegotiation** command.

- Interoperability limitations:
  - If one end of the link has a device running Cisco IOS XE Everest 16.6.1 or Cisco IOS XE Everest 16.6.2 or Cisco IOS XE Everest 16.6.3 and the other end is running Cisco IOS XE Fuji 16.8.1, the link does not come up. To avoid this interoperability issue between releases, it is recommended to use the same image across all the Catalyst 9300 Series Switches and Catalyst 9500 Series Switches in the network.
- Memory leak—When a logging discriminator is configured and applied to a device, memory leak is seen under heavy syslog or debug output. The rate of the leak is dependent on the quantity of logs produced. In extreme cases, the device may fail. As a workaround, disable the logging discriminator on the device.
- QoS restrictions:
  - When configuring a QoS queuing policy, the sum of the queuing buffer should not exceed 100%.
  - For QoS policies, only SVIs are supported for logical interfaces.
  - 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 (Secure Copy Protocol) 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 Install—The feature is deprecated starting with Cisco IOS XE Everest 16.5.1a. The commands are visible on the CLI until Cisco IOS XE Everest 16.6.1, but the feature is not supported. Enter the **no vstack** command in global configuration mode and disable the feature. Starting from Cisco IOS XE Everest 16.6.2, the **vstack** command is not available on the CLI.
- Wired AVC 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 attributes based QoS is not supported (‘match protocol attribute’).
  - 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

- 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.
- YANG data modeling limitations—A maximum of 20 simultaneous NETCONF sessions are supported.

Caveats

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

Cisco Bug Search Tool

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

To view the details of a caveat, click on the identifier.

Open Caveats in Cisco IOS XE Everest 16.6.x

The following are the open caveats in this release:

Identifier	Description
CSCvh72186	ROMMON: HTTP booting does not allow specified port number
CSCvk60809	Wrong Time-Stamp is saved in pcap.
CSCvq13053	NAT translation entry not cleared after fin-rst time-out
CSCvq72713	Cat3k/Cat9k can't forwarding traffic follow the rule of EIGRP unequal cost load-balancing
CSCvr21001	QoS with policing traffic that do not match the ACL on the class-map

Resolved Caveats in Cisco IOS XE Everest 16.6.10

Identifier	Description
CSCvt53563	Cisco IOS XE Software NETCONF and RESTCONF Authentication Bypass Vulnerability
CSCvw25564	Cisco IOS and IOS XE Software IKEv2 AutoReconnect Feature Denial of Service Vulnerability
CSCvw46194	IOS and IOS XE Software UDLD Denial of Service Vulnerability
CSCvx41294	High CPU usage caused by " TCP Timer" process
CSCvx66699	Cisco IOS and IOS XE Software TrustSec CLI Parser Denial of Service Vulnerability

Resolved Caveats in Cisco IOS XE Everest 16.6.9

Identifier	Description
CSCvf75522	Traffic incorrectly matches an ACL-based class-map that contains 'range' operations
CSCvo67790	Switch crash seen when unconfig/defaulting MACSec session over a range of interfaces
CSCvt30243	Connectivity issue after moving client from dot1x enable port to non dot1x port
CSCvu30597	Cisco IOS XE Software Ethernet Frame Denial of Service Vulnerability
CSCvv48305	Route not fully programmed in the hardware for MACSec enabled end-point

Resolved Caveats in Cisco IOS XE Everest 16.6.8

Identifier	Description
CSCvm40582	Crash when entering username with aaa common-criteria policy password
CSCvo78608	DOM SFP sensor entries are not available and cannot be polled via SNMP
CSCvp73666	DNA - LAN Automation doesn't configure link between Peer Device and PnP Agent due CDP limitation
CSCvp81958	Cat9x00 hitting "No connections to Shell Manager available for processing the command"
CSCvq39840	CiscoFlashFile - Get-Next request takes longer time for last file on directory.
CSCvr03905	Memory Leak on FED due to IPv6 Source Guard
CSCvr20522	Cat3k/9k BOOTREPLY dropped when DHCP snooping is enabled
CSCvr46931	ports remain down/down object-manager (fed-ots-mo thread is stuck)
CSCvr59959	Cat3k/9k Flow-based SPAN(FSPAN) can only work in one direction when multiple session configured

Resolved Caveats in Cisco IOS XE Everest 16.6.7

Identifier	Description
CSCvq72181	Seeing 100% CPU with FED on SVL setup
CSCvf42299	User defined System MTU is not taking effect on PO and SVI
CSCvj16691	port LED may turn to amber
CSCvm89543	StackWise-Virtual Ping fails momentarily due to GLC-T optics Link goes up during reboots
CSCvn30230	Slow memory leak in linux_iosd-imag
CSCvn81334	Default ACL being enforced even when dACL is applied after Reload
CSCvo65974	QinQ tunnels causing L2 loop in specific topology.
CSCvo71264	Gateway routes DHCP offer incorrectly after DHCP snooping
CSCvo83305	MAC Access List Blocks Unintended Traffic
CSCvo85183	Uplinkfast take time when recovery from link failure
CSCvo85422	Directly connected IPv4/IPv6 hosts not programmed in HW - %FMFP-3-OBJ_DWNLD_TO_DP_FAILED
CSCvo94058	URPF packet drop despite "rx allow-default" option
CSCvp00026	No audio during first few seconds of voice call between 2 Fabric Edge
CSCvp15389	Port security configuration on interface causing connectivity issue
CSCvp26792	Control plane impacted when > 1Gbps multicast passes through and no entry in IGMP snooping
CSCvp30239	Memory leak when there are constant changes in REP ring
CSCvp33294	Asic 0 Core 0 buffer stuck, rwePbcStall seen
CSCvp43131	Mgmt port "speed 1000" and "negotiation auto" in show run
CSCvp54779	[SDA] 1st ARP Reply is dropped at remote Fabric Edge
CSCvp69629	Authentication sessions does not come up on configuring dot1x when there is active client traffic.
CSCvp75221	Modules shows faulty status when specific MAC ACL is applied on interfaces
CSCvp89755	VPN label is wrongly derived as explicit-null in Cat9k for L3 VPN traffic
CSCvp90279	ADV and REP DHCPv6 packets are sent to SISF when source udp port is not 547
CSCvq01185	SNMP-3-RESPONSE_DELAYED: and timeout when polling ent Sensor Value Entry
CSCvq22011	ARP replies are dropped when IPDT gleans from ARP
CSCvq30316	[SDA] 1st ARP fix for CSCvp00026 is eventually failing after longevity
CSCvq30460	SYS-2-BADSHARE: Bad refcount in datagram_done - messages seen during system churn
CSCvq40137	Mac address not being learnt when "auth port-control auto" command is present
CSCvq44397	ospf down upon switchover with aggressive timers "hello-interval 1" and "dead-interval 4"

Resolved Caveats in Cisco IOS XE Everest 16.6.6

Identifier	Description
CSCvn08296	DNA Center 1.2.5 - SDA Border as RP incorrectly resolving RPF next-hop as LISP interface
CSCvo32446	High CPU Due To Looped Packet and/or Unicast DHCP ACK Dropped
CSCuw36080	SNMP with Extended ACL
CSCvg73991	PBR adjacency not getting updated correctly after shut/no shut on interface
CSCvm07353	Router may crash when a SSH session is closed after configure TACACS
CSCvm48084	Remark in DACL causes Authorization failure
CSCvm77197	C9300/9500:%IOSXE-2-PLATFORM: Switch 1 R0/0: kernel: EXT2-fs (sda1): error:
CSCvm89086	SPAN destination interface not dropping ingress traffic
CSCvn01822	cmnMacMoveNotification is generated when a MAC address is moved between same Port-channel interface
CSCvn23706	no mac address-table notification mac-move can't be saved after reload device
CSCvn31477	Layer 2 SSM Multicast traffic hitting the CPU when SVI is configured with PIM Spare Mode
CSCvn46517	some sgacl were not installed after update a Cell in ISE
CSCvn56579	MQIPC memory corruption resulting dot1x/MAB not working for wired clients
CSCvn72973	Device is getting crashed on the "cts role-based enforcement"
CSCvn74807	Cisco TrustSec crash while processing CoA update
CSCvn79221	MAC ADDRESS LEARNING FAILURE ON PORT CONFIGURED WITH PORT-SECURITY
CSCvo15594	MATM programming issue for remote client
CSCvo42353	SDA; Cat3K,Cat9K:-External border creating incorrect CEF/map-cache entry due to multicast

Resolved Caveats in Cisco IOS XE Everest 16.6.5

Identifier	Description
CSCvh85885	IPv6 stale entries not expiring
CSCvi48988	SNMP timeout when querying entSensorValueEntry
CSCvi96965	Radius Automate Tester probe on feature is not working as expected.
CSCvj79694	sgt-map gets cleared for some of the end points for unknown reason
CSCvj92201	16.6.4:Device-tracking does not consistenly show DH4 for DHCP clients
CSCvk20003	Polaris: Host limit of 32 for session monitoring sessions
CSCvk30813	MAB fails to start negotiation after device moves to another layer 2 adjacent switch

Identifier	Description
CSCvk32866	SISF probing behavior should be changed from broadcast to unicast
CSCvk33369	Stack-merge on Stby and CONN_ERR_CONN_TIMEOUT_ERR on Active with multiple SWO
CSCvk33624	SFF8472-3-READ_ERROR message seen for SVL ports
CSCvk34927	DHCP snooping table not updated from DHCP snooping DB file upon reload.
CSCvk39041	SDA: IP phone latency in fabric is close to 4 sec's
CSCvk60752	DHCP offer with Option 82 but no Remote ID suboption dropped by CAT9K relay agent
CSCvk63089	show logging onboard switch active uptime detail shows 133 years as uptime
CSCvm00765	BFD crash on imitating traffic loss
CSCvm01064	PE stops VPLS traffic forwarding after xconnect flap
CSCvm33622	WCCP redirection to proxy server breaks in certain scenarios.
CSCvm35904	16.6.3: Access Tunnel Create Interface code is considered to be update request in FMAN_FP
CSCvm36333	MAC address programming issue
CSCvm39894	False authorizations and authentications even without radius server for dot1x/mab
CSCvm43071	[IBNS 2.0] aaa-available event is not being triggered when using authentication/authorization list
CSCvm43200	Traffic is not forward out on standby switch over SVL after SSO
CSCvm46814	session management process smd crash at cts_sga due to TDL memory depletion.
CSCvm60720	Broadcast Gratuitous ARP changed to unicast by switch leading to DHCP decline from client
CSCvm62274	Multicast traffic is software switched when switch is provisioned as Edge in Fabric - SDA Deployment
CSCvm63651	Memory leak due to authentication mac-move permit
CSCvm75378	Cat9x00: IPv6 SPAN filter still applied in hardware when removing entire monitor session
CSCvm81361	3850 stack SVL link status incorrect
CSCvm86135	SMD crash after removing access-session attributes filter-list
CSCvm89005	Packets looped internally during VXLAN decap in SD-Access environment
CSCvm95352	uRPF TCAM Resources exhausted even without uRPF configured on the switch
CSCvm97660	C9300 reflects back traffic on the same interface
CSCvn08672	DHCP packets cause unknown protocol drops on 16.6.x
CSCvn36398	WCCP Access-list might not be removed from interface after a WCCP loss of service
CSCvn46171	Rapid Memory Leak in "FED Main Event" Process due to Modifying Adjacencys

Resolved Caveats in Cisco IOS XE Everest 16.6.4a

Identifier	Description
CSCvj83551	SISF crash in IPV6 neighbor discovery packets
CSCvm36748	FED crash at expired "FED MAC AGING TIMER" or "unknown" timer without a stack trace.
CSCvm35904	16.6.3: Access Tunnel Create Interface code is considered to be update request in FMAN_FP
CSCvk60752	DHCP offer with Option 82 but no Remote ID suboption dropped by CAT9K relay agent
CSCvk32774	ACE entry with *established or range * in ACL drops TCP/UDP packets.
CSCvk31115	Device-sensor doesn't send data off initial boot
CSCvj86644	SDA: DHCP does not remove option 82 when sending packets to end-hosts
CSCvk39041	SDA: IP phone latency in fabric is close to 4 sec's
CSCvk02589	Connectivity is lost every four hours when ipv4 and ipv6 dual stack is configured.
CSCvk22204	stackwise virtual will blackhole traffic on standby unit after switchover, NIF is stuck
CSCvm09611	C9x00 crashed with multicast memory corruption.
CSCvj33865	Clearing mac address table should not delete entries created by control plane/remote entries
CSCvk07070	Observing bmalloc smd leaks at OBJ_WEBAUTH_LOGOUT_URL with webauth
CSCvk16813	DHCP client traffic dropped with DHCP snooping and port-channel or cross stack uplinks.
CSCvk46664	DNA Center SWIM Upgrade fails and unable to upgrade manually
CSCvk50734	Device Tracking - Memory leak observed with IPv6 NS/NA Packets .
CSCvk53444	Packets with Fragment Offset not forwarded with DHCP Snooping Enabled in 16.6.4
CSCvm01064	PE stops VPLS traffic forwarding after xconnect flap
CSCvm09121	Evaluation of IOS-XE for CVE-2018-5391 (FragmentSmack)

Resolved Caveats in Cisco IOS XE Everest 16.6.4

The following are the resolved caveats in Cisco IOS XE Everest 16.6.4.

Identifier	Description
CSCvk00115	Uplink FRU module hardware authentication failed
CSCvi69699	9400 - 9300: 40G copper QSFP interoperability broken (link down)
CSCvi83373	Repetitive logs show up 47K times in fed tracelogs
CSCvj52681	dynamic vlan assignment causes all sisf entires under the port to be deleted
CSCvi91714	IPv6 address not assigned or delayed when RA Guard is enabled

Identifier	Description
CSCvi76084	Device-tracking entry stuck in TENTATIVE for certain Mac Pro hosts configured with static IP
CSCvi38916	Persistent Telnet and SSH crashes when configured in 16.6.2
CSCvi26398	"%LISP-4-LOCAL_EID_RLOC_INCONSISTENCY" should be supporessed in SDA context
CSCvi20882	Netconf IP-SLA udp-jitter case missing leaf codec
CSCvi11970	Abnormal output for show pnp tech-support
CSCvh85772	Switch not responding to ARP request for GW Anycast IP
CSCvh79942	Chunk corruption crash related to PNP or Guestshell
CSCvh21909	LISP: Overlapping prefix causes "probe-down" for map-cache entry
CSCvh09334	SDA-IPV6::SISF traceback @ar_relay_create_entry - L2 Binding tbl entry insertion failed
CSCvg45950	packet drop seen intermittently if 40G traffic sent via cts interface
CSCvb69966	Memory leak under LLDP Protocol process
CSCvg41950	Cisco IOS XE Software Diagnostic Shell Path Traversal Vulnerability
CSCvg53159	%SNMP-3-RESPONSE_DELAYED: processing GetNext of cafSessionEntry.2 seen on catalyst switch
CSCvg95580	interface speed config went lost after same FRU OIR with "write mem"
CSCvh48397	create_directory_cache: failed to stat flash message see when device managed by dnac
CSCvh66763	crash is seen at fed_l3_aal_delete_adj
CSCvh71539	Command "show aaa servers" reloads the switch
CSCvh84345	IOS CLI "show platform software fed switch active punt cause summary" may display negative counts
CSCvh87131	TRACEBACK: OID cefcModuleEntry crashes the box
CSCvh87270	StackWise Virtual not forwarding IGMP traffic over the standby switch.
CSCvi08459	set different words for username and password, but username shown the same as password
CSCvi09054	Stackwise Virtual: Routing Neighborships on Standby dont come up with MTU > 9116
CSCvi19809	Memory leak in TMS process
CSCvi38191	Memory leak in lman process due to "ld_license_ext.dat" build-up.
CSCvi39202	DHCP fails when DHCP snooping trust is enabled on uplink etherchannel
CSCvi70528	Cat9K- 40G QSFP Tx/Rx power out of valid range
CSCvi87106	Cat9K - 40G QSA adaptor, Rx power invalid.
CSCvi93137	Voice domain not forwarding for certain clients
CSCvj49476	Telnet Sessions Hang/Become unavailable at execution of "show run"

Resolved Caveats in Cisco IOS XE Everest 16.6.3

The following are the resolved caveats in Cisco IOS XE Everest 16.6.3:

Identifier	Description
CSCvh31431	Memory leak in linux_iosd-image on 16.6 releases.
CSCvh52882	Memory Leak due to nbar config.
CSCvh69402	Dot1x specific configuration applied but not working on the interface.
CSCvh81152	Local SVI IP is registered as dynamic-eid.
CSCvh06383	16.6.x: Intermittent traffic loss for MAB devices after successful intial authentication.
CSCvg58682	Stackwise SNMP OID for cswDistrStackPhyPort and cswDistrStackPhyPortNbr not working.
CSCvg56727	Crashes with 'server-key' command using key of 128 characters or more.
CSCve32330	%UTIL-6-RANDOM: A pseudo-random number was generated twice in succession.
CSCvg22515	After upgrade of IOS, SSH passwords longer than 25 characters do not work.
CSCvg60288	Device IP address AV pair replaced with 192.168.1.5.
CSCvh32416	Evaluation of all for CPU Side-Channel Information Disclosure Vulnerability.
CSCvh55578	To add recovery mechanism for glean entry.
CSCvf84349	Router crash on polling cEigrpPeerEntry.

Resolved Caveats in Cisco IOS XE Everest 16.6.2

The following are the resolved caveats in Cisco IOS XE Everest 16.6.2.

Identifier	Description
CSCvf36657	Catalyst 9500: Interface not coming up after shut/no-shut.
CSCvf75518	Controller port error interface.

Resolved Caveats in Cisco IOS XE Everest 16.6.1

The following are the resolved caveats in Cisco IOS XE Everest 16.6.1.

Identifier	Description
CSCve29216	9500-WebUI: Upon hovering an interface, status description is incorrectly displayed as no link

Troubleshooting

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

http://www.cisco.com/en/US/support/index.html

Choose **Product Support > WirelessSwitches**. Then choose your product and click **Troubleshoot and Alerts** to find information for the problem that you are experiencing.

Related Documentation

- Cisco Catalyst 9500 Series Switches documentation at this URL:

  http://www.cisco.com/go/c9500
- Cisco IOS XE 16 documentation at this URL:

  http://www.cisco.com/c/en/us/products/ios-nx-os-software/ios-xe/index.html
- Cisco SFP and SFP+ modules documentation, including compatibility matrices at this URL:

  http://www.cisco.com/en/US/products/hw/modules/ps5455/tsd_products_support_series_home.html
- Cisco Validated Designs documents at this URL:

  http://www.cisco.com/go/designzone

Obtaining Documentation and Submitting a Service Request

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

http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html

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