Release Notes for Cisco Catalyst 9300 Series Switches, Cisco IOS XE Gibraltar 16.11.x

First Published: 2019-03-29

Last Modified: 2019-07-19

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Introduction

Cisco Catalyst 9300 Series Switches are Cisco's lead stackable access platforms for the next-generation enterprise and have been purpose-built to address emerging trends of Security, IoT, Mobility, and Cloud.

They deliver complete convergence with the rest of the Cisco Catalyst 9000 Series Switches 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). This series forms the foundational building block for SD-Access, which is Cisco's lead enterprise architecture.

Whats New in Cisco IOS XE Gibraltar 16.11.1

Hardware Features in Cisco IOS XE Gibraltar 16.11.1c

Feature Name	Description and Documentation Link
Cisco Catalyst 9300 Series Switches (C9300L)	Ciso Catalyst 9300 Series Switches now support a new set of enterprise access models with fixed uplink ports. A mix of 1-Gigabit Ethernet (GE) and 10-GE models are available: • C9300L-24T-4G—24 1-GE ports • C9300L-24P-4G—24 1-GE ports • C9300L-24T-4X—24 10-GE ports • C9300L-24P-4X—24 10-GE ports • C9300L-48T-4G—48 1-GE ports • C9300L-48P-4G—48 1-GE ports • C9300L-48T-4X—48 10-GE ports • C9300L-48P-4X—48 10-GE ports The features available with *C9300L* models of the series are same as the features available with the *C9300* models, with a few exceptions. The *C9300L* models: • Support only fixed uplink ports. • Do not support MultiGigabit Ethernet (mGig). • Do not support breakout interfaces. • Do not support StackPower. For information about the hardware including installation and technical specifications, see the Cisco Catalyst 9300 Series Switches Hardware Installation Guide. For information about the software, see the Software Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Catalyst 9300 Switches).

Feature Name	Description and Documentation Link
Cisco Catalyst 9300 Series Switches (C9300L)—Supported Transceiver Modules	

Feature Name	Description and Documentation Link

	• Compatible switch models—C9300L-24T-4G, C9300L-24P-4G, C9300L-24T-4X, C9300L-24P-4X, C9300L-48T-4G, C9300L-48P-4G, C9300L-48T-4X, C9300L-48P-4X, C9300L-48FP-4G, and C9300L-48FP-4X-48.
	• Supported transceiver modules and cables:
	  • Cisco 100BASE-X Small Form-Factor Pluggable (SFP) Modules: GLC-GE-100FX
	  • Cisco 10GBASE SFP+ Modules:
	  • SFP-10G-SR, SFP-10G-SR-X, SFP-10G-SR-S
	  • SFP-10G-LR, SFP-10G-LR-X, SFP-10G-LR-S
	  • SFP-10G-ER, SFP-10G-ER-S
	  • SFP-10G-ZR, SFP-10G-ZR-S,
	  • SFP-10G-BXD-I, SFP-10G-BXU-I
	  • SFP-10G-BX40D-I, SFP-10G-BX40U-I
	  • Cisco Coarse Wavelength-Division Multiplexing (CWDM) 10 Gigabit Ethernet SFP Modules: CWDM-SFP10G-XXXX
	  • Cisco CWDM SFP Modules: CWDM-SFP-XXXX
	  • Cisco Dense Wavelength-Division Multiplexing (DWDM) 10 Gigabit Ethernet SFP Modules: DWDM-SFP10G-XXXX
	  • Cisco DWDM SFP Modules: DWDM-SFP-XXXX
	  • Cisco SFP Modules for Gigabit Ethernet
	  • GLC-T (10/100/1000Mbps support)
	  • GLC-TE (10/100/1000Mbps support)
	  • GLC-LH-SMD
	  • GLC-SX-MMD
	  • GLC-EX-SMD
	  • GLC-ZX-SMD
	  • GLC-BX-D, GLC-BX-U
	  • SFP-GE-T
	  • GLC-SX-MM-RGD
	  • GLC-LX-SM-RGD
	  • GLC-ZX-SM-RGD
	  • GLC-BX40-D-I, GLC-BX40-U-I, GLC-BX40-DA-I
	  • GLC-BX80-D-I, GLC-BX80-U-I

Feature Name	Description and Documentation Link
	• Supported Cables: • SFP-H10GB-CU1M, SFP-H10GB-CU3M, SFP-H10GB-CU5M • SFP-H10GB-ACU7M, SFP-H10GB-ACU10M • SFP-10G-AOC1M, SFP-10G-AOC2M, SFP-10G-AOC3M, SFP-10G-AOC5M, SFP-10G-AOC7M, SFP-10G-AOC10M For information about a module, see the corresponding document: Data Sheets. For information about device compatibility, see the Transceiver Module Group (TMG) Compatibility Matrix.

Hardware Features in Cisco IOS XE Gibraltar 16.11.1

Feature Name	Description and Documentation Link
Cisco Catalyst 9300 Series Switches (C9300-24S, C9300-48S)	These new 1-Gigabit Fiber stackable switch models are introduced: • C9300-24S—24 1-Gigabit fiber downlink SFP ports. • C9300-48S—48 1-Gigabit fiber downlink SFP ports. Both C9300-24S and C9300-48S support these network modules on their uplink ports: • C9300-NM-4G, C9300-NM-8X, C9300-NM-2Y, C9300-NM-2Q , C9300-NM-4M • C3850-NM-4-1G, C3850-NM-2-10G, C3850-NM-4-10G, C3850-NM-8-10G, C3850-NM-2-40G For more information about these models, see the Cisco Catalyst 9300 Series Switches Hardware Installation Guide.
Cisco 40GBASE QSFP-40G Modules	Supported transceiver module product number: QSFP-40/100-SRBD **Note** Although this is a dual-rate transceiver module, only the 40G mode is currently supported. For information about the module, see the Cisco 100GBASE QSFP-100G Modules Data Sheet. For information about device compatibility, see the Transceiver Module Group (TMG) Compatibility Matrix.
Cisco 25GBASE SFP28 Modules	Supported transceiver module product number: Cisco SFP-10/25G-LR-S For information about the module, see the Cisco 25GBASE SFP28 Modules Data Sheet and Cisco 25G Transceivers and Cables Enable 25 Gigabit Ethernet over a Fiber or Copper Cable. For information about device compatibility, see the Transceiver Module Group (TMG) Compatibility Matrix.

Feature Name	Description and Documentation Link
Cisco SFP Modules	Supported transceiver module product numbers: • GLC-SX-MM-RGD • GLC-LX-SM-RGD • GLC-ZX-SM-RGD For information about the module, see the Cisco SFP Modules for Gigabit Ethernet Applications Data Sheet. For information about device compatibility, see the Transceiver Module Group (TMG) Compatibility Matrix.

Software Features in Cisco IOS XE Gibraltar 16.11.1

Feature Name	Description, Documentation Link and License Level Information
BGP PE-CE support for MPLS Layer 3 VPNs	Supports BGP as a routing protocol between the provider edge (PE) device and the customer edge (CE) device. See Configuring MPLS Layer 3 VPN. (Network Advantage)
Consent Token for Shell Access	Authenticates a network administrator's request to access the system shell. When debugging software issues, a Cisco TAC engineer may have to work with a network administrator to collect debug information or perform live debugging on a production system. This feature provides the network administrator with privileged, restricted, and secure access to the system shell with mutual consent from the network administrator and Cisco TAC. See System Management → Consent Token. (Network Essentials and Network Advantage)
ERSPAN Termination	Introduces support for encapsulated remote switched port analyzer (ERSPAN) type 3 source feature and the following ERSPAN type 2 and type 3 features: • Security group tag (SGT) • Differentiated services code point (DSCP) • Remote SPAN based redirection • Virtual routing and forwarding (VRF) • Termination The **header-type 3**, **destination**, **ip dscp**, **filter mtu**, and **vrf** commands are available for configuration. See Network Management → Configuring ERSPAN. (DNA Advantage)

Feature Name	Description, Documentation Link and License Level Information
Ingress Replication (IR) for VXLAN BGP EVPN	Enables forwarding of broadcast, unknown unicast, and multicast (BUM) traffic to the relevant recipients in a network. IR is a unicast approach to handling multi-destination traffic, and involves an ingress device replicating every BUM packet and then sending it as a separate unicast to remote egress devices. See Layer 2 → Configuring VXLAN BGP EVPN. (Network Advantage)
IPv6: DHCP Client	IPv6 support is introduced for the DHCP client feature. See IP Addressing Services. (Network Essentials and Network Advantage)
IPv6: IP Service Level Agreements (SLAs)	IPv6 support is introduced for following IP SLA features: • IPv6: IP SLAs - History Statistics • IPv6: IP SLAs - ICMP Path Echo Operation • IPv6: IP SLAs - UDP Echo Operation See Network Management → Configuring Service Level Agreements. (Network Essentials and Network Advantage)
IPv6: IPv6 Multicast Virtual Private Network (MVPNv6)	Enables service providers to use their existing IPv4 backbone to provide multicast-enabled private IPv6 networks to their customers. See IP Multicast Routing → Configuring Multicast Virtual Private Network (Network Advantage)
IPv6: Open Shortest Path First (OSPF)	IPv6 support is introduced for following OSPF features: • IPv6: OSPF Forwarding Address Suppression in Translated Type-5 LSAs • IPv6: OSPF Inbound Filtering using Route Maps with a Distribute List • IPv6: OSPF MIB Support of RFC 1850 and Latest Extensions • IPv6: OSPF Stub Router Advertisement • IPv6: OSPF Support for Link State Advertisement (LSA) Throttling • IPv6: OSPF Update Packet-Pacing Configurable Timers See IP Routing. (Network Essentials and Network Advantage)
IPv6: OSPF Limit on Number of Redistributed Routes	Enables you to configure a maximum number of prefixes (routes) that can be redistributed into OSPFv3 from other protocols or other OSPFv3 processes. Such a limit helps prevent the device from being flooded by too many redistributed routes. See IP Routing → Configuring OSPFv3 Limit on Number of Redistributed Routes. (Network Essentials and Network Advantage)

Feature Name	Description, Documentation Link and License Level Information
IPv6: RFC 5453 Reserved IPv6 Interface Identifiers	An autoconfigured IPv6 address will contain interface identifiers that are not part of the reserved range of interface identifiers specified in RFC 5453. See IP Multicast Routing → IP Multicast Routing Technology Overview. (Network Essentials and Network Advantage)
IPv6 Downloadable ACL (DACL)	Applies per-port IPv6 access-layer restrictions based on Identity Services Engine (ISE) profiles. See Security → IPv6 ACLs. (Network Essentials and Network Advantage)
IPv6 Support for Virtual Extensible LAN (VXLAN) Border Gateway Protocol (BGP) Ethernet VPN (EVPN) in Routed Mode	Introduces IPv6 support for the VXLAN BGP EVPN operation in routed mode. A VXLAN is a network overlay that allows layer 2 segments to be stretched across an IP core. All the benefits of Layer 3 topologies are thereby available with VXLAN. The overlay protocol is VXLAN and BGP uses EVPN as the address family for communicating end host MAC and IP addresses. VXLAN BGP EVPN operates in bridged mode when the hosts are in the same subnet, and in routed mode when the hosts are in different subnets. See Layer 2 → Configuring VXLAN BGP EVPN. (Network Advantage)
Multiprotocol Label Switching (MPLS) • MPLS VPN-Inter-AS Option B • MPLS VPN-Inter-AS-IPv4 BGP Label Distribution • MPLS over GRE • MPLS VPN eBGP Multipath Support for Inter-AS VPNs	• MPLS VPN-Inter-AS Option B—Allows an MPLS Virtual Private Network (VPN) service provider to interconnect different autonomous systems to provide VPN services. In an Inter-AS Option B network, autonomous system boundary router (ASBR) peers are connected by one or more interfaces that are enabled to receive MPLS traffic. • MPLS VPN-Inter-AS-IPv4 BGP Label Distribution—Enables you to set up a VPN service provider network so that ASBRs exchange IPv4 routes with MPLS labels of the provider edge (PE) routers. • MPLS over GRE—Provides a mechanism for tunneling MPLS packets over non-MPLS networks by creating a generic routing encapsulation (GRE) tunnel. The MPLS packets are encapsulated within the GRE tunnel packets, and the encapsulated packets traverse the non-MPLS network through the GRE tunnel. When GRE tunnel packets are received at the other side of the non-MPLS network, the GRE tunnel packet header is removed and the inner MPLS packet is forwarded to its final destination. • MPLS VPN eBGP Multipath Support for Inter-AS VPNs—Enables you to configure external Border Gateway Protocol (eBGP) multipath with IPv4 labels. It allows load balancing of VPN traffic when you use VPNv4 peering for Inter-AS VPNs. Without this feature, the MPLS forwarding table contains the labels only for the BGP best path even though the routing table has more than one path for the prefix. See Multiprotocol Label Switching. (Network Advantage)

Feature Name	Description, Documentation Link and License Level Information
Password Configuration: Secure Password Migration	Introduces support for migration of type 0 and type 7 usernames and passwords to type 6. Password protection restricts access to a network or network device. Encrypting passwords provides an additional layer of security, particularly for passwords that cross the network or are stored on a TFTP server. Starting with this release, the switch supports automatic conversion of usernames and passwords with type 0 and type 7 encryption, to type 6 encryption. Type-6 is a strong, reversible 128-bit Advanced Encryption Standard (AES) password encryption. To start using type-6 encryption, you must enable the AES password encryption feature and configure a primary encryption key, which is used to encrypt and decrypt passwords. See Security → Controlling Switch Access with Passwords and Privilege Levels. (Network Essentials and Network Advantage)

Programmability
• Kill Telemetry Subscription
• NETCONF and RESTCONF Service Level Access Control Lists
• YANG Data Models
	The following programmability features are introduced in this release:
	• Kill Telemetry Subscription—Provides the ability to delete a dynamic model driven telemetry subscription using either:
	  • The **clear telemetry ietf subscription** Cisco IOS command, or
	  • The <kill-subscription> RPC
	• NETCONF and RESTCONF Service Level Access Control Lists (ACLs)—Enables you to configure an IPv4 or IPv6 ACL for NETCONF and RESTCONF sessions.
	  Clients that do not conform to the configured ACL are not allowed to access the NETCONF or RESTCONF subsystems. When service-level ACLs are configured, NETCONF and RESTCONF connection requests are filtered based on the source IP address.
	• 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/16111.
	  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 Programmability.
	
	(Network Essentials and Network Advantage)

Smart Licensing: System Messages for an Evaluation License	Evaluation licenses that are not registered will still expire after the 90-day period, but warning system messages about an evaluation license expiry will now be generated only 275 days after this 90-day window. See License Levels - Usage Guidelines, on page 36. (A license level does not apply)
Supported Spanning-Tree Instances	In per-VLAN spanning-tree plus (PVST+), Rapid PVST+ mode, the device or device stack now supports up to 256 spanning-tree instances. See Layer 2. (Network Essentials and Network Advantage)

Feature Name	Description, Documentation Link and License Level Information
Time Domain Reflectometer (TDR)	Determines if a cable is OPEN or SHORT when it is at fault. This involves running a TDR test, which detects a cable fault by sending a signal through the cable and reading the signal that is reflected back. To run the test, enter the **test cable-diagnostics tdr** command in privileged EXEC mode; to display test results, enter the **show cable-diagnostics tdr** command in privileged EXEC mode. See Interface and Hardware Components → Checking Port Status and Connectivity. (Network Essentials and Network Advantage)

New on the Web UI	
• Application Visibility and Control (AVC) • Switching Database Manager (SDM) templates • Cisco TrustSec	Use the WebUI to: • Configure and monitor AVC—Enables you to configure application-level classification, monitoring, and traffic control. It helps with improved network capacity management, faster troubleshooting, and lower operating costs. Also, Network-Based Application Recognition (NBAR) supports the use of custom protocols to identify customer-specific applications. • Apply SDM templates—Helps configure system resources to optimize support for specific features, depending on how your device is used in the network. • Configure and monitor Cisco TrustSec—Helps build secure networks by establishing domains of trusted network devices. Each device in the domain is authenticated by its peers. Communication on the links between devices in the domain is secured with a combination of encryption, message integrity check, and data-path replay protection mechanisms.

Important Notes

Unsupported Features

- Bluetooth
- Cisco TrustSec Network Device Admission Control (NDAC) on Uplinks
- Converged Access for Branch Deployments
- Gateway Load Balancing Protocol (GLBP)
- IPsec VPN
- Performance Monitoring (PerfMon)
- Virtual Routing and Forwarding (VRF)-Aware web authentication

Complete List of Supported Features

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

Accessing Hidden Commands

Starting with 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. This means that entering enter a question mark (?) at the system prompt did not display the list of available commands. Such hidden commands are only meant to assist Cisco TAC in advanced troubleshooting and are therefore not documented. For more information about CLI help, see the *Using the Command-Line Interface → Understanding the Help System* chapter of the Command Reference document.

Hidden commands are available under:

- Category 1—Hidden commands in privileged or User EXEC mode. Begin by entering the **service internal** command to access these commands.
- Category 2—Hidden commands in one of the configuration modes (global, interface and so on). These commands do not require the **service internal** command.

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

- The commands have CLI help. Entering enter a question mark (?) at the system prompt displays 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 the command is used. For 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 category 1 and 2, there remain internal commands displayed on the CLI, for which the system does NOT generate the %PARSER-5-HIDDEN syslog message.

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

If you find that you are using 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 non-hidden commands.

Supported Hardware

Cisco Catalyst 9300 Series Switches—Model Numbers

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

Table 1: Cisco Catalyst 9300 Series Switches

Switch Model	Default License Level[1]	Description
C9300-24P-A	Network Advantage	Stackable 24 10/100/1000 PoE+ ports; PoE budget of 437W; 715 WAC power supply; supports StackWise-480 and StackPower
C9300-24P-E	Network Essentials	
C9300-24S-A	Network Advantage	Stackable 24 1G SFP ports; two power supply slots with 715 WAC power supply installed by default; supports StackWise-480 and StackPower.
C9300-24S-E	Network Essentials	
C9300-24T-A	Network Advantage	Stackable 24 10/100/1000 Ethernet ports; 350 WAC power supply; supports StackWise-480 and StackPower
C9300-24T-E	Network Essentials	
C9300-24U-A	Network Advantage	Stackable 24 10/100/1000 UPoE ports; PoE budget of 830W; 1100 WAC power supply; supports StackWise-480 and StackPower
C9300-24U-E	Network Essentials	
C9300-24UX-A	Network Advantage	Stackable 24 Multigigabit Ethernet 100/1000/2500/5000/10000 UPoE ports; PoE budget of 490 W with 1100 WAC power supply; supports StackWise-480 and StackPower
C9300-24UX-E	Network Essentials	
C9300-48T-A	Network Advantage	Stackable 48 10/100/1000 Ethernet ports; 350 WAC power supply; supports StackWise-480 and StackPower
C9300-48T-E	Network Essentials	
C9300-48P-A	Network Advantage	Stackable 48 10/100/1000 PoE+ ports; PoE budget of 437W; 715 WAC power supply; supports StackWise-480 and StackPower
C9300-48P-E	Network Essentials	

Switch Model	Default License Level[1]	Description
C9300-48S-A	Network Advantage	Stackable 48 1G SFP ports; two power supply slots with 715 WAC power supply installed by default; supports StackWise-480 and StackPower.
C9300-48S-E	Network Essentials	
C9300-48T-A	Network Advantage	Stackable 48 10/100/1000 Ethernet ports; 350 WAC power supply; supports StackWise-480 and StackPower
C9300-48T-E	Network Essentials	
C9300-48U-A	Network Advantage	Stackable 48 10/100/1000 UPoE ports; PoE budget of 822 W; 1100 WAC power supply; supports StackWise-480 and StackPower
C9300-48U-E	Network Essentials	
C9300-48UN-A	Network Advantage	Stackable 48 Multigigabit Ethernet (100 Mbps or 1/2.5/5 Gbps) UPoE ports; PoE budget of 610 W with 1100 WAC power supply; supports StackWise-480 and StackPower
C9300-48UN-E	Network Essentials	
C9300-48UXM-A	Network Advantage	Stackable 48 (36 2.5G Multigigabit Ethernet and 12 10G Multigigabit Ethernet Universal Power Over Ethernet (UPOE) ports)
C9300-48UXM-E	Network Essentials	

[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 9300L Series Switches

Switch Model	Default License Level[2]	Description
C9300L-24T-4G-A	Network Advantage	Stackable 24x10/100/1000M Ethernet ports; 4x1G SFP fixed uplink ports; 350 WAC power supply; supports StackWise-320.
C9300L-24T-4G-E	Network Essentials	
C9300L-24P-4G-A	Network Advantage	Stackable 24x10/100/1000M PoE+ ports; 4x1G SFP fixed uplink ports; PoE budget of 505W with 715 WAC power supply; supports StackWise-320.
C9300L-24P-4G-E	Network Essentials	

Switch Model	Default License Level[2]	Description
C9300L-24T-4X-A	Network Advantage	Stackable 24x10/100/1000M Ethernet ports; 4x10G SFP+ fixed uplink ports; 350 WAC power supply; supports StackWise-320.
C9300L-24T-4X-E	Network Essentials	
C9300L-24P-4X-A	Network Advantage	Stackable 24x10/100/1000M PoE+ ports; 4x10G SFP+ fixed uplink ports; PoE budget of 505W with 715 WAC power supply; supports StackWise-320.
C9300L-24P-4X-E	Network Essentials	
C9300L-48T-4G-A	Network Advantage	Stackable 48x10/100/1000M Ethernet ports; 4x1G SFP fixed uplink ports; 350 WAC power supply; supports StackWise-320.
C9300L-48T-4G-E	Network Essentials	
C9300L-48P-4G-A	Network Advantage	Stackable 48x10/100/1000M PoE+ ports; 4x1G SFP fixed uplink ports; PoE budget of 505W with 715 WAC power supply; supports StackWise-320.
C9300L-48P-4G-E	Network Essentials	
C9300L-48T-4X-A	Network Advantage	Stackable 48x10/100/1000M Ethernet ports; 4x10G SFP+ fixed uplink ports; 350 WAC power supply; supports StackWise-320.
C9300L-48T-4X-E	Network Essentials	
C9300L-48P-4X-A	Network Advantage	Stackable 48x10/100/1000M PoE+ ports; 4x10G SFP+ fixed uplink ports; PoE budget of 505W with 715 WAC power supply; supports StackWise-320.
C9300L-48P-4X-E	Network Essentials	

[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 the optional uplink network modules with 1-Gigabit, 10-Gigabit, 25-Gigabit, and 40-Gigabit slots. You should only operate the switch with either a network module or a blank module installed.

Network Module	Description
C3850-NM-4-1G [1]	Four 1 Gigabit Ethernet SFP module slots

Network Module	Description
C3850-NM-2-10G [1]	Two 10 Gigabit Ethernet SFP module slots
C3850-NM-4-10G [1]	Four 10 Gigabit Ethernet SFP module slots
C3850-NM-8-10G [1]	Eight 10 Gigabit Ethernet SFP module slots
C3850-NM-2-40G [1]	Two 40 Gigabit Ethernet SFP module slots
C9300-NM-4G [2]	Four 1 Gigabit Ethernet SFP module slots
C9300-NM-4M [2]	Four MultiGigabit Ethernet slots
C9300-NM-8X [2]	Eight 10 Gigabit Ethernet SFP+ module slots
C9300-NM-2Q [2]	Two 40 Gigabit Ethernet QSFP+ module slots
C9300-NM-2Y [2]	Two 25 Gigabit Ethernet SFP28 module slots

Note

1. These network modules are supported only on the C3850 and C9300 SKUs of the Cisco Catalyst 3850 Series Switches and Cisco Catalyst 9300 Series Switches respectively.
2. These network modules are supported only on the C9300 SKUs of the Cisco Catalyst 9300 Series Switches.

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.

Catalyst 9300	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
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 9300	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**.
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**.

Catalyst 9300	Cisco Identity Services Engine	Cisco Access Control Server	Cisco Prime Infrastructure
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)

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 Gibraltar 16.11.1	CAT9K_IOSXE	cat9k_iosxe.16.11.01.SPA.bin
	Licensed Data Payload Encryption (LDPE)	cat9k_iosxeldpe.16.11.01.SPA

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 Cisco IOS XE Everest 16.x.x, or Cisco IOS XE Fuji 16.x.x releases, if there is a new bootloader 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.

Scenario	Automatic Boot Loader Response

If you boot Cisco IOS XE Gibraltar 16.11.1 first time	On Cisco Catalyst 9300 Series Switches, the boot loader may be upgraded to version 16.10.1r[FC1]. For example:
	`ROM: IOS-XE ROMMON`
	`BOOTLDR: System Bootstrap, Version 16.10.1r[FC1], RELEASE SOFTWARE (P)`
	When using **install** commands to upgrade software, you may see this during the install operation:
	`!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!`
	`%IOSXEBOOT-4-BOOTLOADER_UPGRADE: (rp/0): ### Thu Mar 06 18:03:28 Universal 2019 PLEASE DO NOT POWER CYCLE ### BOOT LOADER UPGRADING`
	`waiting for upgrades to complete...`

Automatic Microcode Upgrade

During a Cisco IOS image upgrade or downgrade on a PoE or UPoE switch, microcode is upgraded to reflect applicable feature enhancements and bug fixes. A microcode upgrade occurs only during an image upgrade or downgrade, on PoE or UPoE switches. It does not occur during switch reloads or on non-PoE switches.

Depending on the release you are upgrading from, microcode upgrade can occur during the install operation or during bootup:

- If the release you are upgrading *from* does not support microcode updates during the course of installation, microcode is updated during boot up, and an additional 4 minutes (approximately) are required to complete the microcode upgrade, in addition to the normal reload time. Data traffic is not forwarded when microcode is upgraded during bootup.
- When using **install** commands to upgrade, microcode is upgraded during the install operation, and no additional time is required during bootup. Here microcode is updated before the reload that occurs as part of the image upgrade process. Data traffic continues to be forwarded during the upgrade.

Do not restart the switch during the upgrade or downgrade process.

The following console messages are displayed during microcode upgrade.

```
MM [1] MCU version 111 sw ver 105
MM [2] MCU version 111 sw ver 105
```

```
Front-end Microcode IMG MGR: found 4 microcode images for 1 device.
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_0 mismatch: 0
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_1 mismatch: 1
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_2 mismatch: 1
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_3 mismatch: 0

Front-end Microcode IMG MGR: Preparing to program device microcode...
Front-end Microcode IMG MGR: Preparing to program device[0], index=0 ...594412 bytes....
Skipped[0].
Front-end Microcode IMG MGR: Preparing to program device[0], index=1 ...393734 bytes.
Front-end Microcode IMG MGR: Programming device 0...rwRrrrrrrw..
0%.....................................................................
10%.....................................................................
20%.....................................................................
30%.....................................................................
40%.....................................................................
50%.....................................................................
60%.....................................................................
70%.....................................................................
80%.....................................................................
90%.....................................................................100%
Front-end Microcode IMG MGR: Preparing to program device[0], index=2 ...25186 bytes.
Front-end Microcode IMG MGR: Programming device
0...rrrrrrw..0%....10%....20%......30%...40%......50%....60%......70%...80%......90%....100%wRr!
Front-end Microcode IMG MGR: Microcode programming complete for device 0.
Front-end Microcode IMG MGR: Preparing to program device[0], index=3 ...86370 bytes....
Skipped[3].
Front-end Microcode IMG MGR: Microcode programming complete in 290 seconds
```

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	
`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, in install mode. To perform a software image upgrade, you must be booted into IOS through **boot flash:packages.conf**.

Before you begin

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

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 Gibraltar 16.11.x
Cisco IOS XE Everest 16.6.2 and later	Either **install** commands or **request platform software** commands	

The sample output in this section displays upgrade from

- Cisco IOS XE Everest 16.5.1a to Cisco IOS XE Gibraltar 16.11.1 using **request platform software** commands.
- Cisco IOS XE Everest 16.6.3 to Cisco IOS XE Gibraltar 16.11.1 using **install** commands.

Procedure

Step 1 Clean Up

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.

- **request platform software package clean**
- **install remove inactive**

The following sample output displays the cleaning up of unused files, by using the **request platform software package clean** command for upgrade scenario Cisco IOS XE Everest 16.5.1a to Cisco IOS XE Gibraltar 16.11.1. Use the **switch all** option to clean up all the switches in your stack

Note Ignore the hexdump: messages in the CLI when you enter the command; they have no functional impact and will be removed in a later release. You will see this only on member switches and not on the active or standby. In the sample output below, hexdump messages are seen on switch 3, which is a member switch.

```
Switch# request platform software package clean switch all
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.
done.

Running command on switch 2
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.

Running command on switch 3
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 ...
hexdump: NVRAM: No such file or directory
hexdump: all input file arguments failed
head: cannot open 'NVRAM' for reading: No such file or directory
NVRAM: No such file or directory
hexdump: NVRAM: No such file or directory
hexdump: stdin: Bad file descriptor
tail: cannot open 'NVRAM' for reading: No such file or directory
hexdump: NVRAM: No such file or directory
hexdump: all input file arguments failed
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.SPA.pkg
/flash/cat9k-espbase.SPA.pkg
/flash/cat9k-guestshell.SPA.pkg
/flash/cat9k-rpbase.SPA.pkg
/flash/cat9k-rpboot.SPA.pkg
/flash/cat9k-sipbase.SPA.pkg
/flash/cat9k-sipspa.SPA.pkg
/flash/cat9k-srdriver.SPA.pkg
```

```
/flash/cat9k-webui.SPA.pkg
/flash/cat9k_iosxe.16.05.01a.SPA.conf
/flash/packages.conf.00-
[2]:
/flash/cat9k-cc_srdriver.SPA.pkg
/flash/cat9k-espbase.SPA.pkg
/flash/cat9k-guestshell.SPA.pkg
/flash/cat9k-rpbase.SPA.pkg
/flash/cat9k-rpboot.SPA.pkg
/flash/cat9k-sipbase.SPA.pkg
/flash/cat9k-sipspa.SPA.pkg
/flash/cat9k-srdriver.SPA.pkg
/flash/cat9k-webui.SPA.pkg
/flash/cat9k_iosxe.16.05.01a.SPA.conf
/flash/packages.conf.00-
[3]:
/flash/cat9k-cc_srdriver.SPA.pkg
/flash/cat9k-espbase.SPA.pkg
/flash/cat9k-guestshell.SPA.pkg
/flash/cat9k-rpbase.SPA.pkg
/flash/cat9k-rpboot.SPA.pkg
/flash/cat9k-sipbase.SPA.pkg
/flash/cat9k-sipspa.SPA.pkg
/flash/cat9k-srdriver.SPA.pkg
/flash/cat9k-webui.SPA.pkg
/flash/cat9k_iosxe.16.05.01a.SPA.conf
/flash/packages.conf.00-

Do you want to proceed? [y/n]y
[1]:
Deleting file flash:cat9k-cc_srdriver.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.SPA.pkg ... done.
Deleting file flash:cat9k-webui.SPA.pkg ... done.
Deleting file flash:cat9k_iosxe.16.05.01a.SPA.conf ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
[2]:
Deleting file flash:cat9k-cc_srdriver.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.SPA.pkg ... done.
Deleting file flash:cat9k-webui.SPA.pkg ... done.
Deleting file flash:cat9k_iosxe.16.05.01a.SPA.conf ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
[3]:
Deleting file flash:cat9k-cc_srdriver.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.SPA.pkg ... done.
```

```
Deleting file flash:cat9k-webui.SPA.pkg ... done.
Deleting file flash:cat9k_iosxe.16.05.01a.SPA.conf ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted
```

The following sample output displays the cleaning up of unused files, by using the **install remove inactive** command, for upgrade scenario Cisco IOS XE Everest 16.6.3 to Cisco IOS XE Gibraltar 16.11.1:

```
Switch# install remove inactive
install_remove: START Wed Mar 06 19:51:48 UTC 2019
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.16.06.03.SPA.pkg
/flash/cat9k-espbase.16.06.03.SPA.pkg
/flash/cat9k-guestshell.16.06.03.SPA.pkg
/flash/cat9k-rpbase.16.06.03.SPA.pkg
/flash/cat9k-rpboot.16.06.03.SPA.pkg
/flash/cat9k-sipbase.16.06.03.SPA.pkg
/flash/cat9k-sipspa.16.06.03.SPA.pkg
/flash/cat9k-srdriver.16.06.03.SPA.pkg
/flash/cat9k-webui.16.06.03.SPA.pkg
/flash/cat9k-wlc.16.06.03.SPA.pkg
/flash/packages.conf

Do you want to remove the above files? [y/n]y
[switch 1]:
Deleting file flash:cat9k-cc_srdriver.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-webui.16.06.03.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.16.06.03.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 06 19:52:25 UTC 2019
Switch#
```

Step 2 Copy new image to flash

a) **copy tftp: flash:**

Use this command to 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.16.11.01.SPA.bin flash:
destination filename [cat9k_iosxe.16.11.01.SPA.bin]?
Accessing tftp://10.8.0.6//cat9k_iosxe.16.11.01.SPA.bin...
```

```
Loading /cat9k_iosxe.16.11.01.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 06 2019 10:18:11 -07:00 cat9k_iosxe.16.11.01.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
Switch(config)# exit
```

b) **write memory**

Use this command to save boot settings.

```
Switch# write memory
```

c) **show boot system**

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

The output should display **BOOT variable** = **flash:packages.conf**.

```
Switch# show boot system
```

Step 4 Software install image to flash

- **request platform software package install**
- **install add file activate commit**

You can point to the source image on your TFTP server or in flash if you have it copied to flash. 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 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# request platform software package install switch all file flash-3:cat9k_iosxe.16.11.01.SPA.bin auto-copy`.

The following sample output displays installation of the Cisco IOS XE Gibraltar 16.11.1 software image to flash, by using the **request platform software package install** command, for upgrade scenario Cisco IOS XE Everest 16.5.1a to Cisco IOS XE Gibraltar 16.11.1.

```
Switch# request platform software package install switch all file
flash:cat9k_iosxe.16.11.01.SPA.bin auto-copy

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

```
Finished install local lock acquisition on switch 1

Expanding image file: flash:cat9k_iosxe.16.11.01.SPA.bin
[1]: Copying flash:cat9k_iosxe.16.11.01.SPA.bin from switch 1 to switch 2 3
[2 3]: Finished copying to switch 2 3
[1 2 3]: Expanding file
[1 2 3]: Finished expanding all-in-one software package in switch 1 2 3
SUCCESS: Finished expanding all-in-one software package.
[1 2 3]: 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.16.11.01.SPA.pkg
Added cat9k-espbase.16.11.01.SPA.pkg
Added cat9k-guestshell.16.11.01.SPA.pkg
Added cat9k-rpbase.16.11.01.SPA.pkg
Added cat9k-rpboot.16.11.01.SPA.pkg
Added cat9k-sipbase.16.11.01.SPA.pkg
Added cat9k-sipspa.16.11.01.SPA.pkg
Added cat9k-srdriver.16.11.01.SPA.pkg
Added cat9k-webui.16.11.01.SPA.pkg
Added cat9k-wlc.16.11.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[1]: Finished install successful on switch 1
[2]: install package(s) on switch 2
--- 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.16.11.01.SPA.pkg
Added cat9k-espbase.16.11.01.SPA.pkg
Added cat9k-guestshell.16.11.01.SPA.pkg
Added cat9k-rpbase.16.11.01.SPA.pkg
Added cat9k-rpboot.16.11.01.SPA.pkg
Added cat9k-sipbase.16.11.01.SPA.pkg
Added cat9k-sipspa.16.11.01.SPA.pkg
Added cat9k-srdriver.16.11.01.SPA.pkg
Added cat9k-webui.16.11.01.SPA.pkg
Added cat9k-wlc.16.11.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[2]: Finished install successful on switch 2
```

```
[3]: install package(s) on switch 3
--- 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.16.11.01.SPA.pkg
Added cat9k-espbase.16.11.01.SPA.pkg
Added cat9k-guestshell.16.11.01.SPA.pkg
Added cat9k-rpbase.16.11.01.SPA.pkg
Added cat9k-rpboot.16.11.01.SPA.pkg
Added cat9k-sipbase.16.11.01.SPA.pkg
Added cat9k-sipspa.16.11.01.SPA.pkg
Added cat9k-srdriver.16.11.01.SPA.pkg
Added cat9k-webui.16.11.01.SPA.pkg
Added cat9k-wlc.16.11.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[3]: Finished install successful on switch 3
Checking status of install on [1 2 3]
[1 2 3]: Finished install in switch 1 2 3
SUCCESS: Finished install: Success on [1 2 3]
```

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

The following sample output displays installation of the Cisco IOS XE Gibraltar 16.11.1 software image to flash, by using the **install add file activate commit** command, for upgrade scenario Cisco IOS XE Everest 16.6.3 to Cisco IOS XE Gibraltar 16.11.1:

```
Switch# install add file flash:cat9k_iosxe.16.11.01.SPA.bin activate commit

install_add_activate_commit: START Wed Mar 06 19:54:51 UTC 2018

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]y
Building configuration...

[OK]Modified configuration has been saved

*Mar 06 19:54:55.633: %IOSXE-5-PLATFORM: Switch 1 R0/0: Mar 06 19:54:55 install_engine.sh:

%INSTALL-5-INSTALL_START_INFO: Started install one-shot
flash:cat9k_iosxe.16.11.01.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.16.11.01.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.16.11.01.SPA.pkg
/flash/cat9k-webui.16.11.01.SPA.pkg
/flash/cat9k-srdriver.16.11.01.SPA.pkg
/flash/cat9k-sipspa.16.11.01.SPA.pkg
/flash/cat9k-sipbase.16.11.01.SPA.pkg
/flash/cat9k-rpboot.16.11.01.SPA.pkg
/flash/cat9k-rpbase.16.11.01.SPA.pkg
/flash/cat9k-guestshell.16.11.01.SPA.pkg
/flash/cat9k-espbase.16.11.01.SPA.pkg
/flash/cat9k-cc_srdriver.16.11.01.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

*Mar 06 19:57:41.145: %IOSXE-5-PLATFORM: Switch 1 R0/0: mar 06 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 Wed Mar 06 19:57:48 UTC 2019
Switch#
```

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 **dir flash:**

After the software has been successfully installed, use this command to verify that the flash partition has ten new `.pkg` files and three `.conf` files.

The following is sample output of the **dir flash:** command for upgrade scenario Cisco IOS XE Everest 16.5.1a to Cisco IOS XE Gibraltar 16.11.1:

```
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

491524 -rw- 25711568  Mar 06 2019 11:49:33 -07:00 cat9k-cc_srdriver.16.11.01.SPA.pkg
491525 -rw- 78484428  Mar 06 2019 11:49:35 -07:00 cat9k-espbase.16.11.01.SPA.pkg
491526 -rw- 1598412   Mar 06 2019 11:49:35 -07:00 cat9k-guestshell.16.11.01.SPA.pkg
491527 -rw- 404153288 Mar 06 2019 11:49:47 -07:00 cat9k-rpbase.16.11.01.SPA.pkg
491533 -rw- 31657374  Mar 06 2019 11:50:09 -07:00 cat9k-rpboot.16.11.01.SPA.pkg
491528 -rw- 27681740  Mar 06 2019 11:49:48 -07:00 cat9k-sipbase.16.11.01.SPA.pkg
491529 -rw- 52224968  Mar 06 2019 11:49:49 -07:00 cat9k-sipspa.16.11.01.SPA.pkg
491530 -rw- 31130572  Mar 06 2019 11:49:50 -07:00 cat9k-srdriver.16.11.01.SPA.pkg
491531 -rw- 14783432  Mar 06 2019 11:49:51 -07:00 cat9k-webui.16.11.01.SPA.pkg
491532 -rw- 9160      Mar 06 2019 11:49:51 -07:00 cat9k-wlc.16.11.01.SPA.pkg

11353194496 bytes total (8963174400 bytes free)
```

The following is sample output of the **dir flash:** command for the Cisco IOS XE Everest 16.6.3 to Cisco IOS XE Gibraltar 16.11.1 upgrade scenario:

```
Switch# dir flash:*.pkg

Directory of flash:/
475140 -rw- 2012104   Jul 26 2017 09:52:41 -07:00 cat9k-cc_srdriver.16.06.03.SPA.pkg
475141 -rw- 70333380  Jul 26 2017 09:52:44 -07:00 cat9k-espbase.16.06.03.SPA.pkg
475142 -rw- 13256     Jul 26 2017 09:52:44 -07:00 cat9k-guestshell.16.06.03.SPA.pkg
475143 -rw- 349635524 Jul 26 2017 09:52:54 -07:00 cat9k-rpbase.16.06.03.SPA.pkg
475149 -rw- 24248187  Jul 26 2017 09:53:02 -07:00 cat9k-rpboot.16.06.03.SPA.pkg
475144 -rw- 25285572  Jul 26 2017 09:52:55 -07:00 cat9k-sipbase.16.06.03.SPA.pkg
475145 -rw- 20947908  Jul 26 2017 09:52:55 -07:00 cat9k-sipspa.16.06.03.SPA.pkg
475146 -rw- 2962372   Jul 26 2017 09:52:56 -07:00 cat9k-srdriver.16.06.03.SPA.pkg
475147 -rw- 13284288  Jul 26 2017 09:52:56 -07:00 cat9k-webui.16.06.03.SPA.pkg
475148 -rw- 13248     Jul 26 2017 09:52:56 -07:00 cat9k-wlc.16.06.03.SPA.pkg

491524 -rw- 25711568  Oct 31 2018 11:49:33 -07:00 cat9k-cc_srdriver.16.11.01.SPA.pkg
491525 -rw- 78484428  Oct 31 2018 11:49:35 -07:00 cat9k-espbase.16.11.01.SPA.pkg
491526 -rw- 1598412   Oct 31 2018 11:49:35 -07:00 cat9k-guestshell.16.11.01.SPA.pkg
491527 -rw- 404153288 Oct 31 2018 11:49:47 -07:00 cat9k-rpbase.16.11.01.SPA.pkg
491533 -rw- 31657374  Oct 31 2018 11:50:09 -07:00 cat9k-rpboot.16.11.01.SPA.pkg
491528 -rw- 27681740  Oct 31 2018 11:49:48 -07:00 cat9k-sipbase.16.11.01.SPA.pkg
491529 -rw- 52224968  Oct 31 2018 11:49:49 -07:00 cat9k-sipspa.16.11.01.SPA.pkg
491530 -rw- 31130572  Oct 31 2018 11:49:50 -07:00 cat9k-srdriver.16.11.01.SPA.pkg
491531 -rw- 14783432  Oct 31 2018 11:49:51 -07:00 cat9k-webui.16.11.01.SPA.pkg
491532 -rw- 9160      Oct 31 2018 11:49:51 -07:00 cat9k-wlc.16.11.01.SPA.pkg
11353194496 bytes total (9544245248 bytes free)
Switch#
```

The following sample output 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
- `cat9k_iosxe.16.11.01.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 06 2019 10:59:16 -07:00 packages.conf
516098 -rw- 7406 Mar 06 2019 10:58:08 -07:00 cat9k_iosxe.16.11.01.SPA.conf
11353194496 bytes total (8963174400 bytes free)
```

Step 6 Reload

a) **reload**

Use this command to reload the switch.

```
Switch# reload
```

b) **boot flash:**

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
```

c) **show version**

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

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

The following sample output of the **show version** command displays the **dir flash:*.pkg** image on the device:

```
Switch# show version
Cisco IOS XE Software, Version 16.11.01
Cisco IOS Software [Gibraltar], Catalyst L3 Switch Software (CAT9K_IOSXE), Version
16.11.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2019 by Cisco Systems, Inc.
<output truncated>
```

Downgrading in Install Mode

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

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 Gibraltar 16.11.x	Either **install** commands or **request platform software** commands	Cisco IOS XE Gibraltar 16.10.x or earlier releases.

The sample output in this section shows downgrade from Cisco IOS XE Gibraltar 16.11.1 to Cisco IOS XE Everest 16.6.1, by using the **install** commands.

Important 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. If you add a new switch model to an existing stack, we recommend upgrading all existing switches to the latest release.

Procedure

Step 1 Clean Up

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.

- **request platform software package clean**
- **install remove inactive**

The following sample output displays the cleaning up of Cisco IOS XE Gibraltar 16.11.1 files using the **install remove inactive** command:

```
Switch# install remove inactive

install_remove: START Wed Mar 06 19:51:48 UTC 2019
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.16.11.01.SPA.pkg
/flash/cat9k-espbase.16.11.01.SPA.pkg
/flash/cat9k-guestshell.16.11.01.SPA.pkg
/flash/cat9k-rpbase.16.11.01.SPA.pkg
/flash/cat9k-rpboot.16.11.01.SPA.pkg
/flash/cat9k-sipbase.16.11.01.SPA.pkg
/flash/cat9k-sipspa.16.11.01.SPA.pkg
/flash/cat9k-srdriver.16.11.01.SPA.pkg
/flash/cat9k-webui.16.11.01.SPA.pkg
/flash/cat9k-wlc.16.11.01.SPA.pkg
/flash/packages.conf

Do you want to remove the above files? [y/n]y
[switch 1]:
Deleting file flash:cat9k-cc_srdriver.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-espbase.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-guestshell.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpbase.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-rpboot.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipbase.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-sipspa.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-srdriver.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-webui.16.11.01.SPA.pkg ... done.
Deleting file flash:cat9k-wlc.16.11.01.SPA.pkg ... done.
Deleting file flash:packages.conf ... done.
SUCCESS: Files deleted.

--- Starting Post_Remove_Cleanup ---
Performing Post_Remove_Cleanup on all members
[1] Post_Remove_Cleanup package(s) on switch 1
```

```
[1] Finished Post_Remove_Cleanup on switch 1
Checking status of Post_Remove_Cleanup on [1]
Post_Remove_Cleanup: Passed on [1]
Finished Post_Remove_Cleanup

SUCCESS: install_remove Wed Mar 06 19:52:25 UTC 2019
Switch#
```

Step 2 Copy new image to flash

a) **copy tftp: flash:**

Use this command to 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 - 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 06 2018 13:35:16 -07:00 cat9k_iosxe.16.06.01.SPA.bin
11353194496 bytes total (9055866880 bytes free)
```

Step 3 Downgrade software image

- **install add file activate commit**
- **request platform software package install**

The following example displays the installation of the Cisco IOS XE Everest 16.6.1 software image to flash, by using the **install add file activate commit** command.

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

install_add_activate_commit: START Wed Mar 06 19:54:51 UTC 2019

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

*Mar 06 19:54:55.633: %IOSXE-5-PLATFORM: Switch 1 R0/0: Mar 06 19:54:55 install_engine.sh:
 %INSTALL-
5-INSTALL_START_INFO: Started install one-shot flash:cat9k_iosxe.16.06.01.SPA.bin
install_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

*Mar 06 19:57:41.145: %IOSXE-5-PLATFORM: Switch 1 R0/0: Mar 06 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 Wed Mar 06 19:57:48 UTC 2019
Switch#
```

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

Step 4 Reload

a) **reload**

Use this command to reload the switch.

```
Switch# reload
```

b) **boot flash:**

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
```

Note When you downgrade the software image, the boot loader will not automatically downgrade. It will remain updated.

c) **show version**

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

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

The following sample output of the **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 Fri 16-Mar-18 06:38 by mcpre
<output truncated>
```

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 9300 Series Switches 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.

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—a license that is not registered.

License Levels - Usage Guidelines

- Base licenses (Network Essentials and Network-Advantage) are ordered and fulfilled only with a permanent license type.
- Add-on licenses (DNA Essentials and DNA Advantage) are ordered and fulfilled only with a 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[5]	Yes

[5] 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*.

Cisco Smart Licensing

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure – you control what users can access. With Smart Licensing you get:

- Easy Activation: Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more PAKs (Product Activation Keys).
- Unified Management: My Cisco Entitlements (MCE) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- License Flexibility: Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central (http://software.cisco.com).

Important Cisco Smart Licensing is the default and the only available method to manage licenses.

For a more detailed overview on Cisco Licensing, go to cisco.com/go/licensingguide.

Deploying Smart Licensing

The following provides a process overview of a day 0 to day N deployment directly initiated from a device that is running Cisco IOS XE Fuji 16.9.1 or later releases. Links to the configuration guide provide detailed information to help you complete each one of the smaller tasks.

Procedure

Step 1 Begin by establishing a connection from your network to Cisco Smart Software Manager on cisco.com.

In the software configuration guide of the required release, see *System Management → Configuring Smart Licensing → Connecting to CSSM*

Step 2 Create and activate your Smart Account, or login if you already have one.

To create and activate Smart Account, go to Cisco Software Central → Create Smart Accounts. Only authorized users can activate the Smart Account.

Step 3 Complete the Cisco Smart Software Manager set up.

a) Accept the Smart Software Licensing Agreement.

b) Set up the required number of Virtual Accounts, users and access rights for the virtual account users.

Virtual accounts help you organize licenses by business unit, product type, IT group, and so on.

c) Generate the registration token in the Cisco Smart Software Manager portal and register your device with the token.

In the software configuration guide of the required release, see *System Management → Configuring Smart Licensing → Registering the Device in CSSM*

With this,

- The device is now in an authorized state and ready to use.

- The licenses that you have purchased are displayed in your Smart Account.

Using Smart Licensing on an Out-of-the-Box Device

Starting from Cisco IOS XE Fuji 16.9.1, if an out-of-the-box device has the software version factory-provisioned, all licenses on such a device remain in evaluation mode until registered in Cisco Smart Software Manager.

In the software configuration guide of the required release, see *System Management → Configuring Smart Licensing → Registering the Device in CSSM*

How Upgrading or Downgrading Software Affects Smart Licensing

Starting from Cisco IOS XE Fuji 16.9.1, Smart Licensing is the default and only license management solution; all licenses are managed as Smart Licenses.

Important Starting from Cisco IOS XE Fuji 16.9.1, the Right-To-Use (RTU) licensing mode is deprecated, and the associated **license right-to-use** command is no longer available on the CLI.

Note how upgrading to a release that supports Smart Licensing or moving to a release that does not support Smart Licensing affects licenses on a device:

- **When you upgrade from an earlier release to one that supports Smart Licensing**—all existing licenses remain in evaluation mode until registered in Cisco Smart Software Manager. After registration, they are made available in your Smart Account.

  In the software configuration guide of the required release, see *System Management → Configuring Smart Licensing → Registering the Device in CSSM*

- **When you downgrade to a release where Smart Licensing is not supported**—all smart licenses on the device are converted to traditional licenses and all smart licensing information on the device is removed.

Scaling Guidelines

For information about feature scaling guidelines, see the Cisco Catalyst 9300 Series Switches datasheet at:

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-9300-series-switches/datasheet-c78-738977.html

Limitations and Restrictions

- Cisco TrustSec restrictions—Cisco TrustSec can be configured only on physical interfaces, not on logical interfaces.
- 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.
- 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 switched virtual interfaces (SVIs), port-channel, loopback, tunnels.
- You can not configure multiple flow monitors of same type (ipv4, ipv6 or datalink) on the same interface for same direction.

- QoS restrictions
  - When configuring QoS queuing policy, the sum of the queuing buffer should not exceed 100%.
  - For QoS policies, only switched virtual interfaces (SVI) are supported for logical interfaces.
  - QoS policies are not supported for port-channel interfaces, tunnel interfaces, and other logical interfaces.
  - Stack Queuing and Scheduling (SQS) drops CPU bound packets exceeding 1.4 Gbps.

- 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.

- Stacking:
  - A switch stack supports up to eight stack members.
  - Mixed stacking is not supported. Cisco Catalyst 9300 Series Switches cannot be stacked with Cisco Catalyst 3850 Series Switches.
  - Auto upgrade for a new member switch is supported only in the install 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 2000 connections per second (CPS) at less than 50% CPU utilization. Above this rate, AVC service is not guaranteed.
- Scale—Able to handle up to 20000 bi-directional flows per 24 access ports and 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.
- Secure Password Migration—Type 6 encrypted password is supported from Cisco IOS XE Gibraltar 16.10.1 and later releases. Autoconversion to password type 6 is supported from Cisco IOS XE Gibraltar 16.11.1 and later releases.

  If the startup configuration has a type 6 password and you downgrade to a version in which type 6 password is not supported, you can/may be locked out of the device.
- The File System Check (fsck) utility is not supported in install mode.

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 Gibraltar 16.11.x

Identifier	Description
CSCvi56567	When 9300 switch boots up, link up of its downlink has delayed if switch has network module

Identifier	Description
CSCvk44346	Power high priority not observed in Strict mode on 9300
CSCvm65080	usbflash1 entries are displayed multiple times in sh inventory o/p after multiple SSO
CSCvo46341	Some Cat9300 switches need firmware upgrade to enable app connectivity through front panel ports
CSCvo56403	Standby Switch Stuck in HA Sync config after Stack-Merge

Resolved Caveats in Cisco IOS XE Gibraltar 16.11.1

Identifier	Description
CSCvd72166	Uneven available power distribution when using power sharing
CSCvi48988	SNMP timeout when querying entSensorValueEntry
CSCvk00432	Memory leak in alloc_repexp_entry caused by alloc_ril_index failure
CSCvm45417	Cat9K HA/ 16.9.x,16.10.x- Connectivity issue due to wrong dest MAC rewrite for routed packet
CSCvm69029	Yang Get-config shows all the pwd configured on switch instead it should show only last updated pwd
CSCvm77197	C9300 : %IOSXE-2-PLATFORM: Switch 1 R0/0: kernel: EXT2-fs (sda1): error:
CSCvm86478	RMON statistics and RMON MIB absent in cat9K
CSCvm94132	AAL-INFRA:L2 failed to get ID handle
CSCvn21168	Configure for usb on the switch are gone after renumber the switch
CSCvn30950	16.10.1: c9300 stack could run into a state where all member switch are removed until reboot
CSCvn46334	show inventory does not list the Stack Ports / Stack cables after reload
CSCvn97961	9300 Mgig port 5 - Interface don't come UP and Can't read port related CLI
CSCvo19717	crash in fib_path_list_walk_apply (cisco.comp/cfc_cefmpls/cef/src/fib_path_list_deps.c)

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 9300 Series Switches is at this URL: https://www.cisco.com/c/en/us/support/switches/catalyst-9300-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: http://www.cisco.com/go/mibs

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