



# Release Notes for Catalyst 3650 Series Switch, Cisco IOS XE Denali 16.1.x

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This release note gives an overview of the features for the Cisco IOS XE Denali 16.1.x software on the Catalyst 3650 series switch.

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

## Introduction

The Catalyst 3650 switches are the next generation of enterprise class stackable access layer switches that provide full convergence between wired and wireless networks on a single platform. This convergence is built on the resilience of new and improved 160-Gbps StackWise-160. Wired and wireless security and wireless application visibility and control are natively built into the switch.

The Catalyst 3650 switches also support full IEEE 802.3 at Power over Ethernet Plus (PoE+), modular and field replaceable network modules, redundant fans, and power supplies. The Catalyst 3650 switches enhance productivity by enabling applications such as IP telephony, wireless, and video for a true borderless network experience.



**Note**

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For Cisco Catalyst 3850 Series Switches and Cisco Catalyst 3650 Series Switches, the Cisco IOS XE Release 3.7E has merged with the Cisco IOS XE Denali 16.1.x. Most features supported on Cisco IOS XE Release 3.7E are also supported on Cisco IOS XE Denali 16.1.x. For more information about features not supported in Cisco IOS XE Denali 16.1.x, see [Important Notes, page 51](#)

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Cisco IOS XE Denali 16.1.x and Cisco IOS XE represent the continuing evolution of the preeminent Cisco IOS operating system. The Cisco IOS XE architecture and well-defined set of APIs extend the Cisco IOS software to improve portability across platforms and extensibility outside the Cisco IOS environment. The Cisco IOS XE software retains the same look and feel of the Cisco IOS software, while providing enhanced future-proofing and improved functionality.



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# Whats New in Cisco IOS XE Denali 16.1.3

Feature	Description
In-Place Package Expansion for Software Images	<p>The software image installation process is now optimized:</p> <ul style="list-style-type: none"> <li>• The space required for installation is reduced—after you have copied the .bin file to flash, only 20MB of additional space is required to complete the installation.</li> <li>• The .bin file is automatically deleted after completion of installation.</li> </ul> <p><b>Note</b> The installation procedure you have to follow remains the same. See <a href="#">Upgrading the Switch Software, page 14</a>.</p>
Support for –B Domain	<p>The FCC (USA) rule making on 5 GHz released on April 1, 2014 (FCC 14-30 Report and Order) goes into effect for products that are sold or shipped on or after June 2, 2016. Cisco APs and Cisco WLCs will comply with the new rules by supporting the new regulatory domain (– for the US and will create new AP SKUs that are certified under the new rules. Examples of new rules include new 5-GHz band channels permitted for outdoor use, and transmission (Tx) power level increased to 1W for indoor, outdoor, and point-to-point transmissions. Screen capture</p> <p><b>Note</b> Cisco APs and Cisco WLCs that are in the –A domain category can continue to operate and even coexist with –B domain devices without any issues.</p> <p>We recommend that you upgrade Cisco APs and Cisco WLCs to the appropriate software release that supports –B domain.</p> <p>–B Domain Compliant Cisco APs starting with Cisco IOS XE Denali 16.1.3 are: Cisco Aironet 700, 700W, 1040, 1140, 1260, 1530, 1570, 1600, 1700, 1850, 1830, 2600, 2700, 3500, 3600, 3700.</p>

## What's New in Cisco IOS XE Denali 16.1.2

Feature	Description
Control Plane Policing (CoPP or CPP) in Hardware	<p>Improves security on the switch by protecting the CPU from unnecessary traffic or DoS traffic, and by giving priority to important control plane and management traffic. Different types of control traffic are grouped together based on certain criteria and assigned to a CPU queue. CPU queues can be policed by configuring dedicated policers in hardware.</p> <p>You can use CLI configuration options to enable and disable CPU queues, to change the policer rate, and to set policer rates to default.</p> <p>(LAN Base, IP Base, IP Services)</p>
Improved Switch Start Up Time	<p>When compared to the boot-up time in Cisco IOS XE Denali 16.1.1, the time it takes to boot up the switch in Cisco IOS XE Denali 16.1.2 is now reduced by two minutes.</p>

## What's New in Cisco IOS XE Denali 16.1.1

Feature	Description
Smart Call-Home Version 1 and Version 2	<p>Smart Call Home supports a web-based application and notification system, providing diagnostic and real-time alerts for better network and device management.</p>
Embedded Packet Capture (EPC) and Enhanced EPC with Wireshark	<p>Support for Embedded Packet Capture (on LAN Base) and Enhanced EPC with Wireshark (on IP Base and IP Services). EPC is an on-board packet capture facility that allows network administrators to capture packets flowing to, through, and from the device, and to analyze them locally or save and export them for offline analysis.</p>
Radioactive Tracing and Conditional Debugging	<p>Radioactive tracing provides the ability to stitch together a chain of execution for operations of interest across the system, at an increased verbosity level. Coupled with Conditional Debugging, this feature provides a single debug CLI to debug all execution contexts related to the condition, without having to be aware of the various processes that were part of the control flow for a feature and without having to issue debugs at these processes individually.</p>

Feature	Description
SISF-based Device Tracking CLI	Support for new Switch Integrated Security Features (SISF)-based device-tracking CLI commands to replace IP Device Tracking (IPDT) and IPv6 Snooping CLI commands.
AVC Protocol Pack and Engine Updates for Wireless Networks	The Cisco AVC solution for wireless networks identifies more than 1000 business-class or consumer-class applications using deep packet inspection (DPI). This extraordinary visibility into application traffic allows administrators to mark applications for further prioritization, or to block them for security reasons or to conserve limited network bandwidth. The NBAR2 Protocol Pack version is 14 and NBAR2 Engine version is 23.
Independent Wireless Control Module Upgrade (reboot required)	The Wireless Control Module (WCM) sub-package is a bundle of the WCM module and AP images. Independent WCM Upgrade allows the WCM bundle to be upgraded without the need for a full image upgrade. Independent WCM Upgrade can deliver newer AP images and bug fixes if they are localized to the WCM sub-package. The release notes for future releases will list the compatibility details and caveats, if any.
Wireless Security Module	The Cisco Aironet Access Point Wireless Security Module (WSM) for the Aironet 3600 and 3700 Series Access Points introduces a new way for customers to design and deploy their wireless networks. By tightly coupling data connectivity, spectrum analysis, and security threat detection and mitigation into a single, multipurpose access point, this new Cisco® solution eliminates the need for two separately deployed networks.
X.509v3 SSH Authentication	X.509v3 Certificates for SSH Authentication uses the X.509v3 digital certificates in server and user authentication at the secure shell (SSH) server side.
Dynamic Bandwidth Selection (DBS)	The Dynamic Bandwidth Selection (DBS) algorithm addresses smart switching between channel bandwidths in current and future 802.11ac radios and new coexistence scenarios. DBS will be a differentiating factor for enterprise WLAN networks that have 11ac APs along with legacy APs. DBS also signifies the flexibility of RRM in managing coexistence between 11ac and legacy APs and devices.

Feature	Description
Event Driven RRM (ED-RRM)	Event Driven RRM (ED-RRM) allows an AP in distress to bypass normal RRM intervals and immediately change channels. A CleanAir AP is always monitoring AQ, and reports on this in 15 second intervals. AirQuality is a better metric than relying on normal Wi-Fi chip noise measurements because AirQuality only reports on Classified Interference devices. This makes AirQuality a reliable metric because it is known what is reported is not because of Wi-Fi energy (and hence not a transient normal spike).
FlexDFS	FlexDFS simulation CLI is used for the simulation of radar detection on the current service channel. Radar detection is simulated in sub-channels of 20 MHz. For more information about using the FlexDFS simulation CLI, consult TAC.
Wi-Fi Interference Awareness (also known as ED-RRM)	Multiple Wi-Fi devices covering an area create overlap and interfering radio signals causing network performance degradation. To minimize such interference, Cisco CleanAir provides rogue device detection, visibility into Wi-Fi interference at both the device-level and cumulative level.
Receiver Start of Packet Detection Threshold (RX-SOP)	Receiver Start of Packet Detection Threshold (RX-SOP) determines the Wi-Fi signal level in dBm at which an AP radio will demodulate and decode a packet. The higher the RX-SOP level, the less sensitive the radio is and the smaller the receiver cell size will be. By reducing the cell size, we ensure that the clients are connected to the nearest access point using the highest possible data rates. This is ideal for high density environments such as stadiums and large auditoriums where there are a large number of client devices connected per AP. In a high density environment, the smaller the cell size, the better.
Smart Roaming (Optimized Roaming)	Smart roaming (also known as Optimized Roaming) resolves the problem of sticky clients that remain associated to access points that are far away, and outbound clients that attempt to connect to a Wi-Fi network without having a stable connection.
Transmit Power Control (TPC) Algorithm	The TPC algorithm, run at a fixed ten minute interval by default, is used by the RF Group Leader to determine the APs' RF proximities and adjust each band's transmit power level lower to limit excessive cell overlap and co-channel interference.

Feature	Description
CMX Facebook Connect	CMX Facebook Connect provides organizations with a simple and fast guest access solution.
Interop with Prime 3.0 Release	Support for interoperability with Cisco Prime Infrastructure Release 3.0.
Web User Interface	Support for an embedded GUI-based device-management tool that provides the ability to provision the switch, to simplify device deployment and manageability, and enhance user experience.
Support for AP1850 / AP1830	Cisco Aironet 1830 and 1850 series Access Points are Cisco's cost effective enterprise access points with the latest in Wi-Fi the 802.11ac Wave2 technology. Built with features like 3x3 MIMO and 4x4 MIMO, speeds up to 1084Mbps and 1950Mbps Cisco 1830AP and Cisco 1850AP respectively, provide the small and medium sized networks with flexible deployment modes, better Wi-Fi coverage and improved performance.
New in Cisco Documentation	Introducing the following four end-to-end feature guides to complement existing configuration information: <ul style="list-style-type: none"> <li>• Smart Call-Home Feature Guide</li> <li>• GRE Tunneling Feature Guide</li> <li>• Cisco Plug and Play Feature Guide</li> <li>• Smart Install Feature Guide</li> </ul>

## Supported Hardware

### Catalyst 3650 Switch Models

Table 1 Catalyst 3650 Switch Models

Switch Model	Cisco IOS Image	Description
Catalyst 3650-24TS-L	LAN Base	Stackable 24 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP (small form-factor pluggable) uplink ports, 250-W power supply
Catalyst 3650-48TS-L	LAN Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
Catalyst 3650-24PS-L	LAN Base	Stackable 24 10/100/1000 PoE+ <sup>1</sup> downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply

Table 1 Catalyst 3650 Switch Models (continued)

Switch Model	Cisco IOS Image	Description
Catalyst 3650-48PS-L	LAN Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
Catalyst 3650-48FS-L	LAN Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 1-Gigabit SFP uplink ports, 1025-W power supply
Catalyst 3650-24TD-L	LAN Base	Stackable 24 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-48TD-L	LAN Base	Stackable 48 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-24PD-L	LAN Base	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48PD-L	LAN Base	Stackable 48 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48FD-L	LAN Base	Stackable 48 10/100/1000 Full PoE downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48FQ-L	LAN Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48PQ-L	LAN Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48TQ-L	LAN Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-24TS-S	IP Base	Stackable 24 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
Catalyst 3650-48TS-S	IP Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
Catalyst 3650-24PS-S	IP Base	Stackable 24 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
Catalyst 3650-48PS-S	IP Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply

Table 1 Catalyst 3650 Switch Models (continued)

Switch Model	Cisco IOS Image	Description
Catalyst 3650-48FS-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 1-Gigabit SFP uplink ports, 1025-W power supply
Catalyst 3650-24TD-S	IP Base	Stackable 24 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-48TD-S	IP Base	Stackable 48 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-24PD-S	IP Base	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48PD-S	IP Base	Stackable 48 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48FD-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48FQ-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48PQ-S	IP Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48TQ-S	IP Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-24TS-E	IP Services	Stackable 24 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
Catalyst 3650-48TS-E	IP Services	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
Catalyst 3650-24PS-E	IP Services	Stackable 24 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
Catalyst 3650-48PS-E	IP Services	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
Catalyst 3650-48FS-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, four 1-Gigabit SFP uplink ports, 1025-W power supply



*Table 1 Catalyst 3650 Switch Models (continued)*

Switch Model	Cisco IOS Image	Description
Catalyst 3650-24TD-E	IP Services	Stackable 24 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-48TD-E	IP Services	Stackable 48 10/100/1000 Ethernet downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 250-W power supply
Catalyst 3650-24PD-E	IP Services	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48PD-E	IP Services	Stackable 48 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48FD-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, two 1-Gigabit SFP and two 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48FQ-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
Catalyst 3650-48PQ-E	IP Services	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
Catalyst 3650-48TQ-E	IP Services	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply

1. PoE+ = Power over Ethernet plus (provides up to 30 W per port).

## 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](http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html)

## Access Points and Mobility Services Engine

[Table 2](#) lists the supported products of the Catalyst 3650 Switch.

*Table 2 Catalyst 3650 Switch Supported Products*

Product	Platform Supported
Access Point	Cisco Aironet 700, 700W, 1040, 1140, 1260, 1530, 1570, 1600, 1700, 1850, 1830, 2600, 2700, 3500, 3600, 3700
Mobility Services Engine	3365, Virtual Appliance

Table 3 lists the specific supported Cisco access points.

**Table 3** *Supported Cisco Access Points*

<b>Access Points</b>	
Cisco Aironet 700 Series	AIR-CAP702I-x-K9
	AIR-CAP702I-xK910
Cisco Aironet 700W Series	AIR-CAP702Wx-K9
	AIR-CAP702W-xK910
Cisco Aironet 1040 Series	AIR-AP1041N
	AIR-AP1042N
	AIR-LAP1041N
	AIR-LAP1042N
Cisco Aironet 1140 Series	AIR-AP1141N
	AIR-AP1142N
	AIR-LAP1141N
	AIR-LAP1142N
Cisco Aironet 1260 Series	AIR-LAP1261N
	AIR-LAP1262N
	AIR-AP1261N
	AIR-AP1262N
Cisco Aironet 1530 Series	AIR-CAP1532I-x-K9
	AIR-CAP1532E-x-K9
Cisco Aironet 1570 Series	AIR-AP1572EAC-A-K9
	AIR-AP1572ECx-A-K9
	AIR-AP1572ICx-A-K9
Cisco Aironet 1600 Series	AIR-CAP1602E
	AIR-CAP1602I
Cisco Aironet 1700 Series	AIR-CAP1702I-x-K9
	AIR-CAP1702I-xK910
Cisco Aironet 1830 Series	AIR-AP1832I-UXXK9
	AIR-AP1832I-UXXK910
	AIR-AP1832I-UXXK9C
	AIRAP1832I-UXXK910C
	AIR-AP1832I-x-K9
	AIR-AP1832I-x-K9C

<b>Access Points</b>	
Cisco Aironet 1850 Series	AIR-AP1852I-UXXK9
	AIR-AP1852I-UXXK910
	AIR-AP1852I-UXXK9C
	AIRAP1852I-UXXK910C
	AIR-AP1852E-UXXK9
	AIR-AP1852E-UXXK910
	AIR-AP1852E-UXXK9C
	AIRAP1852E-UXXK910C
	AIR-AP1852E-x-K9
	AIR-AP1852E-x-K9C
	AIR-AP1852I-x-K9
	AIR-AP1852I-x-K9C
	Cisco Aironet 2600 Series
AIR-CAP2602I	
Cisco Aironet 2700 Series	AIR-CAP2702I-x-K9
	AIR-CAP2702E-x-K9
Cisco Aironet 3500 Series	AIR-CAP3501E
	AIR-CAP3501I
	AIR-CAP3501P
	AIR-CAP3502E
	AIR-CAP3502I
	AIR-CAP3502P
Cisco Aironet 3600 Series	AIR-CAP3602E
	AIR-CAP3602I
Cisco Aironet 3700 Series	AIR-CAP3702I
	AIR-CAP3702E
	AIR-CAP3702P

## Compatibility Matrix

For more information about the compatibility of wireless software components across releases, see [Cisco Wireless Solutions](#).

**Table 4** Software Compatibility Matrix

Catalyst 3650	Cisco 5700 WLC	Cisco 5508 or WiSM2	MSE/C MX	ISE	ACS	Cisco PI
Denali 16.1.3	03.07.02E 03.06.03E <sup>1</sup>	8.1.0	CMX 10.2.0	1.3 Patch 3 (Wired) 1.4 (Wireless)	5.3 5.4	3.0.2 + Device Pack 5 + PI 3.0 Technology Pack
Denali 16.1.2	03.07.02E 03.06.03E <sup>1</sup>	8.1.0	CMX 10.2.0	1.3 Patch 3 (Wired) 1.4 (Wireless)	5.3 5.4	3.0.2 + Device Pack 4 + PI 3.0 Technology Pack
Denali 16.1.1	03.07.02E 03.06.03E <sup>1</sup>	8.1.0	CMX 10.2.0	1.3 Patch 3 (Wired) 1.4 (Wireless)	5.3 5.4	3.0.2 + PI 3.0 Device Pack 2 + PI 3.0 Technology Pack
03.07.03E 03.07.02E 03.07.01E 03.07.00E	03.07.03E 03.07.02E 03.07.01E 03.07.00E	8.0 8.0 8.0 7.6	8.0 8.0 <sup>2</sup>	1.3 1.3	5.2 5.2 5.3	2.2
03.06.04E 03.06.03E 03.06.02aE 03.06.01E 03.06.00E	03.06.04E 03.06.02aE 03.06.01E 03.06.00E	8.0 8.0 7.6	8.0 8.0	1.3 1.2	5.2 5.2 5.3	2.2 2.2, 2.1.2, or 2.1.1 if MSE is also deployed <sup>3</sup> 2.1.0 if MSE is not deployed
03.03.03SE 03.03.02SE 03.03.01SE 03.03.00SE	03.03.03SE 03.03.02SE 03.03.01SE 03.03.00SE	7.5 <sup>4</sup>	7.5	1.2	5.2 5.3	2.0

1. Cisco 5700 (with Cisco IOS XE Release 03.06.03E/Cisco IOS XE Release 03.07.02E) inter-operates as a Peer MC with Catalyst 3850 running Cisco IOS XE Denali 16.1.1.
2. Because of SHA-2 certificate implementation, MSE 7.6 is not compatible with Cisco IOS XE Release 3.6E and later. Therefore, we recommend that you upgrade to MSE 8.0.
3. If MSE is deployed on your network, we recommend that you upgrade to Cisco Prime Infrastructure 2.1.2.
4. Prime Infrastructure 2.0 enables you to manage Cisco WLC c7.5.102.0 with the features of Cisco WLC 7.4.110.0 and earlier releases. Prime Infrastructure 2.0 does not support any features of Cisco WLC 7.5.102.0 including the new AP platforms.

For more information on the compatibility of wireless software components across releases, see the [Cisco Wireless Solutions Software Compatibility Matrix](#).

# Web UI System Requirements

## Hardware Requirements

*Table 5 Minimum Hardware Requirements*

Processor Speed	DRAM	Number of Colors	Resolution	Font Size
233 MHz minimum <sup>1</sup>	512 MB <sup>2</sup>	256	1024 x 768	Small

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

## Software Requirements

- Operating Systems
  - Windows 7
  - Mac OS X 10.9.5
- Browsers
  - Google Chrome—Version 38 and later (On Windows)
  - Microsoft Internet Explorer—Versions 10 and later (On Windows)
  - Mozilla Firefox—Version 33 and later (On Windows and Mac)
  - Safari—Version 7 and later (On Mac)

## Finding the Software Version and Feature Set

Table 6 shows the mapping of the Cisco IOS XE version number and the Cisco IOS version number.

*Table 6 Cisco IOS XE to Cisco IOS Version Number Mapping*

Cisco IOS XE Version	Cisco IOSd Version	Cisco Wireless Control Module Version	Access Point Version
Denali 16.1.3	Not applicable	Denali 16.1.3	15.3(3)JNP2
Denali 16.1.2	Not applicable	Denali 16.1.2	15.3(3)JNP1
Denali 16.1.1	Not applicable	Denali 16.1.1	15.3(3)JNP
03.07.03E	15.2(3)E3	10.3.130.0	15.3(3)JNB3
03.07.02E	15.2(3)E2	10.3.100.0	15.3(3)JNB1
03.07.01E	15.2(3)E1	10.3.100.0	15.3(3)JNB1
03.07.00E	15.2(3)E	10.3.100.0	15.3(3)JNB
03.06.04E	15.2(2)E4	10.2.140.0	15.3(3)JN8

**Table 6** Cisco IOS XE to Cisco IOS Version Number Mapping

Cisco IOS XE Version	Cisco IOSd Version	Cisco Wireless Control Module Version	Access Point Version
03.06.03E	15.2(2)E3	10.2.131.0	15.3(3)JN7
03.06.02aE	15.2(2)E2	10.2.120.0	15.3(3)JN4
03.06.01E	15.2(2)E1	10.2.111.0	15.3(3)JN3
03.06.00E	15.2(2)E	10.2.102.0	15.3(3)JN
03.03.05SE	15.0(1)EZ5	10.1.150.0	15.2(4)JB7
03.03.04SE	15.0(1)EZ4	10.1.140.0	15.2(4)JB6
03.03.03SE	15.0(1)EZ3	10.1.130.0	15.2(4)JB5h
03.03.02SE	15.0(1)EZ2	10.1.121.0	15.2(4)JB5
03.03.01SE	15.0(1)EZ1	10.1.110.0	15.2(4)JB2
03.03.00SE	15.0(1)EZ	10.1.100.0	15.2(4)JN

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.

## Upgrading the Switch Software



**Note**

You cannot use the Web UI to install, upgrade to, or downgrade from Cisco IOS XE Denali 16.1.x.

**Table 7** Software Images

Release	Image	File Name
Cisco IOS XE Denali 16.1.3	Universal	cat3k_caa-universalk9.16.01.03.SPA.bin
	Universal without DTLS	cat3k_caa-universalk9ldpe.16.01.03.SPA.bin
Cisco IOS XE Denali 16.1.2	Universal	cat3k_caa-universalk9.16.01.02.SPA.bin
	Universal without DTLS	cat3k_caa-universalk9ldpe.16.01.02.SPA.bin
Cisco IOS XE Denali 16.1.1	Universal	cat3k_caa-universalk9.16.01.01.SPA.bin
	Universal without DTLS	cat3k_caa-universalk9ldpe.16.01.01.SPA.bin

Table 8 Changes in Software Installation CLI Commands

Cisco IOS XE 3.xE	
Switch#software ?	
auto-upgrade	Initiate auto upgrade for switches running incompatible software
clean	Clean unused package files from local media
commit	Commit the provisioned software and cancel the automatic rollback timer
expand	Expand a software bundle to local storage, default location is where the bundle currently resides
install	Install software
rollback	Rollback the committed software
Cisco IOS XE Denali 16.1.1 Commands	
Switch#request platform software package ?	
clean	Clean unnecessary package files from media
copy	Copy package to media
describe	Describe package content
expand	Expand all-in-one package to media
install	Package installation
uninstall	Package uninstall
verify	Verify ISSU software package compatibility

## Automatic Boot Loader Upgrade

When you boot up Cisco IOS XE Denali 16.1.1 for the first time, boot loader is automatically upgraded and it will take effect on the next reload. For subsequent IOS XE 16.x releases, if the boot loader is updated in those releases, it will be automatically upgraded when you load the new release on the switch. If you go back to an IOS 3.xE release, your boot loader will not be downgraded. The updated boot loader supports all previous IOS 3.xE releases.

During the automatic boot loader while booting Cisco IOS XE Denali 16.1.1, you will see the following on the console:

```
%IOSXEBOOT-PLEASE-###: (rp/0): DO NOT POWER CYCLE ### BOOT LOADER UPGRADING
%IOSXEBOOT-Nov-Tue: (rp/0): 24 11:04:42 Universal 2015 boot loader upgrade successful
```



**Caution**

Please do not power cycle your switch during the upgrade.

## Automatic Microcode Upgrade

During an IOS image upgrade or downgrade on a PoE or UPoE switch, the microcode is updated to reflect applicable feature enhancements and bug fixes. Do not restart the switch during the upgrade or downgrade process. With the Cisco IOS XE Denali 16.1.1 release, it takes approximately an additional

4 minutes to complete the microcode upgrade in addition to the normal reload time. The microcode update 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.

The following console messages are displayed during microcode upgrade:

```

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
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_1
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_2
Image for front-end 0: /tmp/microcode_update/front_end/fe_type_6_3

Front-end Microcode IMG MGR: Preparing to program device microcode...
Front-end Microcode IMG MGR: Preparing to program device[0]...594412 bytes...
Skipped[0].
Front-end Microcode IMG MGR: Preparing to program device[0]...381758 bytes.
Front-end Microcode IMG MGR: Programming device
0...rwRrrrrrw..0%.....
.
..10%.....20%.....
.
.....30%.....
.....40%.....
.....50%.....
.....60%.....
.....70%.....
.....80%.....
.....90%.....
.....100%
Front-end Microcode IMG MGR: Preparing to program device[0]...25166 bytes.
Front-end Microcode IMG MGR: Programming device
0...rrrrrrw..0%...10%...20%...30%...40%...50%...60%...70%...80%...90%...
..100%
Front-end Microcode IMG MGR: Microcode programming complete for device 0.
Front-end Microcode IMG MGR: Preparing to program device[0]...86370 bytes...
Skipped[3].
Front-end Microcode IMG MGR: Microcode programming complete in 237 seconds
    
```

## Upgrading from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.1, 16.1.2, or 16.1.3 in Install Mode

Follow these instructions to upgrade from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.1, 16.1.2, or 16.1.3 in Install mode:

### Copy New Image to Stack

When you expand the image, if you point to the source image on your TFTP server, you can skip this section and go to [Software Install Image to Flash, page 17](#).

---

**Step 1** Make sure your tftp server is reachable from IOS via GigabitEthernet0/0.

```

Switch#show run | i tftp
ip tftp source-interface GigabitEthernet0/0
ip tftp blocksize 8192
Switch#
Switch#show run | i ip route vrf
ip route vrf Mgmt-vrf 5.0.0.0 255.0.0.0 5.30.0.1
    
```



```

Switch#
Switch#show run int GigabitEthernet0/0
Building configuration...

Current configuration : 115 bytes
!
interface GigabitEthernet0/0
 vrf forwarding Mgmt-vrf
 ip address 5.30.12.121 255.255.0.0
 negotiation auto
end
Switch#
Switch#ping vrf Mgmt-vrf ip 5.28.11.250
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.28.11.250, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms

```

**Step 2** Copy the image from your tftp server to flash.

```

Switch#copy
tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin flash:
Destination filename [cat3k_caa-universalk9.16.01.01.SPA.bin]?
Accessing
tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin...
Loading cat3k_caa-universalk9.16.01.01.SPA.bin from 5.28.11.250
(via
GigabitEthernet0/0):!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!O!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 469677062 bytes]

469677062 bytes copied in 140.610 secs (3340282 bytes/sec)
Switch#

```

**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

77453  -rw-   469677062   Nov 30 2015 16:31:05 -08:00
cat3k_caa-universalk9.16.01.01.SPA.bin

3458338816 bytes total (2644488192 bytes free)
Switch#

```

## Software Install Image to Flash

**Step 4** Use the `software install` command with the 'new' and 'force' options to expand 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.

```

Switch#software install file flash:cat3k_caa-universalk9.16.01.01.SPA.bin new force
Preparing install operation ...
[4]: Copying software from active switch 4 to switches 1,2,3
[4]: Finished copying software to switches 1,2,3
[1 2 3 4]: Starting install operation
[1 2 3 4]: Expanding bundle flash:cat3k_caa-universalk9.16.01.01.SPA.bin
[1 2 3 4]: Copying package files
[1 2 3 4]: Package files copied
[1 2 3 4]: Finished expanding bundle flash:cat3k_caa-universalk9.16.01.01.SPA.bin
[1 2 3 4]: Verifying and copying expanded package files to flash:

```

```

[1 2 3 4]: Verified and copied expanded package files to flash:
[1 2 3 4]: Starting compatibility checks
[1 2 3 4]: Bypassing peer package compatibility checks due to 'force' command option
[1 2 3 4]: Finished compatibility checks
[1 2 3 4]: Starting application pre-installation processing
[1 2 3 4]: Finished application pre-installation processing
[1]: Old files list:
Removed cat3k_caa-base.SPA.03.07.02E.pkg
Removed cat3k_caa-drivers.SPA.03.07.02E.pkg
Removed cat3k_caa-infra.SPA.03.07.02E.pkg
Removed cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
Removed cat3k_caa-platform.SPA.03.07.02E.pkg
Removed cat3k_caa-wcm.SPA.10.3.120.0.pkg
[2]: Old files list:
Removed cat3k_caa-base.SPA.03.07.02E.pkg
Removed cat3k_caa-drivers.SPA.03.07.02E.pkg
Removed cat3k_caa-infra.SPA.03.07.02E.pkg
Removed cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
Removed cat3k_caa-platform.SPA.03.07.02E.pkg
Removed cat3k_caa-wcm.SPA.10.3.120.0.pkg
[3]: Old files list:
Removed cat3k_caa-base.SPA.03.07.02E.pkg
Removed cat3k_caa-drivers.SPA.03.07.02E.pkg
Removed cat3k_caa-infra.SPA.03.07.02E.pkg
Removed cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
Removed cat3k_caa-platform.SPA.03.07.02E.pkg
Removed cat3k_caa-wcm.SPA.10.3.120.0.pkg
[4]: Old files list:
Removed cat3k_caa-base.SPA.03.07.02E.pkg
Removed cat3k_caa-drivers.SPA.03.07.02E.pkg
Removed cat3k_caa-infra.SPA.03.07.02E.pkg
Removed cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
Removed cat3k_caa-platform.SPA.03.07.02E.pkg
Removed cat3k_caa-wcm.SPA.10.3.120.0.pkg
[1]: New files list:
Added cat3k_caa-rpbase.16.01.01.SPA.pkg
Added cat3k_caa-srdriver.16.01.01.SPA.pkg
Added cat3k_caa-wcm.16.01.01.SPA.pkg
Added cat3k_caa-webui.16.01.01.SPA.pkg
[2]: New files list:
Added cat3k_caa-rpbase.16.01.01.SPA.pkg
Added cat3k_caa-srdriver.16.01.01.SPA.pkg
Added cat3k_caa-wcm.16.01.01.SPA.pkg
Added cat3k_caa-webui.16.01.01.SPA.pkg
[3]: New files list:
Added cat3k_caa-rpbase.16.01.01.SPA.pkg
Added cat3k_caa-srdriver.16.01.01.SPA.pkg
Added cat3k_caa-wcm.16.01.01.SPA.pkg
Added cat3k_caa-webui.16.01.01.SPA.pkg
[4]: New files list:
Added cat3k_caa-rpbase.16.01.01.SPA.pkg
Added cat3k_caa-srdriver.16.01.01.SPA.pkg
Added cat3k_caa-wcm.16.01.01.SPA.pkg
Added cat3k_caa-webui.16.01.01.SPA.pkg
[1 2 3 4]: Creating pending provisioning file
[1 2 3 4]: Finished installing software. New software will load on reboot.
[1 2 3 4]: Committing provisioning file

[1 2 3 4]: Do you want to proceed with reload? [yes/no]: yes
[1 2 3 4]: Reloading

```



**Note** Old files listed in the logs should be removed using the `request platform software package clean switch all` command, after reload

## Reload

**Step 5** If you said ‘Yes’ to the prompt in software install and your switches are configured with auto boot, 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 boot the new image, it will automatically update the boot loader.

**Step 6** When the new image boots up, you can verify the version of the new image, by checking `show version`

```
Switch#show version
Cisco IOS Software, Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version
Denali 16.1.1E, RELEASE SOFTWARE (fcl)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Thu 26-Nov-15 21:04 by mcpre
```

**Step 7** After you have successfully installed the image, you no longer need the .bin image and the file can be deleted from flash of each switch if it was copied to flash.

```
Switch#delete flash:cat3k_caa-universalk9.16.01.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.01.01.SPA.bin]?
Delete flash:/cat3k_caa-universalk9.16.01.01.SPA.bin? [confirm]
Switch#
```

## Upgrading from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.1, 16.1.2, or 16.1.3 in Bundle Mode

Follow these instructions to upgrade from Cisco IOS XE 3.xE in Bundle mode to Cisco IOS XE Denali 16.1.1, 16.1.2, or 16.1.3 in Bundle Mode:

### Copy New Image to Stack

You cannot boot Cisco IOS XE Denali 16.1.1 via TFTP for the first time with a Cisco IOS XE 3.xE boot loader. The Cisco IOS XE 3.xE boot loaders have a limitation that they cannot boot an image larger than 400MB via the TFTP server. Since Cisco IOS XE Denali 16.1.x is larger than 400MB, you must boot the image via flash.



**Note** You cannot boot Cisco IOS XE Denali 16.1.1 via TFTP if you have a Cisco IOS XE 3.xE boot loader. The Cisco IOS XE 3.xE boot loaders have a limitation that they cannot boot an image larger than 400MB via TFTP.

**Step 1** Make sure your TFTP server is reachable from IOS via GigabitEthernet0/0.

```
Switch#show run | i tftp
ip tftp source-interface GigabitEthernet0/0
```

```
ip tftp blocksize 8192
Switch#
Switch#show run | i ip route vrf
ip route vrf Mgmt-vrf 5.0.0.0 255.0.0.0 5.30.0.1
Switch#
Switch#show run int GigabitEthernet0/0
Building configuration...

Current configuration : 115 bytes
!
interface GigabitEthernet0/0
 vrf forwarding Mgmt-vrf
 ip address 5.30.12.121 255.255.0.0
 negotiation auto
end
Switch#
Switch#ping vrf Mgmt-vrf ip 5.28.11.250
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.28.11.250, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

**Step 2** Copy the image from your TFTP server to flash.

```
Switch#copy tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin flash:
Destination filename [cat3k_caa-universalk9.16.01.01.SPA.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin...
Loading cat3k_caa-universalk9.16.01.01.SPA.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!O!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!
[OK - 469677062 bytes]

469677062 bytes copied in 140.610 secs (3340282 bytes/sec)
Switch#
```




---

**Note** If you have a stack, you must copy the image to the flash of each switch in your stack.

---

**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

77453 -rw- 469677062 Nov 30 2015 16:31:05 -08:00
cat3k_caa-universalk9.16.01.01.SPA.bin

3458338816 bytes total (2644488192 bytes free)
Switch#
```

## Edit the Boot variable

**Step 4** Clear the boot variable

```
Switch(config)#no boot system
```

**Step 5** Edit the boot variable to point to the new image.

```
Switch(config)#boot system flash:cat3k_caa-universalk9.16.01.01.SPA.bin
```

**Step 6** Use the `write memory` command to save the configuration change.

- Step 7** Use the `show boot` command to confirm that your boot variable is pointing to the new image

```
Switch#write memory
Switch#show boot
-----
Switch 1
-----
Current Boot Variables:
BOOT variable = flash:cat3k_caa-universalk9.16.01.01.SPA.bin;

Boot Variables on next reload:
BOOT variable = flash:cat3k_caa-universalk9.16.01.01.SPA.bin;
Allow Dev Key = yes
Manual Boot = yes
Enable Break = yes
Switch#
```

## Reload

- Step 8** Reload the switch

```
switch#reload
```

- Step 9** If your switches are configured with auto boot, the stack will automatically boot up with the new image. If not, you can manually boot `flash:cat3k_caa-universalk9.16.01.01.SPA.bin`

```
switch:boot flash:cat3k_caa-universalk9.16.01.01.SPA.bin
```




---

**Note** When you boot the new image, it will automatically update the boot loader.

---

- Step 10** When the new image boots up, you can verify the version of the new image, by checking `show version`

```
Switch#show version
Cisco IOS Software, Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version
Denali 16.1.1E, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Thu 26-Nov-15 21:04 by mcpre
```

## Move from Cisco IOS XE Denali 16.x Bundle Mode to Install Mode

- Step 11** Ensure you have enough space in flash to expand a new image by cleaning up old installation files. This command will erase your Cisco IOS XE Denali 16.x bin image file, so ensure that you copy it to your Active again.




---

**Note** Use the `switch all` option to clean up all switches in your stack.

---

```
Switch#request platform software package clean switch all file flash:
Running command on switch 1
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
  done.

Running command on switch 2
Cleaning up unnecessary package files
```

```

Scanning boot directory for packages ... done.
Preparing packages list to delete ...
done.

Running command on switch 3
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
done.

Running command on switch 4
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
done.

The following files will be deleted:
[1]:
/flash/cat3k_caa-base.SPA.03.07.02E.pkg
/flash/cat3k_caa-drivers.SPA.03.07.02E.pkg
/flash/cat3k_caa-infra.SPA.03.07.02E.pkg
/flash/cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
/flash/cat3k_caa-platform.SPA.03.07.02E.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-wcm.SPA.10.3.120.0.pkg
/flash/packages.conf
[2]:
/flash/cat3k_caa-base.SPA.03.07.02E.pkg
/flash/cat3k_caa-drivers.SPA.03.07.02E.pkg
/flash/cat3k_caa-infra.SPA.03.07.02E.pkg
/flash/cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
/flash/cat3k_caa-platform.SPA.03.07.02E.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-wcm.SPA.10.3.120.0.pkg
/flash/packages.conf
[3]:
/flash/cat3k_caa-base.SPA.03.07.02E.pkg
/flash/cat3k_caa-drivers.SPA.03.07.02E.pkg
/flash/cat3k_caa-infra.SPA.03.07.02E.pkg
/flash/cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
/flash/cat3k_caa-platform.SPA.03.07.02E.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-wcm.SPA.10.3.120.0.pkg
/flash/packages.conf
[4]:
/flash/cat3k_caa-base.SPA.03.07.02E.pkg
/flash/cat3k_caa-drivers.SPA.03.07.02E.pkg
/flash/cat3k_caa-infra.SPA.03.07.02E.pkg
/flash/cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
/flash/cat3k_caa-platform.SPA.03.07.02E.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-wcm.SPA.10.3.120.0.pkg
/flash/packages.conf

Do you want to proceed? [y/n]y
[1]:
Deleting file flash:cat3k_caa-base.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-drivers.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-infra.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg ... done.
Deleting file flash:cat3k_caa-platform.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-wcm.SPA.10.3.120.0.pkg ... done.
Deleting file flash:packages.conf ... done.

```

```

SUCCESS: Files deleted.
[2]:
Deleting file flash:cat3k_caa-base.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-drivers.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-infra.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg ... done.
Deleting file flash:cat3k_caa-platform.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-wcm.SPA.10.3.120.0.pkg ... done.
Deleting file flash:packages.conf ... done.
SUCCESS: Files deleted.
[3]:
Deleting file flash:cat3k_caa-base.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-drivers.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-infra.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg ... done.
Deleting file flash:cat3k_caa-platform.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-wcm.SPA.10.3.120.0.pkg ... done.
Deleting file flash:packages.conf ... done.
SUCCESS: Files deleted.
[4]:
Deleting file flash:cat3k_caa-base.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-drivers.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-infra.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg ... done.
Deleting file flash:cat3k_caa-platform.SPA.03.07.02E.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-wcm.SPA.10.3.120.0.pkg ... done.
Deleting file flash:packages.conf ... done.
SUCCESS: Files deleted.
Switch#

```

### Step 12 Copy the image from your tftp server to flash

```

Switch#copy tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin flash:
Destination filename [cat3k_caa-universalk9.16.01.01.SPA.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.16.01.01.SPA.bin...
Loading cat3k_caa-universalk9.16.01.01.SPA.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 469677062 bytes]

469677062 bytes copied in 140.610 secs (3340282 bytes/sec)
Switch#

```

**Step 13** Use the **software expand** command to expand the target image to flash and move from bundle mode to install mode. You can point to the source image on your TFTP server or in flash if you have it copied to flash.



#### Note

Use the **switch all** option to upgrade all switches in your stack  
 Use the **auto-copy** option to copy the .bin image from flash: to all other switches in your stack

```

Switch#request platform software package expand switch all file
flash:cat3k_caa-universalk9.16.01.01.SPA.bin auto-copy
[1]: Copying flash:cat3k_caa-universalk9.16.01.01.SPA.bin from switch 1 to switch 2 3
4
[2 3 4]: Finished copying to switch 2 3 4
[1 2 3 4]: Expanding file
[1 2 3 4]: Finished expanding all-in-one software package in switch 1 2 3 4

```

```
SUCCESS: Finished expanding all-in-one software package.
Switch#
```

## Edit the Boot variable

- Step 14** Clear the boot variable

```
Switch(config)#no boot system
```

- Step 15** Edit the boot variable to point to the new image.

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

- Step 16** Use the **write memory** command to save the configuration change.

```
Switch#write memory
```

- Step 17** Use the **show boot** command to confirm that your boot variable is pointing to the new image

```
Switch#show boot
-----
Switch 1
-----
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:
BOOT variable = flash:packages.conf;
Manual Boot = yes
Enable Break = yes
Switch#
```

## Reload

- Step 18** Reload the switch

```
switch:boot flash:cat3k_caa-universalk9.16.01.01.SPA.bin
```

- Step 19** If your switches are configured with auto boot, 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 20** When the new image boots up, you can verify the version of the new image, by checking **show version**

```
Switch#show version
Cisco IOS Software, Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version
Denali 16.1.1E, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Thu 26-Nov-15 21:04 by mcpre
```

- Step 21** After you have successfully installed the image, you no longer need the .bin image and the file can be deleted from the flash of each switch if you had copied to flash.

```
Switch#delete flash:cat3k_caa-universalk9.16.01.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.01.01.SPA.bin]?
Delete flash:/cat3k_caa-universalk9.16.01.01.SPA.bin? [confirm]
Switch#
```



# Upgrading from Cisco IOS XE Denali 16.1.1 to 16.1.2 or 16.1.3 in Install Mode

Follow these instructions to upgrade from Cisco IOS XE Denali 16.1.1 to 16.1.2 or 16.1.3 in install mode. In order to do a software image upgrade, you must be booted into IOS using the `boot flash:packages.conf`.

## Clean Up

**Step 1** Ensure you have enough space in flash to expand a new image by cleaning up old installation files.



**Note** Use the switch all option to clean up all switches in your stack.

```
Switch# request platform software package clean switch all file flash:
Running command on switch 1
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
  packages.conf
      File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 2
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
  packages.conf
      File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 3
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
```

```

cat3k_caa-webui.16.01.01.SPA.pkg
  File is in use, will not delete.
packages.conf
  File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 4
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    packages.conf
      File is in use, will not delete.
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
  done.
SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Switch#

```

## Copy New Image to Stack

- 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://5.28.11.250/cat3k_caa-universalk9.16.01.02.SPA.bin
flash:cat3k_caa-universalk9.16.01.02.SPA.bin
Destination filename [cat3k_caa-universalk9.16.01.02.SPA.bin]?
Accessing tftp://5.28.11.250/ cat3k_caa-universalk9.16.01.02.SPA.bin...
Loading cat3k_caa-universalk9.16.01.02.SPA.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 470552652 bytes]

470552652 bytes copied in 112.601 secs (4178938 bytes/sec)
Switch#

```

- 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:/

 7758  -rw-   470552652  Feb 12 2016 15:12:22 -08:00
cat3k_caa-universalk9.16.01.02.SPA.bin
1621966848 bytes total (593379328 bytes free)
Switch#

```

## Software Install Image to Flash

- Step 4** Use the `request platform software package install switch all file flash: new auto-copy` 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**

Use the `switch all` option to upgrade all switches in your stack

Use the `new` option to upgrade from Cisco IOS XE Denali 16.1.1 to 16.1.2 or 16.1.3. (There are packaging changes in Cisco IOS XE Denali 16.1.2 and 16.1.3)

Use the `auto-copy` option to copy the .bin image from flash: to all other switches in your stack

**Note**

When you execute the command, the following message is displayed:

```
Unknown package type 21
```

This is expected and does not affect the upgrade. See CSCux82059

```
Switch#request platform software package install switch all file
flash:cat3k_caa-universalk9.16.02.01.SPA.bin new auto-copy
Expanding image file: flash:cat3k_caa-universalk9.16.01.02.SPA.bin
[1]: Copying flash:cat3k_caa-universalk9.16.01.02.SPA.bin from switch 1 to switch 2 3
4
[2 3 4]: Finished copying to switch 2 3 4
[1 2 3 4]: Expanding file
[1 2 3 4]: Finished expanding all-in-one software package in switch 1 2 3 4
SUCCESS: Finished expanding all-in-one software package.
[1 2 3 4]: Performing install
```

```
Unknown package type 21
```

```
Unknown package type 21
```

```
Unknown package type 21
```

```
Unknown package type 21
```

```
SUCCESS: install Finished
```

```
[1]: install package(s) on switch 1
```

```
--- Starting list of software package changes ---
```

```
Old files list:
```

```
Removed cat3k_caa-rpbase.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-srdriver.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-wcm.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-webui.16.01.01E.SPA.pkg
```

```
New files list:
```

```
Added cat3k_caa-rpbase.16.01.02.SPA.pkg
```

```
Added cat3k_caa-rpcore.16.01.02.SPA.pkg
```

```
Added cat3k_caa-srdriver.16.01.02.SPA.pkg
```

```
Added cat3k_caa-wcm.16.01.02.SPA.pkg
```

```
Added cat3k_caa-webui.16.01.02.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 cat3k_caa-rpbase.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-srdriver.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-wcm.16.01.01E.SPA.pkg
```

```
Removed cat3k_caa-webui.16.01.01E.SPA.pkg
```

```
New files list:
```

```
Added cat3k_caa-rpbase.16.01.02.SPA.pkg
```

```
Added cat3k_caa-rpcore.16.01.02.SPA.pkg
```

```
Added cat3k_caa-srdriver.16.01.02.SPA.pkg
```

```
Added cat3k_caa-wcm.16.01.02.SPA.pkg
```

```
Added cat3k_caa-webui.16.01.02.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 cat3k_caa-rpbase.16.01.01E.SPA.pkg
  Removed cat3k_caa-srdriver.16.01.01E.SPA.pkg
  Removed cat3k_caa-wcm.16.01.01E.SPA.pkg
  Removed cat3k_caa-webui.16.01.01E.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.01.02.SPA.pkg
  Added cat3k_caa-rpcore.16.01.02.SPA.pkg
  Added cat3k_caa-srdriver.16.01.02.SPA.pkg
  Added cat3k_caa-wcm.16.01.02.SPA.pkg
  Added cat3k_caa-webui.16.01.02.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[3]: Finished install successful on switch 3
[4]: install package(s) on switch 4
--- Starting list of software package changes ---
Old files list:
  Removed cat3k_caa-rpbase.16.01.01E.SPA.pkg
  Removed cat3k_caa-srdriver.16.01.01E.SPA.pkg
  Removed cat3k_caa-wcm.16.01.01E.SPA.pkg
  Removed cat3k_caa-webui.16.01.01E.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.01.02.SPA.pkg
  Added cat3k_caa-rpcore.16.01.02.SPA.pkg
  Added cat3k_caa-srdriver.16.01.02.SPA.pkg
  Added cat3k_caa-wcm.16.01.02.SPA.pkg
  Added cat3k_caa-webui.16.01.02.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[4]: Finished install successful on switch 4
Checking status of install on [1 2 3 4]
[1 2 3 4]: Finished install in switch 1 2 3 4
SUCCESS: Finished install: Success on [1 2 3 4]
Switch#

```




---

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

---

**Step 5** After you have successfully installed the software, verify that the flash partition has five new .pkg files and one updated packages.conf file. See sample output below:

```

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

Directory of flash:/

 7747 -rw-   281076014  Feb 12 2016 14:18:35 -08:00
cat3k_caa-rpbase.16.01.01E.SPA.pkg
 7748 -rw-     7197312  Feb 12 2016 14:18:35 -08:00
cat3k_caa-srdriver.16.01.01E.SPA.pkg
 7749 -rw-   166767220  Feb 12 2016 14:18:35 -08:00  cat3k_caa-wcm.16.01.01E.SPA.pkg
 7750 -rw-   14631548  Feb 12 2016 14:18:36 -08:00
cat3k_caa-webui.16.01.01E.SPA.pkg
 7760 -rw-   21918309  Feb 12 2016 15:24:46 -08:00
cat3k_caa-rpbase.16.01.02.SPA.pkg
 7764 -rw-   259668600  Feb 12 2016 15:24:49 -08:00
cat3k_caa-rpcore.16.01.02.SPA.pkg

```

```

7762 -rw-      7201408 Feb 12 2016 15:24:47 -08:00
cat3k_caa-srdriver.16.01.02.SPA.pkg
7761 -rw-     167113332 Feb 12 2016 15:24:47 -08:00 cat3k_caa-wcm.16.01.02.SPA.pkg
7763 -rw-     14645884 Feb 12 2016 15:24:47 -08:00 cat3k_caa-webui.16.01.02.SPA.pkg
1621966848 bytes total (122314752 bytes free)
Switch#

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

Directory of flash:/

7767 -rw-      4700 Feb 12 2016 15:26:05 -08:00 packages.conf
7765 -rw-      4700 Feb 12 2016 15:25:28 -08:00
cat3k_caa-universalk9.16.01.02.SPA.conf
1621966848 bytes total (122314752 bytes free)
Switch#

```

- Step 6** After you have successfully installed the image, you no longer need the .bin image. If you copied the file to flash, you can delete it from the flash of each switch.

```

Switch#delete flash: cat3k_caa-universalk9.16.01.02.SPA.bin
Delete filename [cat3k_caa-universalk9.16.01.02.SPA.bin]?
Delete flash:/cat3k_caa-universalk9.16.01.02.SPA.bin? [confirm]
Switch#

```

## Reload

- Step 7** Reload the switch.

```
Switch#reload
```

- Step 8** If the switch is configured with auto boot, then the stack automatically boots up with the new image. If not, you can manually boot flash:packages.conf

```
switch:boot flash:packages.conf
```

- Step 9** When the new image boots up, you can verify the version of the new image, by using the `show version` command:

```

Switch#show version
Cisco IOS Software, Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version
Denali 16.1.2, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Tue 23-Feb-16 10:51 by mcpre

```

## Upgrading from Cisco IOS XE Denali 16.1.2 or 16.1.3 to Cisco IOS XE 16.x in Install Mode

Follow these instructions to upgrade from Cisco IOS XE Denali 16.1.2 or 16.1.3 to a future IOS XE 16.x release in Install mode. In order to do a software image upgrade, you must be booted into IOS via “boot flash:packages.conf.”

## Clean Up

**Step 1** Ensure you have enough space in flash to expand a new image by cleaning up old installation files.



**Note** Use the `switch all` option to clean up all switches in your stack.

```
Switch#request platform software package clean switch all file flash:
Running command on switch 1
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
    packages.conf
      File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 2
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
    packages.conf
      File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 3
Cleaning up unnecessary package files
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-rpbase.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-wcm.16.01.01.SPA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.16.01.01.SPA.pkg
      File is in use, will not delete.
    packages.conf
      File is in use, will not delete.
done.

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Running command on switch 4
Cleaning up unnecessary package files
```

```

Scanning boot directory for packages ... done.
Preparing packages list to delete ...
packages.conf
  File is in use, will not delete.
cat3k_caa-rpbase.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.01.01.SPA.pkg
  File is in use, will not delete.
done.

```

```

SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
Switch#

```

## Copy New Image to Stack

- 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://5.28.11.250/cat3k_caa-universalk9.16.02.01.SPA.bin
flash:cat3k_caa-universalk9.16.02.01.SPA.bin
Destination filename [cat3k_caa-universalk9.16.02.01.SPA.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.16.02.01.SPA.bin...
Loading cat3k_caa-universalk9.16.02.01.SPA.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 469674585 bytes]

469674585 bytes copied in 47.237 secs (9942938 bytes/sec)
Switch#

```

- 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:/

47718  -rw-   469674585  Nov 25 2015 17:06:53 +00:00
cat3k_caa-universalk9.16.02.01.SPA.bin

3458338816 bytes total (2310709248 bytes free)
Switch#

```

## Software Install Image to Flash

- Step 4** Use the `request platform software package install switch all file flash: auto-copy` 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

---

Use the `switch all` option to upgrade all switches in your stack  
 Use the `auto-copy` option to copy the `.bin` image from flash: to all other switches in your stack

---

```

Switch#request platform software package install switch all file
flash:cat3k_caa-universalk9.16.02.01.SPA.bin auto-copy
Expanding image file: flash:cat3k_caa-universalk9.16.02.01.SPA.bin
[4]: Copying flash:cat3k_caa-universalk9.16.02.01.SPA.bin from switch 4 to switch 1 2
3
[1 2 3]: Finished copying to switch 1 2 3
[1 2 3 4]: Expanding file
[1 2 3 4]: Finished expanding all-in-one software package in switch 1 2 3 4
SUCCESS: Finished expanding all-in-one software package.
[1 2 3 4]: Performing install
    SUCCESS: install Finished
[1]: install package(s) on switch 1
--- Starting list of software package changes ---
Old files list:
    Removed cat3k_caa-rpbase.16.01.01.SPA.pkg
    Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
    Removed cat3k_caa-wcm.16.01.01.SPA.pkg
    Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
    Added cat3k_caa-rpbase.16.02.01.SPA.pkg
    Added cat3k_caa-srdriver.16.02.01.SPA.pkg
    Added cat3k_caa-wcm.16.02.01.SPA.pkg
    Added cat3k_caa-webui.16.02.01.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 cat3k_caa-rpbase.16.01.01.SPA.pkg
    Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
    Removed cat3k_caa-wcm.16.01.01.SPA.pkg
    Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
    Added cat3k_caa-rpbase.16.02.01.SPA.pkg
    Added cat3k_caa-srdriver.16.02.01.SPA.pkg
    Added cat3k_caa-wcm.16.02.01.SPA.pkg
    Added cat3k_caa-webui.16.02.01.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 cat3k_caa-rpbase.16.01.01.SPA.pkg
    Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
    Removed cat3k_caa-wcm.16.01.01.SPA.pkg
    Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
    Added cat3k_caa-rpbase.16.02.01.SPA.pkg
    Added cat3k_caa-srdriver.16.02.01.SPA.pkg
    Added cat3k_caa-wcm.16.02.01.SPA.pkg
    Added cat3k_caa-webui.16.02.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[3]: Finished install successful on switch 3
[4]: install package(s) on switch 4
--- Starting list of software package changes ---
Old files list:
    Removed cat3k_caa-rpbase.16.01.01.SPA.pkg
    Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
    Removed cat3k_caa-wcm.16.01.01.SPA.pkg
    Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:

```



```

Added cat3k_caa-rpbase.16.02.01.SPA.pkg
Added cat3k_caa-srdriver.16.02.01.SPA.pkg
Added cat3k_caa-wcm.16.02.01.SPA.pkg
Added cat3k_caa-webui.16.02.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[4]: Finished install successful on switch 4
Checking status of install on [1 2 3 4]
[1 2 3 4]: Finished install in switch 1 2 3 4
SUCCESS: Finished install: Success on [1 2 3 4]

```

**Note**


---

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

---

**Step 5** After the software has been successfully installed, verify that the flash partition has four new .pkg files and 1 updated packages.conf file. See sample output below.

```

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

Directory of flash:/

47721 -rw- 280883175 Nov 24 2015 14:07:07 +00:00
cat3k_caa-rpbase.16.01.01.SPA.pkg
47739 -rw- 7197312 Nov 24 2015 14:07:07 +00:00
cat3k_caa-srdriver.16.01.01.SPA.pkg
47738 -rw- 166576756 Nov 24 2015 14:07:07 +00:00 cat3k_caa-wcm.16.01.01.SPA.pkg
47741 -rw- 14631548 Nov 24 2015 14:07:07 +00:00 cat3k_caa-webui.16.01.01.SPA.pkg
111331 -rw- 281075550 Nov 25 2015 17:31:41 +00:00
cat3k_caa-rpbase.16.02.01.SPA.pkg
111333 -rw- 7197312 Nov 25 2015 17:31:42 +00:00
cat3k_caa-srdriver.16.02.01.SPA.pkg
111332 -rw- 166765172 Nov 25 2015 17:31:42 +00:00 cat3k_caa-wcm.16.02.01.SPA.pkg
111334 -rw- 14631548 Nov 25 2015 17:31:42 +00:00
cat3k_caa-webui.16.02.01.SPA.pkg
3458338816 bytes total (1840529408 bytes free)
Switch#

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

Directory of flash:/

47744 -rw- 4612 Nov 25 2015 17:33:21 +00:00 packages.conf
111335 -rw- 4588 Nov 25 2015 17:32:13 +00:00
cat3k_caa-universalk9.16.02.01.SPA.conf
3458338816 bytes total (1840529408 bytes free)
Switch#

```

**Step 6** After you have successfully installed the image, you do not need the .bin image and the file can be deleted from the flash of EACH switch if you had it copied to flash.

```

Switch#delete flash:cat3k_caa-universalk9.16.02.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.02.01.SPA.bin]?
Delete flash:/ cat3k_caa-universalk9.16.02.01.SPA.bin? [confirm]
Switch#

```

## Reload

**Step 7** Reload the switch

```
Switch#reload
```

- Step 8** 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 boot the new image, it will automatically update the boot loader.

---

- Step 9** When the new image boots up, you can verify the version of the new image, using the `show version` command:

```
Switch#show version
Cisco IOS Software, Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Version
Denali 16.2.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Thu 19-Nov-15 22:49 by mcpre
```

## Downgrade from Cisco IOS XE Denali 16.1.x to Cisco IOS XE 3.xE in Install Mode

Follow these instructions to downgrade from Cisco IOS XE Denali 16.1.x to older Cisco IOS XE 3.xE releases in Install Mode.

### Clean Up

- Step 1** Ensure you have enough space in flash to expand a new image by cleaning up old installation files.




---

**Note** Use the `switch all` option to clean up all switches in your stack.

---

```
Switch#request platform software package clean switch all file flash:
Running command on switch 1
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
packages.conf
File is in use, will not delete.
cat3k_caa-rpbase.16.01.01.SPA.pkg
File is in use, will not delete.
cat3k_caa-srdriver.16.01.01.SPA.pkg
File is in use, will not delete.
cat3k_caa-wcm.16.01.01.SPA.pkg
File is in use, will not delete.
cat3k_caa-webui.16.01.01.SPA.pkg
File is in use, will not delete.
done.

Running command on switch 2
Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
packages.conf
File is in use, will not delete.
cat3k_caa-rpbase.16.01.01.SPA.pkg
File is in use, will not delete.
```

```

cat3k_caa-srdriver.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.01.01.SPA.pkg
  File is in use, will not delete.
done.

```

Running command on switch 3

```

Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
packages.conf
  File is in use, will not delete.
cat3k_caa-rpbase.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.01.01.SPA.pkg
  File is in use, will not delete.
done.

```

Running command on switch 4

```

Cleaning up unnecessary package files
Scanning boot directory for packages ... done.
Preparing packages list to delete ...
packages.conf
  File is in use, will not delete.
cat3k_caa-rpbase.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.01.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.01.01.SPA.pkg
  File is in use, will not delete.
done.

```

The following files will be deleted:

```

[1]:
/flash/cat3k_caa-rpbase.16.02.01.SPA.pkg
/flash/cat3k_caa-srdriver.16.02.01.SPA.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-universalk9.16.01.01.SPA.conf
/flash/cat3k_caa-wcm.16.02.01.SPA.pkg
/flash/cat3k_caa-webui.16.02.01.SPA.pkg
/flash/packages.conf.00-
[2]:
/flash/cat3k_caa-rpbase.16.02.01.SPA.pkg
/flash/cat3k_caa-srdriver.16.02.01.SPA.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-universalk9.16.01.01.SPA.conf
/flash/cat3k_caa-wcm.16.02.01.SPA.pkg
/flash/cat3k_caa-webui.16.02.01.SPA.pkg
/flash/packages.conf.00-
[3]:
/flash/cat3k_caa-rpbase.16.02.01.SPA.pkg
/flash/cat3k_caa-srdriver.16.02.01.SPA.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-universalk9.16.01.01.SPA.conf
/flash/cat3k_caa-wcm.16.02.01.SPA.pkg
/flash/cat3k_caa-webui.16.02.01.SPA.pkg

```

```

/flash/packages.conf.00-
[4]:
/flash/cat3k_caa-rpbase.16.02.01.SPA.pkg
/flash/cat3k_caa-srdriver.16.02.01.SPA.pkg
/flash/cat3k_caa-universalk9.16.01.01.SPA.bin
/flash/cat3k_caa-universalk9.16.01.01.SPA.conf
/flash/cat3k_caa-wcm.16.02.01.SPA.pkg
/flash/cat3k_caa-webui.16.02.01.SPA.pkg
/flash/packages.conf.00-

Do you want to proceed? [y/n]y
[1]:
Deleting file flash:cat3k_caa-rpbase.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-srdriver.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.conf ... done.
Deleting file flash:cat3k_caa-wcm.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-webui.16.02.01.SPA.pkg ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
[2]:
Deleting file flash:cat3k_caa-rpbase.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-srdriver.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.conf ... done.
Deleting file flash:cat3k_caa-wcm.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-webui.16.02.01.SPA.pkg ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
[3]:
Deleting file flash:cat3k_caa-rpbase.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-srdriver.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.conf ... done.
Deleting file flash:cat3k_caa-wcm.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-webui.16.02.01.SPA.pkg ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
[4]:
Deleting file flash:cat3k_caa-rpbase.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-srdriver.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.bin ... done.
Deleting file flash:cat3k_caa-universalk9.16.01.01.SPA.conf ... done.
Deleting file flash:cat3k_caa-wcm.16.02.01.SPA.pkg ... done.
Deleting file flash:cat3k_caa-webui.16.02.01.SPA.pkg ... done.
Deleting file flash:packages.conf.00- ... done.
SUCCESS: Files deleted.
Switch#

```

## Copy New Image to Stack

- Step 2** Copy the target Cisco IOS XE 3.xE image to flash: (you can skip this step if you want to use the image from your TFTP server).

```

Switch#copy tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
flash:
cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Destination filename [cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin...
Loading cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin from 5.28.11.250 (via
GigabitEthernet0/0):

```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!O!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!
[OK - 311154824 bytes]

311154824 bytes copied in 68.781 secs (4523849 bytes/sec)
Switch#
```

**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:/

47718 -rw- 311154824 Nov 25 2015 18:17:21 +00:00
cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin

3458338816 bytes total (2468995072 bytes free)
Switch#
```

## Downgrade Software Image

**Step 4** Use the `request platform software package install` command with the `new` option to downgrade your stack. You can point to the source image on your tftpserver or in flash if you have it copied to flash.



### Note

Use the `switch all` option is needed to upgrade all switches in your stack.  
Use the `auto-copy` option to copy the `.bin` image from flash: to all other switches in your stack.

```
Switch#request platform software package install switch all file flash:cat3k_caa-
universalk9.SPA.03.07.02.E.152-3.E2.bin new auto-copy
Expanding image file: flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
[4]: Copying flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin from switch 4 to
switch 1 2 3
[1 2 3]: Finished copying to switch 1 2 3
[1 2 3 4]: Expanding file
[1 2 3 4]: Finished expanding all-in-one software package in switch 1 2 3 4
SUCCESS: Finished expanding all-in-one software package.
[1 2 3 4]: Performing install
SUCCESS: install Finished
[1]: install package(s) on switch 1
--- Starting list of software package changes ---
Old files list:
  Removed cat3k_caa-rpbase.16.01.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
  Removed cat3k_caa-wcm.16.01.01.SPA.pkg
  Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
  Added cat3k_caa-base.SPA.03.07.02E.pkg
  Added cat3k_caa-drivers.SPA.03.07.02E.pkg
  Added cat3k_caa-infra.SPA.03.07.02E.pkg
  Added cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
  Added cat3k_caa-platform.SPA.03.07.02E.pkg
  Added cat3k_caa-wcm.SPA.10.3.120.0.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 cat3k_caa-rpbase.16.01.01.SPA.pkg
Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
Removed cat3k_caa-wcm.16.01.01.SPA.pkg
Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
  Added cat3k_caa-base.SPA.03.07.02E.pkg
  Added cat3k_caa-drivers.SPA.03.07.02E.pkg
  Added cat3k_caa-infra.SPA.03.07.02E.pkg
  Added cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
  Added cat3k_caa-platform.SPA.03.07.02E.pkg
  Added cat3k_caa-wcm.SPA.10.3.120.0.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 cat3k_caa-rpbase.16.01.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
  Removed cat3k_caa-wcm.16.01.01.SPA.pkg
  Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
  Added cat3k_caa-base.SPA.03.07.02E.pkg
  Added cat3k_caa-drivers.SPA.03.07.02E.pkg
  Added cat3k_caa-infra.SPA.03.07.02E.pkg
  Added cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
  Added cat3k_caa-platform.SPA.03.07.02E.pkg
  Added cat3k_caa-wcm.SPA.10.3.120.0.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[3]: Finished install successful on switch 3
[4]: install package(s) on switch 4
--- Starting list of software package changes ---
Old files list:
  Removed cat3k_caa-rpbase.16.01.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.01.01.SPA.pkg
  Removed cat3k_caa-wcm.16.01.01.SPA.pkg
  Removed cat3k_caa-webui.16.01.01.SPA.pkg
New files list:
  Added cat3k_caa-base.SPA.03.07.02E.pkg
  Added cat3k_caa-drivers.SPA.03.07.02E.pkg
  Added cat3k_caa-infra.SPA.03.07.02E.pkg
  Added cat3k_caa-iosd-universalk9.SPA.152-3.E2.pkg
  Added cat3k_caa-platform.SPA.03.07.02E.pkg
  Added cat3k_caa-wcm.SPA.10.3.120.0.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[4]: Finished install successful on switch 4
Checking status of install on [1 2 3 4]
[1 2 3 4]: Finished install in switch 1 2 3 4
SUCCESS: Finished install: Success on [1 2 3 4]

```



**Note**

The old files listed in the logs should be removed using the `software clean` command, after reload

**Step 5**

After you have successfully installed the image, you no longer need the .bin image and the file can be deleted from flash of each switch if you copied it to flash.

```

Switch#delete flash: cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Delete filename [cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin]?
Delete flash:/ cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin? [confirm]
Switch#

```

## 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
```



**Note**

When you downgrade to a Cisco IOS XE 3.xE image, your boot loader will not automatically downgrade. It will remain updated. The new boot loader can support booting both Cisco IOS XE 3.xE releases as well as Cisco IOS XE Denali16.x releases.

## Downgrade from Cisco IOS XE Denali 16.1.x to Cisco IOS XE 3.xE in Bundle Mode

Follow these instructions to downgrade from Cisco IOS XE Denali 16.1.x in Bundle mode to an older Cisco IOS XE 3.xE releases in Bundle mode.

### Copy New Image to Stack

**Step 1** Make sure your TFTP server is reachable from IOS via GigabitEthernet0/0.

```
Switch#show run | i tftp
ip tftp source-interface GigabitEthernet0/0
ip tftp blocksize 8192
Switch#
Switch#show run | i ip route vrf
ip route vrf Mgmt-vrf 5.0.0.0 255.0.0.0 5.30.0.1
Switch#
Switch#show run int GigabitEthernet0/0
Building configuration...

Current configuration : 115 bytes
!
interface GigabitEthernet0/0
 vrf forwarding Mgmt-vrf
 ip address 5.30.12.121 255.255.0.0
 negotiation auto
end
Switch#
Switch#ping vrf Mgmt-vrf ip 5.28.11.250
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 5.28.11.250, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

**Step 2** Copy the image from your TFTP server to flash.

```
Switch#copy tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
flash:
cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
```

```

Destination filename [cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin...
Loading cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!O!!!!!!!!!!!!
!
!!!!!!!!!!!!!!!!!!!!
[OK - 311154824 bytes]

311154824 bytes copied in 68.781 secs (4523849 bytes/sec)
Switch#

```




---

**Note** If you have a stack, you must copy the image to the flash of each switch in your stack.

---

**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:/

47718  -rw-   311154824  Nov 25 2015 18:17:21 +00:00
cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin

3458338816 bytes total (2468995072 bytes free)
Switch#

```

## Edit the Boot variable

**Step 4** Clear the boot variable

```
Switch(config)#no boot system
```

**Step 5** Edit the boot variable to point to the new image.

```
Switch(config)#boot system flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
```

**Step 6** Use the `write memory` command to save the configuration change.

```
Switch#write memory
```

**Step 7** Use the `show boot` command to confirm that your boot variable is pointing to the new image

```

Switch#show boot
-----
Switch 1
-----
Current Boot Variables:
BOOT variable = flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin;

Boot Variables on next reload:
BOOT variable = flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin;
Allow Dev Key = yes
Manual Boot = yes
Enable Break = yes
Switch#

```



## Reload

**Step 8** Reload the switch

```
switch#reload
```

**Step 9** If your switches are configured with auto boot, the stack will automatically boot up with the new image. If not, you can manually boot flash:cat3k\_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin

```
switch:boot flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
```



**Note**

When you downgrade to a Cisco IOS XE 3.xE image, your boot loader will remain updated, and will automatically be downgraded. The new boot loader can support booting both Cisco IOS SE 3.x releases as well as Cisco IOS XE Denali 16.x releases.

**Step 10** When the new image boots up, you can verify the version of the new image, by checking `show version`

```
Switch#show version
Cisco IOS Software, IOS-XE Software, Catalyst L3 Switch Software
(CAT3K_CAA-UNIVERSALK9-M), Version 03.07.02E RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Tue 21-Jul-15 12:51 by prod_rel_team
```

## Move from Cisco IOS XE 3.xE Bundle Mode to Install Mode

**Step 11** Ensure you have enough space in flash to expand a new image by cleaning up old installation files. This command will erase your Cisco IOS XE 3.xE bin image file, so ensure that you copy it to your Active again.

```
Switch#software clean file flash:
Preparing clean operation ...
[1 2 3 4]: Cleaning up unnecessary package files
[1 2 3 4]: Preparing packages list to delete ...
[1]: Files that will be deleted:
cat3k_caa-rpbase.16.01.01E.SPA.pkg
cat3k_caa-srdriver.16.01.01E.SPA.pkg
cat3k_caa-universalk9.16.01.01.SPA.bin
cat3k_caa-wcm.16.01.01E.SPA.pkg
cat3k_caa-webui.16.01.01E.SPA.pkg
packages.conf
[2]: Files that will be deleted:
cat3k_caa-rpbase.16.01.01E.SPA.pkg
cat3k_caa-srdriver.16.01.01E.SPA.pkg
cat3k_caa-universalk9.16.01.01.SPA.bin
cat3k_caa-wcm.16.01.01E.SPA.pkg
cat3k_caa-webui.16.01.01E.SPA.pkg
packages.conf
[3]: Files that will be deleted:
cat3k_caa-rpbase.16.01.01E.SPA.pkg
cat3k_caa-srdriver.16.01.01E.SPA.pkg
cat3k_caa-universalk9.16.01.01.SPA.bin
cat3k_caa-wcm.16.01.01E.SPA.pkg
cat3k_caa-webui.16.01.01E.SPA.pkg
packages.conf
[4]: Files that will be deleted:
cat3k_caa-rpbase.16.01.01E.SPA.pkg
cat3k_caa-srdriver.16.01.01E.SPA.pkg
cat3k_caa-universalk9.16.01.01.SPA.bin
cat3k_caa-wcm.16.01.01E.SPA.pkg
```

```

cat3k_caa-webui.16.01.01E.SPA.pkg
packages.conf

[1 2 3 4]: Do you want to proceed with the deletion? [yes/no]: yes
[1 2 3 4]: Clean up completed
Switch#

```

**Step 12** Copy the image from your TFTP server to flash

```

Switch#copy tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
flash:
cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Destination filename [cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin...
Loading cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!O!!!!!!!!!!!!!!
!
!!!!!!!!!!!!!!!!!!!!
[OK - 311154824 bytes]

311154824 bytes copied in 68.781 secs (4523849 bytes/sec)
Switch#

```

**Step 13** Use the `software expand` command to expand the target image to flash and move from bundle mode to install mode. You can point to the source image on your TFTP server or in flash if you have it copied to flash.

```

Switch#software expand file flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Preparing expand operation ...
[1]: Copying software from active switch 1 to switches 2,3,4
[1]: Finished copying software to switches 2,3,4
[1 2 3 4]: Expanding bundle flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
[1 2 3 4]: Copying package files
[1 2 3 4]: Package files copied
[1 2 3 4]: Finished expanding bundle
flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Switch#

```

## Edit the Boot variable

**Step 14** Clear the boot variable

```
Switch(config)#no boot system
```

**Step 15** Edit the boot variable to point to the new image.

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

**Step 16** Use the `write memory` command to save the configuration change.

```
Switch#write memory
```

**Step 17** Use the `show boot` command to confirm that your boot variable is pointing to the new image

```

Switch#show boot
-----
Switch 1
-----
Current Boot Variables:
BOOT variable = flash:packages.conf;

Boot Variables on next reload:

```

```

BOOT variable = flash:packages.conf;
Manual Boot = yes
Enable Break = yes
Switch#

```

## Reload

- Step 18** Reload the switch

```
switch#reload
```

- Step 19** If your switches are configured with auto boot, 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 20** When the new image boots up, you can verify the version of the new image, by checking **show version**

```

Switch#show version
Cisco IOS Software, IOS-XE Software, Catalyst L3 Switch Software
(CAT3K_CAA-UNIVERSALK9-M), Version 03.07.02E RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2015 by Cisco Systems, Inc.
Compiled Tue 21-Jul-15 12:51 by prod_rel_team

```

- Step 21** After you have successfully installed the image, you no longer need the .bin image and the file can be deleted from the flash of each switch if you had copied to flash.

```

Switch#delete flash:cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin
Delete filename [cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin]?
Delete flash:/cat3k_caa-universalk9.SPA.03.07.02.E.152-3.E2.bin? [confirm]
Switch#

```

## WCM Sub Package Software Image Upgrade

The sub-package upgrade steps are similar to the bundle package upgrade, except that you only install one sub-package and not all packages. In order to perform a sub-package software image upgrade, you must be booted into IOS using **boot flash:packages.conf**.

- Step 1** Copy new sub-package image to flash. For example, **cat3k\_caa-wcm.16.02.01.SPA.pkg** for **WCM module** for the WCM module.

- Step 2** Use the **request platform software package install switch <switch id> file flash:<image>** command to upgrade your switch.

```

switch#request platform software package install switch 1 file flash:
cat3k_caa-wcm.16.02.01.SPA.pkg
[1]: install package(s) on switch 1
--- Starting list of software package changes ---
Old files list:
  Removed cat3k_caa-wcm.16.01.01.SPA.pkg
New files list:
  Added cat3k_caa-wcm.16.02.01.SPA.pkg
Finished list of software package changes
SUCCESS: Software provisioned. New software will load on reboot.
[1]: Finished install successful on switch 1

```

**Step 3** When you upgrade the WCM sub-package, and you have AP(s) connected and joined to the controller, you can pre-download the newly upgraded AP images to APs before restarting the APs. The pre-download steps are as follows:

Step	Command	Purpose
1.	<code># show ap join stats summary.</code>	Shows all APs connected to the controller, includes joined and not joined APs.
2.	<code># show ap image</code>	Only joined AP(s) can perform the image pre-downloading process.
3.	<code># ap image predownload</code>	While pre-downloading the AP image(s), use <code>#show ap image</code> to monitor the pre-downloading status. Go to the next step after image pre-downloading is completed.
4.	<code># ap image swap</code>	Swaps the backup AP image with the bootup AP image on AP device.
5.	<code># ap imate reset</code>	Restarts all the APs that have connected to the controller.
6.	<code># reload</code>	Restart the controller.

## Upgrading RTU Licenses

In Cisco IOS XE Denali 16.1.1, right-to-use (RTU) licensing has been modified to allow stack members to join a stack without having the same license level as the rest of the existing stack. The mismatched switch will not be put into Lic-Mismatch state. Even though the switch with the mismatched license is allowed to join the stack, the following syslog message is displayed periodically reminding you to fix the RTU license level:

```
%STACK_RTU_LICENSE-6-IOSD_LIC_MISMATCH:Switch 5 R0/0: stack_mgr: Switch #5:
Current IOSd runs on lanbase license while RTU active license is ipservices.
Please configure RTU license to current IOSd license.
```

For more information, see [CSCux27336](#).

The EXEC mode **Right to Use License** command allows you to activate or deactivate feature set licenses or Adder AP Count Licenses. This command provides options to activate or deactivate any license supported on the platform.

```
license right-to-use [activate|deactivate] [ lanbase | ipbase | ipservices |
ap-count] {evaluation | <count> } [ all | slot <switch id>] {acceptEULA}
```

The EXEC mode **Right to Use License** command has been provided to activate or deactivate feature set licenses or Adder AP Count Licenses. This command provides options to activate or deactivate any license supported on the platform.

```
license right-to-use [activate|deactivate] [ lanbase | ipbase | ipservices |
ap-count] {evaluation | <count> } [ all | slot <switch id>] {acceptEULA}
```

## Upgrading an IP Base SKU to IP Services License

Step	Command	Purpose
1	license right-to-use activate ipservices slot <switch id>	Activate IP Services license. Pass the switch id. EULA will be prompted, accept the EULA by typing 'yes'.
2	show license right-to-use summary	Check the reboot license level is ipservices.
3	reload	Reboot the switch to boot with ipservices.

## Evaluating IP Services License on IP Base SKU

Step	Command	Purpose
1	license right-to-use activate ipservices evaluation slot <switch id>	Activate IP Services evaluation license. Pass the switch id. EULA will be prompted, accept the EULA by typing 'yes'.
2	show license right-to-use summary	Check the reboot license level is ipservices eval.
3	reload	Reboot the switch to boot with ipservices eval.

## Upgrading an LAN Base SKU to IP Services License Without Prompting EULA

Step	Command	Purpose
1	license right-to-use activate ipservices slot <switch id> acceptEULA	Activate IP Services license. Pass the switch id. EULA will be accepted automatically without being prompted.
2	Show license right-to-use summary	Check the reboot license level is ipservices.
3	Reload	Reboot the switch to boot with ipservices.

## Deactivating Evaluation IP Services License on IP Base SKU

Step	Command	Purpose
1	license right-to-use deactivate ipservices evaluation slot <switch id>	Deactivates IP Services evaluation license.
2	Show license right-to-use summary	Check the reboot license level is ipbase.
3	Reload	Reboot the switch to boot with ipbase.

## Upgrading LAN Base Stack to IP Base Stack

Step	Command	Purpose
1	license right-to-use activate ipbase all	Activate IP Base license on all the switches in the stack. EULA will be prompted, accept the EULA by typing 'yes'.
2	Show license right-to-use	Check the reboot license level is ipbase for all the switches.
3	Reload	Reboot the switch to boot with ipbase.

## Changing the License Level of License Mismatch Switch from Active's Console

If the license mismatch switch has a lower license level than other switches in the stack, and the stack is running at IP Services and the mismatch switch is booted with IP Base license.

Step	Command	Purpose
1	show switch	Get the switch number in license mismatch state.
2	show license right-to-use mismatch	Check the license level of the license mismatch switch.
3	license right-to-use activate ipservices slot <switch-id>	Activate IP Services license on all the mismatch switches in the stack. EULA will be prompted, accept the EULA by typing 'yes'.
4	Reload slot <switch-id>	Reboot the license mismatch switch to boot with ipservices and join the stack.

If the license mismatch switch has a higher license level than other switches in the stack, and the stack is running at IP Base and the mismatch switch is booted with IP Services license.

Step	Command	Purpose
1	show switch	Get the switch number in license mismatch state.
2	show license right-to-use mismatch	Check the license level of the license mismatch switch.
3	license right-to-use activate ipbase slot <switch-id>	Activate IP Base license on the license mismatch switch. EULA will be prompted, accept the EULA by typing 'yes'.

## Adding Adder AP Count Licenses

Step	Command	Purpose
1	license right-to-use activate apcount <count> slot <switch id>	Pass the number of AP count licenses to add as count. Pass the switch-id on which the Adder AP count licenses are to be added. EULA is prompted, accept it by typing 'yes'.
2	Show license right-to-use slot <switch-id>	Check the adder AP count licenses are incremented on the given switch.
3	Show license right-to-use summary	Check the total Adder AP count licenses are incremented and the Total available AP count are incremented.

## Decrementing Adder AP Count licenses

Step	Command	Purpose
1	license right-to-use deactivate apcount <count> slot <switch id>	Pass the number of AP count licenses to be removed as count. Pass the switch-id on which the Adder AP count licenses are to be removed.
2	Show license right-to-use slot <switch-id>	Check the adder AP count licenses are decremented on the given switch.
3	Show license right-to-use summary	Check the total Adder AP count licenses are reduced by count and the Total available AP Count are reduced.

## Activating Evaluation AP Count License on the Stack

Step	Command	Purpose
1	license right-to-use activate apcount evaluation	Activated evaluation AP Count licenses on the stack. EULA will be prompted, accept it.
2	Show license right-to-use summary	Check the license type evaluation with maximum supported AP Count is displayed. Base and adder AP Count licenses are not seen.
3	Show license right-to-use	To check the base and adder apcount licenses, if any.

## Deactivating Evaluation AP Count License

Step	Command	Purpose
1	license right-to-use deactivate apcount evaluation	Deactivates evaluation AP Count licenses on the stack.
2	Show license right-to-use summary	Base and Adder AP Count licenses are displayed. Total available AP Count is sum of Base and Adder AP Count.

## Feature Sets

The Catalyst 3650 switch supports three different feature sets:

- LAN Base feature set—Provides basic Layer 2+ features, including access control lists (ACLs) and quality of service (QoS), and up to 255 VLANs.
- IP Base feature set—Provides Layer 2+ and basic Layer 3 features (enterprise-class intelligent services). These features include access control lists (ACLs), quality of service (QoS), static routing, EIGRP stub routing, IP multicast routing, Routing Information Protocol (RIP), basic IPv6 management, the Open Shortest Path First (OSPF) Protocol (for routed access only), and support for wireless controller functionality. The license supports up to 4094 VLANs.
- IP Services feature set—Provides a richer set of enterprise-class intelligent services and full IPv6 support. It includes IP Base features plus Layer 3 routing (IP unicast routing and IP multicast routing). The IP Services feature set includes protocols such as the Enhanced Interior Gateway Routing Protocol (EIGRP), the Open Shortest Path First (OSPF) Protocol, and support for wireless controller functionality. The license supports up to 4094 VLANs.



**Note** A separate access point count license is required to use the switch as a wireless controller.

For more information about the features, see the product data sheet at this URL:

[http://www.cisco.com/en/US/products/ps13133/products\\_data\\_sheets\\_list.html](http://www.cisco.com/en/US/products/ps13133/products_data_sheets_list.html)



# Interoperability with Other Client Devices

This section describes the interoperability of this version of the switch software release with other client devices.

**Table 9** *Test Bed Configuration for Interoperability*

Hardware/Software Parameter	Hardware/Software Configuration Type
Release	16.1.2
Controller	Cisco 3850 Controller
Access points	3502, 3602, 2602, 1702, 2702, 3702, 702W, 1852
Radio	802.11ac, 802.11a, 802.11g, 802.11n2, 802.11n5
Security	Open, WEP, PSK (WPA and WPA2), 802.1X (WPA-TKIP and WPA2-AES) (LEAP, PEAP, EAP-FAST, EAP-TLS)
RADIUS	ACS 5.3, ISE 1.2
Types of tests	Connectivity, traffic, and roaming between two access points

**Table 10** lists the client types on which the tests were conducted. The clients included laptops, handheld devices, and phones.

**Table 10** *Client Types*

Client Type and Name	Version
<b>Laptops</b>	
Intel 4965	v13.4
Intel 5100/5300	v14.3.2.1
Intel 6200	15.15.0.1
Intel 6300	15.16.0.2
Intel 6205	15.16.0.2
Intel 1000/1030	v14.3.0.6
Intel 7260	18.32.0.5
Intel 7265	18.32.0.5
Intel 3160	18.32.0.5
Broadcom 4360	6.30.163.2005
Linksys AE6000 (USB)	5.1.2.0
Netgear A6200 (USB)	6.30.145.30
Netgear A6210(USB)	5.1.18.0
D-Link DWA-182 (USB)	6.30.145.30
Engenius EUB 1200AC(USB)	1026.5.1118.2013
Asus AC56(USB)	1027.7.515.2015

**Table 10**      *Client Types*

Dell 1395/1397/Broadcom 4312HMG(L)	5.30.21.0
Dell 1501 (Broadcom BCM4313)	v5.60.48.35/v5.60.350.11
Dell 1505/1510/Broadcom 4321MCAG/4322HM	5.60.18.8
Dell 1515(Atheros)	8.0.0.239
Dell 1520/Broadcom 43224HMS	5.60.48.18
Dell 1530 (Broadcom BCM4359)	5.100.235.12
Dell 1540	6.30.223.215
Cisco CB21	1.3.0.532
Atheros HB92/HB97	8.0.0.320
Atheros HB95	7.7.0.358
MacBook Pro	OSX 10.11.1
MacBook Air old	OSX 10.11.1
MacBook Air new	OSX 10.11.1
Macbook Pro with Retina Display	OSX 10.11.1
Macbook New 2015	OSX 10.11.1
<b>Tablets</b>	
Apple iPad2	iOS 9.2(13C75)
Apple iPad3	iOS 9.2(13C75)
Apple iPad mini with Retina display	iOS 9.2(13C75)
Apple iPad Air	iOS 9.2(13C75)
Apple iPad Air 2	iOS 9.2(13C75)
Samsung Galaxy Tab Pro SM-T320	Android 4.4.2
Samsung Galaxy Tab 10.1- 2014 SM-P600	Android 4.4.2
Samsung Galaxy Note 3 – SM-N900	Android 5.0
Microsoft Surface Pro 3	Windows 8.1 Driver: 15.68.3073.151
Microsoft Surface Pro 2	Windows 8.1 Driver: 14.69.24039.134
Google Nexus 9	Android 6.0
Google Nexus 7 2 <sup>nd</sup> Gen	Android 5.0
<b>Phones</b>	
Cisco 7921G	1.4.5.3.LOADS
Cisco 7925G	1.4.5.3.LOADS
Cisco 8861	Sip88xx.10-2-1-16
Apple iPhone 4S	iOS 9.2(13C75)
Apple iPhone 5	iOS 9.2(13C75)

*Table 10 Client Types*

Apple iPhone 5s	iOS 9.2(13C75)
Apple iPhone 5c	iOS 9.2(13C75)
Apple iPhone 6	iOS 9.2(13C75)
Apple iPhone 6 Plus	iOS 9.2(13C75)
HTC One	Android 5.0
OnePlusOne	Android 4.3
Samsung Galaxy S4 – GT-I9500	Android 5.0.1
Sony Xperia Z Ultra	Android 4.4.2
Nokia Lumia 1520	Windows Phone 8.1
Google Nexus 5	Android 5.1
Nexus 6	Android 5.1.1
Samsung Galaxy S5-SM-G900A	Android 4.4.2
Huawei Ascend P7	Android 4.4.2
Samsung Galaxy S III	Android 4.4.2
Google Nexus 9	Android 6.0
Samsung Galaxy Nexus GTI9200	Android 4.4.2
Samsung Galaxy Mega SM900	Android 4.4.2
Samsung Galaxy S6	Android 5.1.1
Samsung Galaxy S5	Android 5.0.1

## Important Notes

- Starting with Cisco IOS XE Denali 16.1.x, a DHCP client that includes option 61 (used by DHCP clients to specify their unique client identifier) in their DHCP discover/offer packet must accept the response message with option 61 from the DHCP server/relay. A client that fails to accept the response message with option 61, is not in compliance with RFC 6842 and requires a firmware upgrade.
- A switch stack containing a mix of Catalyst 3850 and Catalyst 3650 switches is not supported.
- Although visible in the CLI, the following commands are not supported:
  - **collect flow username**
  - **authorize-lsc-ap** (CSCui93659)
- The following features available in Cisco IOS XE Release 3.7.2E, are not supported in Cisco IOS XE Denali 16.1.x:
  - Auto-LAG
  - Named VLAN
  - LACP Fast Rate
  - VRRPv3 (both for IPv4 and IPv6)
  - VRF-aware Copy

- PVRST+ as the default STP mode.
- Security Group Tag (SGT) over Flexible NetFlow (FnF)
- Media Access Control Security (MACsec)
- The following feature is available in Cisco IOS XE Release 3.6.3, but is not supported in Cisco IOS XE Denali 16.1.x
  - Cisco Discovery Protocol (CDP) Bypass
- The following features are not supported in Cisco IOS XE Denali 16.1.x:
  - IP-in-IP (IPIP) Tunneling
  - Mesh, FlexConnect, and OfficeExtend access point deployment
  - Wireless Guest Anchor Controller (The Catalyst 3650 switch can be configured as a foreign controller.)
  - DVMRP Tunneling
  - Port Security on EtherChannel
  - 802.1x Configurable username and password for MAB
  - IEEE 802.1X-2010 with 802.1AE support
  - Command Switch Redundancy
  - CNS Config Agent
  - Dynamic Access Ports
  - IPsec with FIPS
  - IPv6 Ready Logo phase II - Host
  - IPv6 IKEv2 / IPsecv3
  - Fallback bridging for non-IP traffic
  - DHCP snooping ASCII circuit ID
  - Protocol Storm Protection
  - 802.1x NEAT
  - Per VLAN Policy & Per Port Policer
  - Packet Based Storm Control
  - Ingress/egress Shared Queues
  - Trust Boundary Configuration
  - Cisco Group Management Protocol (CGMP)
  - Device classifier for ASP
  - IPSLA Media Operation
  - Passive Monitoring
  - Performance Monitor (Phase 1)
  - AAA: TACACS over IPv6 Transport
  - Auto QoS for Video endpoints
  - EX SFP Support (GLC-EX-SMD)
  - IPv6 Strict Host Mode Support

- IPv6 Static Route support on LAN Base images
- VACL Logging of access denied
- RFC5460 DHCPv6 Bulk Leasequery
- DHCPv6 Relay Source Configuration
- RFC 4293 IP-MIB (IPv6 only)
- RFC 4292 IP-FORWARD-MIB (IPv6 only)
- RFC4292/RFC4293 MIBs for IPv6 traffic
- Layer 2 Tunneling Protocol Enhancements
- UniDirectional Link Routing (UDLR)
- Pragmatic General Multicast (PGM)
- Ingress Strict Priority Queuing (Expedite)
- Weighted Random Early Detect (WRED)
- Improvements in QoS policing rates
- Fast SSID support for guest access WLANs

## Scaling Guidelines

*Table 11*          *Scaling Guidelines*

System Feature	Maximum Limit
Number of HTTP session redirections system-wide (wired/wireless)	Up to 100 clients per second
Number of HTTPS session redirections system-wide (wired/wireless)	Up to 20 clients per second

## Limitations and Restrictions

- You cannot configure NetFlow export using the Ethernet Management port (g0/0).
- The maximum committed information rate (CIR) for voice traffic on a wireless port is 132 Mb/sec.
- Flex Links are not supported. We recommend that you use spanning tree protocol (STP) as the alternative.
- Outdoor access points are supported only when they are in Local mode.
- 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.
- Restrictions for Cisco TrustSec:
  - Cisco TrustSec 802.1x is not supported.
  - Cisco TrustSec Critical Auth is not supported.
  - Media Access Control Security (MACsec) is not supported.

- Cisco TrustSec can be configured only on physical interfaces, not on logical interfaces.
- Cisco TrustSec for IPv6 is not supported.
- Dynamic binding of IP-SGT is not supported for hosts on Layer 3 physical routed interfaces because the IP Device Tracking feature for Layer 3 physical interfaces is not supported.
- Cisco TrustSec cannot be configured on a pure bridging domain with IPSG feature enabled. You must either enable IP routing or disable the IPSG feature in the bridging domain.
- Cisco TrustSec on the switch supports up to 255 security group destination tags for enforcing security group ACLs.
- 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.
- When a logging discriminator is configured and applied to a device, memory leak is seen under heavy syslog or debug output. The rate of the leak is dependent on the quantity of logs produced. In extreme cases, the device may crash. As a workaround, disable the logging discriminator on the device.

## Caveats

- [Cisco Bug Search Tool, page 54](#)
- [Open Caveats in Cisco IOS XE Denali 16.1.x, page 54](#)
- [Resolved Caveats in Cisco IOS XE Denali 16.1.3, page 56](#)
- [Resolved Caveats in Cisco IOS XE Denali 16.1.2, page 57](#)
- [Resolved Caveats in Cisco IOS XE Denali 16.1.1, page 58](#)

## Cisco Bug Search Tool

The Bug Search Tool (BST), which is the online successor to Bug Toolkit, is designed to improve the effectiveness in network risk management and device troubleshooting. The 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 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 listed in this document:

1. Access the BST (use your Cisco user ID and password) at <https://tools.cisco.com/bugsearch/>.
2. Enter the bug ID in the **Search For:** field.

## Open Caveats in Cisco IOS XE Denali 16.1.x

Use the BST to view the details of a caveat listed in this section.

Identifier	Description
<a href="#">CSCu184467</a>	C3850:Stack:Port-Channel:active mem switch power shut causes traffic loss
<a href="#">CSCus49022</a>	Active switch crashes on changing STP mode from RSTP to PVST w/ 128vlans
<a href="#">CSCuv47300</a>	CTS: In loopback interface, config of IP SGT map should not be allowed
<a href="#">CSCuv75864</a>	"octeon_wdt: WDT device closed unexpectedly" error msgs on reload
<a href="#">CSCuw01854</a>	Higher MST convergence times in scaled setups (with 4K VLANs, 16K VPs)
<a href="#">CSCuw24943</a>	mGig speed downshifting to 5G with "speed auto 10000" config
<a href="#">CSCuw38877</a>	Static IGMP join-group on VLAN interface is not reachable
<a href="#">CSCuw56706</a>	LACP with 16 ports: after switchover, ports in H state change to D state
<a href="#">CSCuw69672</a>	WebUI: ACL - "any" option for mask not disabled when it is not supported
<a href="#">CSCuw69829</a>	WebUI: Not able to contain rogue APs using webUI
<a href="#">CSCuw94814</a>	IEEE8023-LAG-MIB does not work use CISCO-LAG-MIB
<a href="#">CSCuw98808</a>	Empty VLAN ACL sequence with no match causes STP issues
<a href="#">CSCux01125</a>	MAC address once aged due to port-security ageing is not re-learned
<a href="#">CSCux09139</a>	Lanbase with "vlan template" does not work - use "advanced template"
<a href="#">CSCux09478</a>	"sh proc mem platform sorted" output is incorrect with low free memory
<a href="#">CSCux22276</a>	VLAN pooling-static ip client is not passing traffic for wireless dot1x
<a href="#">CSCux25383</a>	Passwords still encrypted after encryption key is removed
<a href="#">CSCux23861</a>	WebUI: Few scenarios - refreshing issue related to AP with 11AC module
<a href="#">CSCux23932</a>	WebUI: Operation Status for all Radios - Refreshing issue
<a href="#">CSCux26381</a>	Match based on username fails for dot1x client with Native Profile WLAN
<a href="#">CSCux35423</a>	TACACS mgmt over wireless not working
<a href="#">CSCux35552</a>	Error on editing RogueRule on user configured SSID
<a href="#">CSCux62751</a>	Memory leak seen @ dup_classmap_runtime
<a href="#">CSCux63677</a>	IOSXE_INFRA-6-PROCPATH_CLIENT_HOG: message when trunk going down
<a href="#">CSCux77357</a>	Stuck session with 0 Mac 0 IP not removed from admission cache output
<a href="#">CSCux82059</a>	"Unknown package type" msg when upgrading from 16.1.1 to 16.1.x or 16.x
<a href="#">CSCux89701</a>	CFD QMUL: session comes up after port-security violation
<a href="#">CSCux96301</a>	"% failed to initialize nvram" upon booting with default config
<a href="#">CSCuy04948</a>	Reauthorization timer running for unauthorized case
<a href="#">CSCuz05771</a>	3850 Last reload reason: "Power Failure" when reloaded due to OOM
<a href="#">CSCuy06768</a>	Secure LDAP with wired 1k dot1x sessions may reload the system
<a href="#">CSCuy09339</a>	Observing few dot1x sessions stuck in pending deletion state
<a href="#">CSCuy21768</a>	Session fails auth after few VLANs in group brought down and up
<a href="#">CSCuy46011</a>	Software rollback fails between 16.1.1 and 16.1.2/16.2.1
<a href="#">CSCuy75068</a>	System traceback while smart call home debugs turned on
<a href="#">CSCuy19562</a>	3850/3650 intercepts telnet/ssh connections for unknown destinations

Identifier	Description
<a href="#">CSCuy42327</a>	New domain lists not updated in the show access-session details
<a href="#">CSCuz02972</a>	DBM process crash after SWO, upon deletion of WLAN/ AP group
<a href="#">CSCuz27857</a>	3602 AP fails to detect/ display interferes output
<a href="#">CSCuz50876</a>	3850 Denali 16.1.1 - Bootflash is missing from system-report
<a href="#">CSCuz65463</a>	Storm-control is not working after 3850 reload

## Resolved Caveats in Cisco IOS XE Denali 16.1.3

Use the BST to view the details of a caveat listed in this section.

Identifier	Description
<a href="#">CSCur54635</a>	3850/SSH: Traceback and dummy watched message after switch deployment
<a href="#">CSCut74192</a>	BFD session not coming up after interface in VRF shut and no shut
<a href="#">CSCuv76000</a>	Missing load-balancing details in "show int <port> etherchannel"
<a href="#">CSCuw15272</a>	PNP non-VLAN 1 zero-touch upgrade does not work
<a href="#">CSCuw16591</a>	VACL in Cat3850 is dropping traffic that should be permitted
<a href="#">CSCuw33039</a>	IP-SGT bind should not be seen for link-local IPv6 as client authorizes
<a href="#">CSCuw69566</a>	SysObjectID conflict for WS-C3650-24PD
<a href="#">CSCuw77872</a>	CTS Untrusted Port with SGT not updated by SISF for IP-SGT
<a href="#">CSCuw79758</a>	Duplicate IP detected in Windows 7/8 clients with "tracking" enabled
<a href="#">CSCuw83228</a>	Switch does not retain diagnostic config changes after save and reload
<a href="#">CSCuw90085</a>	No version of "parameter-map" cmd allowed when active session exists
<a href="#">CSCuw97308</a>	WebUI: Unable to apply IPv6 access list on physical interface
<a href="#">CSCux02676</a>	IGMP input mem leaks seen on Mcast RVR join/leave 10 groups continuously
<a href="#">CSCux05946</a>	sh ver shows ROM as "Power Failure" even on regular reload
<a href="#">CSCux15679</a>	Dynamic SGT with VRF not getting mapped under VRF SGT mapping table
<a href="#">CSCux16194</a>	3650 doesn't change to link down when remove SFP Tx cable
<a href="#">CSCux22760</a>	On reload, 1G SFP is connected/up on 3750x while 3850 is notconnect/down
<a href="#">CSCux24057</a>	Install/upgrade on a specific non-active switch will fail
<a href="#">CSCux25388</a>	Device profiling w/ VLAN override shows incorrect IP information
<a href="#">CSCux28536</a>	Interface stays in down state after link flap on the neighbor
<a href="#">CSCux40358</a>	PIM Auto-RP information lost on device
<a href="#">CSCux52728</a>	Rogue AP auto containment is not working
<a href="#">CSCux66659</a>	Wireless Mobility Multicast: IP config validation issues observed
<a href="#">CSCux78543</a>	Device-tracking database not updated after client moves
<a href="#">CSCux79223</a>	Standalone webauth in multi-domain mode failed
<a href="#">CSCux79855</a>	TPS Server failure in crypto_engine_pk_decrypt breaking https post sso.



Identifier	Description
<a href="#">CSCux91239</a>	Observing SMD crash with secure LDAP
<a href="#">CSCux97364</a>	System crashed on FED@doppler_I3_ucast_ip_stats after bootup
<a href="#">CSCux98348</a>	LACP ping is failing
<a href="#">CSCuy05242</a>	With invalid downloadable ACL in ACS 5.2 server, wireless client joined
<a href="#">CSCuy05272</a>	nginx process restarting when ssl handshakes failing
<a href="#">CSCuy11133</a>	Observing memory leaks with EPM after CoA
<a href="#">CSCuy15931</a>	Critical auth reinitialize on RADIUS alive not working in legacy mode
<a href="#">CSCuy25828</a>	Authentication config. for large scale i/f-range may reset the stack
<a href="#">CSCuy32054</a>	Observing issue with "show access-session" output post SSO
<a href="#">CSCuy30244</a>	60MB increase in WCM USS
<a href="#">CSCuy31137</a>	Eedge critical-auth not working
<a href="#">CSCuy34601</a>	SMD leak@OBJ_MAB_METH_MAC,CWA roam in webauth_pending
<a href="#">CSCuy39925</a>	BLE Beacons, WCM crash, spectrumProcessIDRDataInformation
<a href="#">CSCuy43943</a>	Crash on standby during power_save_client test
<a href="#">CSCuy45574</a>	IOSd crash seen with baseline and webauth roaming
<a href="#">CSCuy48103</a>	Critical-auth not working after switchover
<a href="#">CSCuy49397</a>	Bundling the AP1852E fix with IOS XE Denali 16.1 and 16.2
<a href="#">CSCuy49923</a>	MAB, LEAP, PEAP client join time degradation - 60 seconds
<a href="#">CSCuy54279</a>	Duplicate entries in OBFL CLI chain and error while clearing OBFL log
<a href="#">CSCuy61234</a>	Traceback and crash observed in active switch with dot1x and MAB
<a href="#">CSCuz40711</a>	Wireless configuration lost after 4th switchover

## Resolved Caveats in Cisco IOS XE Denali 16.1.2

Bug ID	Description
<a href="#">CSCuv11888</a>	"no switchport" reapplies Hidden "dot1x supplicant" config
<a href="#">CSCuw41707</a>	QinQ with PAGP, tunnel port err-disabled mode
<a href="#">CSCuw44426</a>	LACP member port got suspend after SSO s/o on PHY 0ee1 intermittently
<a href="#">CSCuw44585</a>	USB console Link not recognized by switch
<a href="#">CSCuw49457</a>	SGT still present for client's STALE state after removing client IP
<a href="#">CSCuw56905</a>	Error msg "FMFP_ACL-3-ACL_OBJECT_DOWNLOAD" seen after SSO
<a href="#">CSCuw71101</a>	CFD CSCul84467:PAGP/LACP port channel issues on bring up/sw intermittely
<a href="#">CSCuw86324</a>	Invalid input error msg seen during boot-up for unsupported SNMP traps
<a href="#">CSCuw89782</a>	WebUI: System UP time does not get displayed in webui
<a href="#">CSCuw91252</a>	Only 10 domain names supported in domain list for FQDN ACL DNS snooping
<a href="#">CSCuw91350</a>	Intermitent issue with FQDN with central web authentication
<a href="#">CSCuw94893</a>	Uplink FRU module hardware authentication fails intermittently

CSCUw99419	WebUI: AAA Radius Server, default value for port numbers to be changed
CSCUx11081	SVI IP assignment using "ip address dhcp" does not work w/ DHCP snooping
CSCUx15917	CTS: Memory leak when PAC/ENV data get refreshed (once in ~24 hrs)
CSCUx24728	Some Cipher suites are missing for HTTPS
CSCUx26399	CWA config: Client gets disconnected when roaming b/w same subnet cntrlr
CSCUx27336	RTU behavior in 16.1.1 is slightly different than IOS-XE 03.07.xx
CSCUx41983	Issue in upgrade or download the switch, when it is in Install mode
CSCUu25580	VTY0-4 settings are modified if switch is accessed via WebUI
CSCUw57306	Wireless: WGB is not getting ip address in export anchor scenario
CSCUw82148	Traceback (__strftime_internal) when executing "sh pl soft fed sw 1 acl"
CSCUw91176	Console messages on boot-up - "dplr_pcie: Enabled MSI returned 0"
CSCUw94595	Tracebacks on bootup at "epm_vlan_name_insert_or_delete" w/200+ VLANs
CSCUw95002	show inventory missing for 2nd power supply when inserted later
CSCUx04001	Mobility Capwap i/f counters not populated - no functionality impact
CSCUx07225	Inaccurate values under show stack-power load-shedding
CSCUx07278	GOLD tests on a Provisioned switch should be Skipped instead of Failed
CSCUx15979	Traffic from hosts in Multi-Host mode is not downloading DACL policy
CSCUx24515	"%Failed to update configuration" message seen on boot-up sometimes
CSCUx24971	WebUI: Configure >Access Points >Radio takes 3 minutes to load
CSCUx29357	WebUI: Not able to access AP CDP neighbor after viewing local profiling

## Resolved Caveats in Cisco IOS XE Denali 16.1.1

All open bugs reported in Cisco IOS XE 3.6.3E and Cisco IOS XE 3.7.2E have been resolved, unless listed out in the Open Caveats section.

## 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 > Switches**. Then choose your product and click **Troubleshoot and Alerts** to find information for the problem that you are experiencing.

## Related Documentation

- Cisco IOS XE Denali 16.1.x documentation at this URL: <http://www.cisco.com/c/en/us/products/ios-nx-os-software/ios-xe/index.html>
- Catalyst 3650 switch documentation at this URL: [http://www.cisco.com/go/cat3650\\_docs](http://www.cisco.com/go/cat3650_docs)

- Error Message Decoder at this URL:  
<https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi>

## 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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