



Release Notes for Catalyst 3650 Series Switch, Cisco IOS XE Denali 16.2.x

First Published: March 2016

Last Updated: September 02, 2016

This release note gives an overview of the features for the Cisco IOS XE Denali 16.2.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

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 and Cisco IOS XE Denali 16.2.x.

- For information about features not supported in Cisco IOS XE Denali 16.2.x, see [Important Notes, page 6](#).
 - For information about important software and hardware restrictions and limitations, see [Limitations and Restrictions, page 56](#).
 - For information about open issues with the software and past opens that are resolved in Cisco IOS XE Denali 16.2.x, see [Caveats, page 57](#).
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Cisco IOS XE Denali 16.2.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.

Whats New in Cisco IOS XE Denali 16.2.2

Hardware Features in Cisco IOS XE Denali 16.2.2

The following Catalyst switch models have been introduced:

Switch Model (License Level)	Description
New in Catalyst 3650 Switches	
WS-C3650-8X24PD-L (LAN Base)	Stackable, 8 100M/1G/2.5G/5G/10G PoE+ downlink ports, 16 10/100/1000 PoE+ downlink ports, 2 10-Gigabit SFP+ uplink ports, 715-W power supply
WS-C3650-8X24PD-S (IP Base)	
WS-C3650-8X24PD-E (IP Services)	
WS-C3650-12X48FD-L (LAN Base)	Stackable, 12 100M/1G/2.5G/5G/10G Full PoE downlink ports, 36 10/100/1000 Full PoE downlink ports, 2 10-Gigabit SFP+ uplink ports, 1100-W power supply
WS-C3650-12X48FD-S (IP Base)	
WS-C3650-12X48FD-E (IP Services)	

Software Features in Cisco IOS XE Denali 16.2.2

Feature Name	Description and License Level Information
In-Place Package Expansion for Software Images	<p>The software image installation process is now optimized:</p> <ul style="list-style-type: none"> 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. The.bin file is automatically deleted after completion of installation. <p>The installation procedure you have to follow remains the same. See Upgrading the Switch Software, page 18</p>
New in Wired Switching	
Resilient Ethernet Protocol (REP)	<p>Support for REP, a Cisco proprietary protocol that provides an alternative to Spanning Tree Protocol (STP) to control network loops, handle link failures, and improve convergence time in ring topologies. REP controls a group of ports connected in a segment, ensures that the segment does not create any bridging loops, and responds to link failures within the segment. REP also supports VLAN load balancing.</p> <p>See Configuring Resilient Ethernet Protocol. (IP Base and IP Services)</p>

Feature Name	Description and License Level Information
New in Wireless Switching	
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>Note 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 16.2.2 are: 3600, 1600, 2600, 3700, 2700, 1700, 702i, 702w, 1552, 1532, 1572.</p>

What's New in Cisco IOS XE Denali 16.2.1

Hardware Features in Cisco IOS XE Denali 16.2.1

The following Catalyst switch models have been introduced:

Switch Model (License Level)	Description
New in Catalyst 3650 Switches	
WS-C3650-24PDM-L (LAN Base) WS-C3650-24PDM-S (IP Base) WS-C3650-24PDM-E (IP Services)	Stackable, 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP uplink ports, two 10-Gigabit SFP+ uplink ports, fixed 640-W power supply
WS-C3650-48FQM-L (LAN Bases) WS-C3650-48FQM-S (IP Base) WS-C3650-48FQM-E (IP Services)	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, fixed 975-W power supply
WS-C3650-8X24UQ-L (LAN Base) WS-C3650-8X24UQ-S (IP Base) WS-C3650-8X24UQ-E (IP Services)	Stackable 8 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 16 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UZ-L (LAN Base) WS-C3650-12X48UZ-S (IP Base) WS-C3650-12X48UZ-E (IP Services)	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, two 40-Gigabit uplink QSFP+ ports, 1100-W power supply

Switch Model (License Level)	Description
WS-C3650-12X48UR-L (LAN Base)	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, eight 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UR-S (IP Base)	
WS-C3650-12X48UR-E (IP Services)	
WS-C3650-12X48UQ-L (LAN Base)	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UQ-S (IP Base)	
WS-C3650-12X48UQ-E (IP Services)	

Software Features in Cisco IOS XE Denali 16.2.1

Feature Name	Description and License Level Information
New in Wired Switching	
Automated Link Aggregation Group (Auto-LAG)	<p>Provides the ability to automatically create EtherChannels on ports connected to a switch.</p> <p>By default, auto-LAG is disabled globally and is enabled on all port interfaces. Auto-LAG applies to a switch only when it is enabled globally.</p> <p>See Configuring EtherChannels.</p> <p>(LAN Base, IP Base and IP Services)</p>
Cisco TrustSec (CTS) Security Group Access Control (SGACL) HA	<p>Support for high availability on switches that support the Cisco StackWise technology. Cisco StackWise provides stateful redundancy and allows the switch stack to enforce and process access control entries.</p> <p>This feature does not require any Cisco TrustSec-specific user configuration.</p> <p>See TrustSec SGACL High Availability.</p> <p>(LAN Base, IP Base, and IP Services)</p>
Gateway Load Balancing Protocol (GLBP) for IPv4	<p>Protects data traffic from a failed router or circuit, like Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP), while allowing packet load sharing between a group of redundant routers.</p> <p>See Configuring GLBP.</p> <p>(IP Base and IP Services)</p>
Link Aggregation Control Protocol (LACP) Fast Rate	<p>Support for the new lACP rate command, to set the rate at which LACP packets are sent to LACP-supported interfaces. You can change the timeout rate from 30 seconds (default rate) to 1 second (fast rate).</p> <p>See the lACP rate command.</p> <p>(LAN Base, IP Base, and IP Services)</p>
Named VLAN	<p>Option to specify a VLAN name for access and voice VLAN.</p> <p>See the switchport access vlan command.</p> <p>(LAN Base, IP Base, and IP Services)</p>

Feature Name	Description and License Level Information
Rapid PVST+ as Default	<p>Rapid PVST+ is now the default spanning-tree mode used on all Ethernet port-based VLANs.</p> <p>See Configuring Spanning Tree Protocol.</p> <p>(LAN Base, IP Base and IP Services)</p>
Source Group Tag (SGT) and Destination Group Tag (DGT) over Flexible NetFlow (FNF)	<p>Support for SGTs and DGTs to be automatically displayed for ingress and egress data, based on the CTS configuration.</p> <p>See Configuring Flexible NetFlow.</p> <p>(IP Base and IP services)</p>
Virtual Router Redundancy Protocol Version 3 (VRRPv3) for IPv4 and IPv6	<p>Enables a group of devices to form a single virtual device, to eliminate the single point of failure, which is inherent to a static default routed environment.</p> <p>See VRRPv3 Protocol Support.</p> <p>(IP Base and IP Services)</p>
Virtual Routing Forwarding (VRF)-Aware Copy Commands	<p>Support for VRF-aware copy commands. You can specify a VRF for copy commands (FTP, TFTP, SCP etc.), when copying files to and from the switch.</p> <p>See Managing Configuration Files.</p> <p>(IP Services)</p>
New in Wireless Switching	
AirTime Fairness (ATF)	<p>Designed to function as wireless QoS, this feature regulates the downlink air-time needed to transmit frames instead of egress bandwidth. The feature allocates air-time autonomously based on the policies implemented. This brings in fairness of time allocated across multiple operators in large deployments.</p> <p>See Configuring AirTime Fairness.</p> <p>(IP Base, IP Services, and AP count)</p>
Bluetooth Low Energy (BLE)	<p>Provides granular location details of devices (Smartphones, or any Bluetooth-enabled device). This helps push context-sensitive advertising and other information to users.</p> <p>See Configuring Bluetooth Low Energy.</p> <p>(IP Base, IP Services, and AP count)</p>

Feature Name	Description and License Level Information
Cisco Hyperlocation	<p>An ultra-precise location solution that helps you track the location of wireless clients with the accuracy of one meter. This is made possible by the HALO module, an external third radio that attaches to the back of your Cisco Aironet 3600 and 3700 access points. This powerful module combines Wi-Fi and Bluetooth Low Energy (BLE) technologies to allow pinpointing beacons, inventory, and personal mobile devices.</p> <p>Cisco Hyperlocation works in conjunction with Cisco Connected Mobile eXperience (CMX). Combining the Cisco Hyperlocation feature on the Cisco wireless controller with a CMX device help you achieve better location accuracy, which can result in delivering more targeted content to users.</p> <p>When you use CMX with Cisco CleanAir frequency scanning, it is simple to locate failed, lost, and even rogue beacons.</p> <p>See Cisco Hyperlocation.</p> <p>(IP Base, IP Services, and AP count)</p>
Mobility Controller (MC) managing Mobility Agent (MA)	<p>Pushes wireless configuration and common configuration from the MC to the MAs. This helps you easily configure, monitor, and troubleshoot all the MAs from the MC.</p> <p>See Configuring Mobility.</p> <p>(LAN Base, IP Base, IP Services and AP count)</p>
New on the Web User Interface (Web UI)	
Features introduced on the Web UI in this release:	<ul style="list-style-type: none"> • Cisco ATF • Cisco Application Visibility for Wired Devices • Cisco Hyperlocation • Cisco Smart Call Home • Software Upgrade • MC Managing MA • BLE

Important Notes

- When using Cisco Prime Infrastructure (PI), you cannot downgrade from Cisco IOS XE Denali 16.2.2 to Cisco IOS XE Denali 16.1.x in install mode. Use bundle mode instead.
- 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 3.7.3E, are not supported in Cisco IOS XE Denali 16.2.x:
 - Cisco Plug-In for OpenFlow (OpenFlow 1.0 and 1.3)

- The following features available in Cisco IOS XE Release 3.7.2E, are not supported in Cisco IOS XE Denali 16.2.x:
 - 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 16.2.x:
 - Cisco Discovery Protocol (CDP) Bypass
- The following features are not supported in Cisco IOS XE Denali 16.2.x:
 - IP-in-IP (IPIP) Tunneling
 - SGACL Logging and SGACL Monitor Mode
 - VRF-Aware SGT
 - 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
 - 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)
- DAI, IPSG Interoperability
- Ingress Strict Priority Queuing (Expedite)
- Weighted Random Early Detect (WRED)
- Improvements in QoS policing rates
- Fast SSID support for guest access WLANs

Supported Hardware

Catalyst 3650 Switch Models

Table 1 **Catalyst 3650 Switch Models**

Switch Model	Cisco IOS Image	Description
WS-C3650-24TS-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
WS-C3650-48TS-L	LAN Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
WS-C3650-24PS-L	LAN Base	Stackable 24 10/100/1000 PoE+ ¹ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
WS-C3650-48PS-L	LAN Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
WS-C3650-48FS-L	LAN Base	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
WS-C3650-24TD-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
WS-C3650-48TD-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
WS-C3650-24PD-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
WS-C3650-48PD-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
WS-C3650-24PDM-L	LAN Base	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP uplink ports, two 10-Gigabit SFP+ uplink ports, Fixed 640-W power supply
WS-C3650-48FD-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
WS-C3650-48FQ-L	LAN Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
WS-C3650-48FQM-L	LAN Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports., Fixed 975-W power supply
WS-C3650-48PQ-L	LAN Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
WS-C3650-48TQ-L	LAN Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply
WS-C3650-8X24UQ-L	LAN Base	Stackable 8 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 16 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SPF+ ports, 1100-W power supply
WS-C3650-8X24PD-L	LAN Base	Stackable, 8 100M/1G/2.5G/5G/10G PoE+ downlink ports, 16 10/100/1000 PoE+ downlink ports, 2 10-Gigabit SFP+ uplink ports, 715-W power supply
WS-C3650-12X48UZ-L	LAN Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, two 40-Gigabit uplink QSFP+ ports, 1100-W power supply

Table 1 Catalyst 3650 Switch Models (continued)

Switch Model	Cisco IOS Image	Description
WS-C3650-12X48UR-L	LAN Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, eight 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UQ-L	LAN Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48FD-L	LAN Base	Stackable, 12 100M/1G/2.5G/5G/10G Full PoE downlink ports, 36 10/100/1000 Full PoE downlink ports, 2 10-Gigabit SFP+ uplink ports, 1100-W power supply
WS-C3650-24TS-S	IP Base	Stackable 24 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
WS-C3650-48TS-S	IP Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
WS-C3650-24PS-S	IP Base	Stackable 24 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
WS-C3650-48PS-S	IP Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
WS-C3650-48FS-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 1-Gigabit SFP uplink ports, 1025-W power supply
WS-C3650-24TD-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
WS-C3650-48TD-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
WS-C3650-24PD-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
WS-C3650-48PD-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
WS-C3650-24PDM-S	IP Base	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP uplink ports, two 10-Gigabit SFP+ uplink ports, Fixed 640-W power supply
WS-C3650-48FD-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

Table 1 Catalyst 3650 Switch Models (continued)

Switch Model	Cisco IOS Image	Description
WS-C3650-48FQ-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
WS-C3650-48FQM-S	IP Base	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, Fixed 975-W power supply
WS-C3650-48PQ-S	IP Base	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
WS-C3650-48TQ-S	IP Base	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply
WS-C3650-8X24UQ-S	IP Base	Stackable 8 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 16 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-8X24PD-S	IP Base	Stackable, 8 100M/1G/2.5G/5G/10G PoE+ downlink ports, 16 10/100/1000 PoE+ downlink ports, 2 10-Gigabit SFP+ uplink ports, 715-W power supply
WS-C3650-12X48UZ-S	IP Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, two 40-Gigabit uplink QSFP+ ports, 1100-W power supply
WS-C3650-12X48UR-S	IP Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, eight 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UQ-S	IP Base	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48FD-S	IP Base	Stackable, 12 100M/1G/2.5G/5G/10G Full PoE downlink ports, 36 10/100/1000 Full PoE downlink ports, 2 10-Gigabit SFP+ uplink ports, 1100-W power supply
WS-C3650-24TS-E	IP Services	Stackable 24 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
WS-C3650-48TS-E	IP Services	Stackable 48 10/100/1000 Ethernet downlink ports, four 1-Gigabit SFP uplink ports, 250-W power supply
WS-C3650-24PS-E	IP Services	Stackable 24 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
WS-C3650-48PS-E	IP Services	Stackable 48 10/100/1000 PoE+ downlink ports, four 1-Gigabit SFP uplink ports, 640-W power supply
WS-C3650-48FS-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, four 1-Gigabit SFP uplink ports, 1025-W power supply
WS-C3650-24TD-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
WS-C3650-48TD-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
WS-C3650-24PD-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
WS-C3650-48PD-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
WS-C3650-24PDM-E	IP Services	Stackable 24 10/100/1000 PoE+ downlink ports, two 1-Gigabit SFP uplink ports, two 10-Gigabit SFP+ uplink ports, Fixed 640-W power supply
WS-C3650-48FD-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
WS-C3650-48FQ-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, 1025-W power supply
WS-C3650-48FQM-E	IP Services	Stackable 48 10/100/1000 Full PoE downlink ports, four 10-Gigabit SFP+ uplink ports, Fixed 975-W power supply
WS-C3650-48PQ-E	IP Services	Stackable 48 10/100/1000 PoE+ downlink ports, four 10-Gigabit SFP+ uplink ports, 640-W power supply
WS-C3650-48TQ-E	IP Services	Stackable 48 10/100/1000 Ethernet downlink ports, four 10-Gigabit SFP+ uplink ports, 250-W power supply
WS-C3650-8X24UQ-E	IP Services	Stackable 8 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 16 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-8X24PD-E	IP Services	Stackable, 8 100M/1G/2.5G/5G/10G PoE+ downlink ports, 16 10/100/1000 PoE+ downlink ports, 2 10-Gigabit SFP+ uplink ports, 715-W power supply

Table 1 *Catalyst 3650 Switch Models (continued)*

Switch Model	Cisco IOS Image	Description
WS-C3650-12X48UZ-E	IP Services	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, two 40-Gigabit uplink QSFP+ ports, 1100-W power supply
WS-C3650-12X48UR-E	IP Services	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, eight 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48UQ-E	IP Services	Stackable 12 100M/1G/2.5G/5G/10G Cisco UPOE™ downlink ports, 36 10/100/1000 Cisco UPOE™ downlink ports, four 10-Gigabit uplink SFP+ ports, 1100-W power supply
WS-C3650-12X48FD-E	IP Services	Stackable, 12 100M/1G/2.5G/5G/10G Full PoE downlink ports, 36 10/100/1000 Full PoE downlink ports, 2 10-Gigabit SFP+ uplink ports, 1100-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

Access Points and Mobility Services Engine

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



Note Telnet is not supported on Cisco 1800 Series APs

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

Access Points	
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

Access Points	
Cisco Aironet 1850 Series	AIR-AP1852I-UXX9
	AIR-AP1852I-UXX910
	AIR-AP1852I-UXX9C
	AIRAP1852I-UXX910C
	AIR-AP1852E-UXX9
	AIR-AP1852E-UXX910
	AIR-AP1852E-UXX9C
	AIRAP1852E-UXX910C
	AIR-AP1852E-x-K9
	AIR-AP1852E-x-K9C
	AIR-AP1852I-x-K9
	AIR-AP1852I-x-K9C
Cisco Aironet 2600 Series	AIR-CAP2602E
	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
Modules Supported: <ul style="list-style-type: none"> • AIR-RM3000AC-x-K9= • AIR-RM3000M= • AIR-RM3010L-x-K9= with AIR-ANT-LOC-01= 	
Cisco Aironet 3700 Series	AIR-CAP3702I
	AIR-CAP3702E
	AIR-CAP3702P
Modules supported: <ul style="list-style-type: none"> • AIR-RM3000M= • AIR-RM3010L-x-K9= with AIR-ANT-LOC-01= 	

Compatibility Matrix

Table 4 lists the software compatibility matrix.

Table 4 Software Compatibility Matrix

Catalyst 3650	Cisco 5700 WLC	Cisco 5508 or WiSM2	MSE/CMX	ISE	ACS	Cisco PI
Denali 16.2.2	03.07.02E 03.06.03E ²	8.1.0, 8.2.0	CMX 10.2.2	1.3 Patch 5 (Wired and Wireless)	5.3 5.4	3.1.0 + Device Pack 1 (Wired and Wireless)
Denali 16.2.1	03.07.03E 03.06.03E ²	8.1.0, 8.2.0	CMX 10.2.2	1.3 Patch 5 (Wired and Wireless)	5.3 5.4	3.1.0 (Wired) 3.1.0, 3.0.2 ¹ + Device Pack 4 + PI 3.0 Technology Pack (Wireless)
Denali 16.1.3	03.07.02E 03.06.03E ²	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 ²	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 ²	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 ³	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 ⁴ 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 ⁵	7.5	1.2	5.2 5.3	2.0

1. The Cisco IOS XE Denali 16.2.1 features are not available with 3.0.2, but 3.0.2 is compatible with Cisco IOS XE Denali 16.2.1.
2. 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
3. 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.
4. If MSE is deployed on your network, we recommend that you upgrade to Cisco Prime Infrastructure 2.1.2.
5. 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 ¹	512 MB ²	256	1024 x 768	Small

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

Software Requirements

- Operating Systems
 - Windows 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 16.2.2	Not applicable	Denali 16.2.2	15.3(3)JPB1
Denali 16.2.1	Not applicable	Denali 16.2.1	15.3(3)JPB
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

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
03.07.01E	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
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

This section covers the following scenarios:

- [Automatic Boot Loader Upgrade](#)
- [Automatic Microcode Upgrade](#)
- [Upgrading from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.x or 16.2.x in Install Mode](#)
- [Upgrading from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.x or 16.2.x in Bundle Mode](#)
- [Upgrading from Cisco IOS XE Denali 16.1.1 to 16.1.x or 16.2.x in Install Mode](#)
- [Upgrading from Cisco IOS XE Denali 16.2.x to Cisco IOS XE 16.x in Install Mode](#)
- [Downgrade from Cisco IOS XE 16.x to Cisco IOS XE 3.xE in Install Mode](#)
- [Downgrade from Cisco IOS XE 16.x to Cisco IOS XE 3.xE in Bundle Mode](#)

- [WCM Sub Package Software Image Upgrade](#)



Note

You cannot use the Web UI to install, upgrade to, or downgrade from Cisco IOS XE Denali 16.1.x and 16.2.1.

Table 7 Software Images

Release	Image	File Name
Cisco IOS XE Denali 16.2.2	Universal	cat3k_caa-universalk9.16.02.02.SPA.bin
	Universal without DTLS	cat3k_caa-universalk9ldpe.16.02.02.SPA.bin
Cisco IOS XE Denali 16.2.1	Universal	cat3k_caa-universalk9.16.02.01.SPA.bin
	Universal without DTLS	cat3k_caa-universalk9ldpe.16.02.01.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.x 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 upgrade from any prior IOS 3.xE release to an IOS XE 16.x release for the first time, the 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.



Caution

Do not power cycle your switch during the upgrade.

Scenario	Automatic Boot Loader Response
<p>If you boot Cisco IOS XE Denali 16.2.x for the first time</p>	<p>The boot loader is upgraded to version 3.56. For example:</p> <pre>switch: version BOOTLDR: CAT3K_CAA Boot Loader (CAT3K_CAA-HBOOT-M) Version 3.56, RELEASE SOFTWARE (P)</pre> <p>During the automatic boot loader upgrade while booting Cisco IOS XE Denali 16.2.1, you will see the following on the console:</p> <pre>%IOSXEBOOT-Thu-###: (rp/0): Mar 24 18:18:10 Universal 2016 PLEASE DO NOT POWER CYCLE ### BOOT LOADER UPGRADING %IOSXEBOOT-loader-boot: (rp/0): upgrade successful</pre>
<p>If you boot Cisco IOS XE Denali 16.1.1 for the first time</p>	<p>The boot loader is upgraded to version 3.2. For example:</p> <pre>BOOTLDR: CAT3K_CAA Boot Loader (CAT3K_CAA-HBOOT-M) Version 3.2, RELEASE SOFTWARE (P)</pre> <p>During the automatic boot loader upgrade while booting Cisco IOS XE Denali 16.1.1, you will see the following on the console:</p> <pre>%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</pre>

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...rwRrrrrrrw..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.x or 16.2.x in Install Mode

Follow these instructions to upgrade from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.x or 16.2.x 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 22](#).

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.


```

Removed cat3k_caa-iosd-universalk9.SPA.152-3.E3.pkg
Removed cat3k_caa-platform.SPA.03.07.03E.pkg
Removed cat3k_caa-wcm.SPA.10.3.130.0.pkg
[4]: Old files list:
Removed cat3k_caa-base.SPA.03.07.03E.pkg
Removed cat3k_caa-drivers.SPA.03.07.03E.pkg
Removed cat3k_caa-infra.SPA.03.07.03E.pkg
Removed cat3k_caa-iosd-universalk9.SPA.152-3.E3.pkg
Removed cat3k_caa-platform.SPA.03.07.03E.pkg
Removed cat3k_caa-wcm.SPA.10.3.130.0.pkg
[1]: New files list:
Added cat3k_caa-rpbase.16.02.01.SPA.pkg
Added cat3k_caa-rpcore.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
[2]: New files list:
Added cat3k_caa-rpbase.16.02.01.SPA.pkg
Added cat3k_caa-rpcore.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
[3]: New files list:
Added cat3k_caa-rpbase.16.02.01.SPA.pkg
Added cat3k_caa-rpcore.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
[4]: New files list:
Added cat3k_caa-rpbase.16.02.01.SPA.pkg
Added cat3k_caa-rpcore.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
[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
Switch#

```



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 16.2.1, RELEASE SOFTWARE (fc1)
```

```
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Sun 27-Mar-16 01:22 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-universalk9.16.02.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.02.01.SPA.bin]?
Delete flash:/cat3k_caa-universalk9.16.02.01.SPA.bin? [confirm]
Switch#
```

Upgrading from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.x or 16.2.x in Bundle Mode

Follow these instructions to upgrade from Cisco IOS XE 3.xE to Cisco IOS XE Denali 16.1.x or 16.2.x 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
```


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 that your boot variable is configured to. If not, you can manually boot flash:

```
cat3k_caa-universalk9.16.02.01.SPA.bin
```

```
switch:boot flash:cat3k_caa-universalk9.16.02.01.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 16.2.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Sun 27-Mar-16 01:22 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-universalk9.16.02.01.SPA.bin flash:
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):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!O!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!
[OK - 465466221 bytes]

465466221 bytes copied in 109.461 secs (4252348 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-universalk9.16.02.01.SPA.bin auto-copy
[1]: Copying flash:cat3k_caa-universalk9.16.02.01.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.

- Step 17** 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: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, 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) 1986-2016 by Cisco Systems, Inc.
Compiled Sun 27-Mar-16 01:22 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-universalk9.16.02.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.02.01.SPA.bin]?
Delete flash:/cat3k_caa-universalk9.16.02.01.SPA.bin? [confirm]
Switch#
```

Upgrading from Cisco IOS XE Denali 16.1.1 to 16.1.x or 16.2.x in Install Mode

Follow these instructions to upgrade from Cisco IOS XE Denali 16.1.1 to Cisco IOS XE Denali 16.1.x or 16.2.x 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-universalk9.16.02.01.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 - 465466221 bytes]

465466221 bytes copied in 118.175 secs (3938788 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:/

 7759  -rw-   465466221  Mar 28 2016 04:35:43 +00:00
cat3k_caa-universalk9.16.02.01.SPA.bin
1621966848 bytes total (598597632 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 Cisco IOS XE Denali 16.1.2 or Cisco IOS XE Denali 16.2.x. (There are packaging changes in Cisco IOS XE Denali 16.1.2 and Cisco IOS XE Denali 16.2.x.)
 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-universalk9.16.02.01.SPA.bin

```

```
[1]: Copying flash:cat3k_caa-universalk9.16.02.01.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.
[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.16.02.01.SPA.pkg
  Added cat3k_caa-rpcore.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.16.01.01E.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.16.02.01.SPA.pkg
  Added cat3k_caa-rpcore.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.16.01.01E.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.16.02.01.SPA.pkg
  Added cat3k_caa-rpcore.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.16.01.01E.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.16.02.01.SPA.pkg
  Added cat3k_caa-rpcore.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]
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  Mar 27 2016 22:15:50 +00:00
cat3k_caa-rpbase.16.01.01E.SPA.pkg
 7748 -rw-    7197312  Mar 27 2016 22:15:51 +00:00
cat3k_caa-srdriver.16.01.01E.SPA.pkg
 7749 -rw-   166767220  Mar 27 2016 22:15:51 +00:00  cat3k_caa-wcm.16.01.01E.SPA.pkg
 7750 -rw-   14631548  Mar 27 2016 22:15:51 +00:00
cat3k_caa-webui.16.01.01E.SPA.pkg
 7761 -rw-   21906269  Mar 28 2016 04:45:48 +00:00
cat3k_caa-rpbase.16.02.01.SPA.pkg
 7765 -rw-   253160056  Mar 28 2016 04:45:50 +00:00
cat3k_caa-rpcore.16.02.01.SPA.pkg
 7763 -rw-    7328384  Mar 28 2016 04:45:49 +00:00
cat3k_caa-srdriver.16.02.01.SPA.pkg
 7762 -rw-   165657204  Mar 28 2016 04:45:49 +00:00  cat3k_caa-wcm.16.02.01.SPA.pkg
 7764 -rw-   17408636  Mar 28 2016 04:45:49 +00:00  cat3k_caa-webui.16.02.01.SPA.pkg
1621966848 bytes total (132620288 bytes free)
Switch#

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

Directory of flash:/

 7768 -rw-      5017  Mar 28 2016 04:47:14 +00:00  packages.conf
 7766 -rw-      5017  Mar 28 2016 04:46:47 +00:00
cat3k_caa-universalk9.16.02.01.SPA.conf
1621966848 bytes total (132620288 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-universalk9.16.02.01.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 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 16.2.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Sun 27-Mar-16 01:22 by mcpre
```

Upgrading from Cisco IOS XE Denali 16.2.x to Cisco IOS XE 16.x in Install Mode

Follow these instructions to upgrade from Cisco IOS XE Denali 16.2.x 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 ...
packages.conf
File is in use, will not delete.
cat3k_caa-rpbase.16.02.01.SPA.pkg
File is in use, will not delete.
cat3k_caa-rpcore.16.02.01.SPA.pkg
File is in use, will not delete.
cat3k_caa-srdriver.16.02.01.SPA.pkg
File is in use, will not delete.
```

```
cat3k_caa-wcm.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.02.01.SPA.pkg
  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 ...
packages.conf
  File is in use, will not delete.
cat3k_caa-rpbase.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-rpcore.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.02.01.SPA.pkg
  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 ...
packages.conf
  File is in use, will not delete.
cat3k_caa-rpbase.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-rpcore.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.02.01.SPA.pkg
  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.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-rpcore.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-srdriver.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-wcm.16.02.01.SPA.pkg
  File is in use, will not delete.
cat3k_caa-webui.16.02.01.SPA.pkg
  File is in use, will not delete.
done.

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

```
Switch#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-universalk9.16.03.01.SPA.bin
flash:cat3k_caa-universalk9.16.03.01.SPA.bin
Destination filename [cat3k_caa-universalk9.16.03.01.SPA.bin]?
Accessing tftp://5.28.11.250/cat3k_caa-universalk9.16.03.01.SPA.bin...
Loading cat3k_caa-universalk9.16.03.01.SPA.bin from 5.28.11.250 (via
GigabitEthernet0/0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 465466221 bytes]

465466221 bytes copied in 118.175 secs (3938788 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:/

 7759 -rw- 465466221 Mar 28 2016 04:35:43 +00:00
cat3k_caa-universalk9.16.03.01.SPA.bin
1621966848 bytes total (598597632 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-universalk9.16.03.01.SPA.bin auto-copy
Expanding image file: flash:cat3k_caa-universalk9.16.03.01.SPA.bin
[1]: Copying flash:cat3k_caa-universalk9.16.03.01.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.
[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.16.02.01.SPA.pkg
Removed cat3k_caa-rpcore.16.02.01.SPA.pkg
Removed cat3k_caa-srdriver.16.02.01.SPA.pkg
```

```

Removed cat3k_caa-wcm.16.02.01.SPA.pkg
Removed cat3k_caa-webui.16.02.01.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.03.01.SPA.pkg
  Added cat3k_caa-rpcore.16.03.01.SPA.pkg
  Added cat3k_caa-srdriver.16.03.01.SPA.pkg
  Added cat3k_caa-wcm.16.03.01.SPA.pkg
  Added cat3k_caa-webui.16.03.01.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.16.02.01.SPA.pkg
  Removed cat3k_caa-rpcore.16.02.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.02.01.SPA.pkg
  Removed cat3k_caa-wcm.16.02.01.SPA.pkg
  Removed cat3k_caa-webui.16.02.01.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.03.01.SPA.pkg
  Added cat3k_caa-rpcore.16.03.01.SPA.pkg
  Added cat3k_caa-srdriver.16.03.01.SPA.pkg
  Added cat3k_caa-wcm.16.03.01.SPA.pkg
  Added cat3k_caa-webui.16.03.01.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.16.02.01.SPA.pkg
  Removed cat3k_caa-rpcore.16.02.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.02.01.SPA.pkg
  Removed cat3k_caa-wcm.16.02.01.SPA.pkg
  Removed cat3k_caa-webui.16.02.01.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.03.01.SPA.pkg
  Added cat3k_caa-rpcore.16.03.01.SPA.pkg
  Added cat3k_caa-srdriver.16.03.01.SPA.pkg
  Added cat3k_caa-wcm.16.03.01.SPA.pkg
  Added cat3k_caa-webui.16.03.01.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.16.02.01.SPA.pkg
  Removed cat3k_caa-rpcore.16.02.01.SPA.pkg
  Removed cat3k_caa-srdriver.16.02.01.SPA.pkg
  Removed cat3k_caa-wcm.16.02.01.SPA.pkg
  Removed cat3k_caa-webui.16.02.01.SPA.pkg
New files list:
  Added cat3k_caa-rpbase.16.03.01.SPA.pkg
  Added cat3k_caa-rpcore.16.03.01.SPA.pkg
  Added cat3k_caa-srdriver.16.03.01.SPA.pkg
  Added cat3k_caa-wcm.16.03.01.SPA A.pkg
  Added cat3k_caa-webui.16.03.01.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]
```

```
Switch#
```



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:/

 7749 -rw-      21902119  Mar 28 2016 06:09:38 +00:00
cat3k_caa-rpbase.16.03.01.SPA.pkg
 7761 -rw-      21906269  Mar 28 2016 04:45:48 +00:00
cat3k_caa-rpbase.16.02.01.SPA.pkg
 7765 -rw-      253160056  Mar 28 2016 04:45:50 +00:00
cat3k_caa-rpcore.16.02.01.SPA.pkg
 7763 -rw-        7328384  Mar 28 2016 04:45:49 +00:00
cat3k_caa-srdriver.16.02.01.SPA.pkg
 7762 -rw-      165657204  Mar 28 2016 04:45:49 +00:00  cat3k_caa-wcm.16.02.01.SPA.pkg
 7764 -rw-      17408636  Mar 28 2016 04:45:49 +00:00  cat3k_caa-webui.16.02.01.SPA.pkg
 7760 -rw-      253094520  Mar 28 2016 06:09:41 +00:00
cat3k_caa-rpcore.16.03.01.SPA.pkg
 7755 -rw-        7326336  Mar 28 2016 06:09:39 +00:00
cat3k_caa-srdriver.16.03.01.SPA.pkg
 7750 -rw-      165667444  Mar 28 2016 06:09:39 +00:00  cat3k_caa-wcm.16.03.01.SPA.pkg
 7759 -rw-      16829052  Mar 28 2016 06:09:39 +00:00  cat3k_caa-webui.16.03.01.SPA.pkg
1621966848 bytes total (137928704 bytes free)
Switch#

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

Directory of flash:/

 7766 -rw-         5137  Mar 28 2016 06:10:39 +00:00
cat3k_caa-universalk9.16.03.01.SPA.conf
 7769 -rw-         5125  Mar 28 2016 06:11:19 +00:00  packages.conf
1621966848 bytes total (137928704 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-universalk9.16.03.01.SPA.bin
Delete filename [cat3k_caa-universalk9.16.03.01.SPA.bin]?
Delete flash:/ cat3k_caa-universalk9.16.03.01.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 16.3.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Thu 19-Nov-16 22:49 by mcpre
```

Downgrade from Cisco IOS XE 16.x to Cisco IOS XE 3.xE in Install Mode

Follow these instructions to downgrade from Cisco IOS XE 16.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
```


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 Denali 16.x releases.

Downgrade from Cisco IOS XE 16.x to Cisco IOS XE 3.xE in Bundle Mode

Follow these instructions to downgrade from Cisco IOS XE 16.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 XE 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#
```


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 all IP Base features plus full Layer 3 routing (IP unicast routing, IP multicast routing, and fallback bridging for only IP traffic). 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

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	16.2.1
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
Laptops	
Intel 4965	13.4
Intel 5100/5300	14.3.2.1
Intel 6200	15.15.0.1
Intel 6300	15.16.0.2
Intel 6205	15.16.0.2
Intel 1000/1030	14.3.0.6
Intel 8260	18.32.0.5
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
Tablets	
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)
Apple iPad Pro	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 nd Gen	Android 5.0
Phones	
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)

Table 10 **Client Types**

Apple iPhone 5	iOS 9.2(13C75)
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
Google 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
Xiaomi Mi 4i	Android 5.0.2
Microsoft Lumia 950 XL	Windows 10

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

- ATF configuration is not pushed from the MC to the MA when in Centralized mode in Cisco IOS XE Denali 16.2.1 release. This issue is being tracked with CSCuy16948.
- 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.
- 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

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

- [Cisco Bug Search Tool](#), page 57
- [Open Caveats in Cisco IOS XE Denali 16.2.1](#), page 58
- [Resolved Caveats in Cisco IOS XE Denali 16.2.2](#), page 59
- [Resolved Caveats in Cisco IOS XE Denali 16.2.1](#), page 61

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:

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 16.2.1

The following are the open caveats in Cisco IOS XE Denali 16.2.x. Click on the identifier to view the details of a caveat in the BST.

Identifier	Description
CSCuz76184	During REP ring failure, duplicate packets may be seen for a short time.
CSCva34131	Intermittent REP multicast traffic packet drops with REP enabled
CSCuu38981	Crash observed on high rates of roam @ fman_qos_mark_aom_free
CSCuy75068	System traceback while Smart Call Home debugs turned on
CSCuy79779	AP flaps for 30 minutes upon changing AP mode after SSO
CSCuw94595	Tracebacks on bootup at "\"epm_vlan_name_insert_or_delete\" w/200+ VLANs
CSCux09139	LANBase with "\"vlan template\" does not work - use "\"advanced template\""
CSCuy32871	WS-C3850-48XS:'sh inventory FRU' lists fan even after removal/failure
CSCuy34177	Need 5508 to support sleeping client as single Anchor with Cat3850/3650
CSCuy34341	AP flapping during switch over on 3650 stack
CSCuw38877	Static IGMP join-group on VLAN interface is not reachable
CSCux63677	IOSXE_INFRA-6-PROCPATH_CLIENT_HOG: message when trunk going down
CSCuy37439	Etherchannel port member in suspended state
CSCuy37456	PoE removed on high priority ports on graceful load shed event
CSCuy39207	PI: voice diagnostics SNMP GET not working
CSCuy64901	SMD crash on active switch, maroon malloc related
CSCux02676	IGMP input memory leaks seen on Mcast RVR join/leave, 10 groups continuously
CSCuv76000	Missing load-balancing details in "\"show int < port > etherchannel\""
CSCuz65251	All the UP interfaces displayed as DOWN after wr erase and reload
CSCuy21301	Port coming directly under chassis in CAT3850 s/w version 03.06.03.E
CSCuz11169	Reduced memory usage during bootup - Cat3650/3850
CSCuz12475	Forwarding mgr RP crash occurs with bgp_pic profile
CSCuz20613	IOS-XE: Shell license bypass via LXC (2)
CSCuz48487	Catalyst 3850 drops MacSec traffic
CSCuz88340	AN: ULA is configured on ANI & same ANI used for multiple neighbors
CSCuz72243	Loopback on 3650 corrupts SSH and console access

Resolved Caveats in Cisco IOS XE Denali 16.2.2

The following is the list of caveats that were open in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.1 and are resolved in Cisco IOS XE Denali 16.2.2. Click on the identifier to view the details of a caveat in the BST.

Identifier	Description
CSCuz96860	Client create on same IF_ID may lead to fman fp crash at wlclient_def
CSCva17300	REP Multicast traffic does not resume after neighbor switch reloaded
CSCuz91060	REP: Poor convergence when EC REP port on ingress node
CSCsv05154	Cisco IOS HTTP server vulnerable to CSRF attacks
CSCut87285	MAC address being learned on an individual port-channel member interface
CSCuv71876	Hardware counters update for mcast traffic on SVI interface on Cat3850
CSCuw49406	"no ip routing protocol purge interface" delete with reload
CSCux16194	Cat3650 does not change to link down on removing SFP Tx cable
CSCux28874	EAPOL M5 retransmissions do not increment replay counter
CSCux39186	Improper output for the OIR of SFP/SFP+
CSCux40358	PIM Auto-RP information lost on device
CSCuy37701	Account termination cause displayed is incorrect
CSCuy63412	During bootup, traceback seen at osapibin
CSCuy67349	3650/3850 IPv6 ND RAGUARD drops RS packets (ICMPv6 type 133)
CSCuz26115	HFL packet not sent after topology change because of "rep preempt" cmd
CSCuz28908	Add 'show software authenticity running' to 'show tech'
CSCuz60623	"snmp-server enable traps transceiver all" is recorded twice
CSCuz63410	VLAN DHCP failed state is not marked as yes
CSCuz65463	Storm-control is not working after Cat3850 reload
CSCuz81646	3850 stack REP "non-operational" - because neighbor mismatch detected
CSCuz91590	Cat3850 FED crash when removing "match vlan x" under class-map
CSCuy15191	BUILTIN_AUTOCONF_POLICY Configs are removed when you undo policy config.
CSCuy80248	Boot up fails and IOSd held down is seen if auth is configured >70 ports
CSCuy79465	In certain scale scenarios Prime was Unable to modify TP threshold
CSCux29685	WebUI: UI issue in the WLAN create wizard
CSCuy81151	ATF functionality intermittently fails when stack is reloaded
CSCux00255	Flash-MIB not displaying some object values correctly
CSCux33536	Show Version shows "Denali 16.1.1E" instead of "Denali 16.1.1"
CSCux07426	Default duplex for 100x is shown as half for 3850-1G and 2x10G uplink
CSCux46926	PnP-mgmt interf doesn't get IP w/ autoinstall; use "ip address dhcp"
CSCux24515	"%Failed to update configuration" message seen on boot-up sometimes
CSCuw33039	IP-SGT bind should not be seen for link-local IPv6 as client authorizes

Identifier	Description
CSCUv75864	Error message on reload: “ WDT device closes unexpectedly”
CSCU184467	C3850:Stack:Port-Channel:active mem switch power shut causes traffic loss
CSCUr17429	SNMP: IEEE8023-LAG-MIB does not work on the switch.
CSCUy19562	3850/3650 intercepts telnet/ssh connections for unknown destinations
CSCUy81008	IP directed-broadcast does not broadcast CIP packets onto local subnet
CSCUw69829	WebUI: Not able to contain rogue AP's using webUI
CSCUw97308	WebUI: Unable to apply IPv6 access list on physical interface
CSCUy12760	'show inventory' cmd does not show the stack cable
CSCUy16820	'show SUDI' cmd: Unsupported for c3850/c3650 switches
CSCUy16544	Hw module breakout CLI doesn't work on c3850-24XU & c3850-12XS switches
CSCUw08909	After reload, reapply the service policy for the traffic policer to work
CSCU19598	L2 COS output marking policy does not take effect until del/add
CSCUy87829	Memory leak at QoS WPM node
CSCUx24728	Some Cipher suites are missing for HTTPS
CSCUq63532	Virtual hostname mapping not working for global parameter map
CSCUy92775	16.2.1 to 3.6.x/3.7.x downgrade fails when file is on a remote switch
CSCUx24057	Install/upgrade on a specific non-active switch will fail
CSCUx35552	Error on editing RogueRule on user configured SSID
CSCUu25580	VTY0-4 settings are modified if switch is accessed via WebUI
CSCUw15272	PNP: non-vlan 1 zero-touch upgrade does not work
CSCUy51956	AAA server moves to DEAD state even though CTS server is ALIVE
CSCUy06768	Secure LDAP with wired 1k dot1x sessions may reload the system
CSCUx52728	Rogue AP auto containment is not working
CSCUy24630	Not able to open webauth page in client with IPv6 address
CSCUy47917	Frwrng mgr failed to send NACK back upon client creation
CSCUx09478	sh proc mem platform sorted output is incorrect with low free memory
CSCUx15679	Dynamic SGT with VRF not being mapped under VRF SGT mapping table
CSCUx60447	1K scale: few dot1x sessions missing on standby switch; use SSO
CSCUy25828	Authentication config. for large scale i/f-range may reset the stack
CSCUy73209	Client association failed in native-profiling test
CSCUy85838	Clients stuck 'Method status list: empty' after SSO->shut/no shut helps
CSCUx26381	Match based on username fails for dot1x client with Native Profile WLAN
CSCUy04948	Reauth timer running for unauthorized case
CSCUy21768	Session fails authz after few vlans in group brought down and up
CSCUy64839	SMD crash on active switch during bootstrap
CSCUy79579	SMD leak while testing CWA disconnect&reauth
CSCUy61234	Traceback and crash observed in active switch with dot1x and MAB

Identifier	Description
CSCuy91141	Failure in verifying exp RA traces in ctrlr
CSCuy70285	Perennial traceback after SSO and some windows client not able to rejoin
CSCuy75151	Toggle DTLS followed by AP joins could result into standby crash
CSCux26399	CWA config: Client gets disconnected when roaming b/w same subnet cntrlr
CSCuy40283	c3850 RRM TPC - txpower unchanged on MC for 2.4GHz
CSCuy42327	New domain lists do not get updated in the show access-session details
CSCux77357	Stuck session with 0 Mac 0 IP not removed from admission cache output
CSCuy63743	WCM crash after enabling wireless and DBM trace
CSCux25388	Device profiling w/ VLAN override shows incorrect IP information
CSCuy73892	Not able to enable Rogue Rules through GUI
CSCuy66674	AP Sub Mode not shown for APs associated to ios devices

Resolved Caveats in Cisco IOS XE Denali 16.2.1

The following open caveats from Cisco IOS XE Denali 16.1.x are resolved in Cisco IOS XE Denali 16.2.1. Click on the identifier to view the details of a caveat in the BST.

Identifier	Description
CSCux96093	SMD crash when processing framed-netmask attribute from radius
CSCuw98808	Empty VLAN ACL sequence with no match causes STP issues
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"
CSCux05946	sh ver shows ROM as "Power Failure" even on regular reload
CSCuw44585	USB console Link not recognized by switch
CSCux15110	"show proc cpu" showing ASR1000 processes on 3850
CSCux07278	GOLD tests on a Provisioned switch should be Skipped instead of Failed
CSCuw83228	Switch does not retain diagnostic config changes after save and reload
CSCuw91252	Only 10 domain names supported in domain list for FQDN ACL DNS snooping
CSCux48405	SMD crash when all-zeros MAC is received
CSCux15979	Traffic from hosts in Multi-Host mode is not downloading DACL policy
CSCux96301	"% failed to initialize nvram" upon booting with default config
CSCus49022	Active switch crashes on changing STP mode from RSTP to PVST w/ 128vlans
CSCux71386	After clear counters is issued, the Xmit-err shows a very huge number
CSCuw01854	Higher MST convergence times in scaled setups (with 4K VLANs, 16K VPs)
CSCuw94814	IEEE8023-LAG-MIB does not work use CISCO-LAG-MIB
CSCuw86324	Invalid input error msg seen during boot-up for unsupported SNMP traps
CSCuw44426	LACP member port got suspend after SSO s/o on PHY 0ee1 intermittently
CSCux74815	LACP traffic not prioritized over link resulting in channel down

Identifier	Description
CSCUw56706	LACP with 16 ports: after switchover, ports in H state change to D state
CSCUw41707	QinQ with PAgP, tunnel port err-disabled mode
CSCUx85425	show platform hardware fed switch x vlan on member causes reload
CSCUx63710	SPANTREE_VLAN_SW-2-MAX_INSTANCE message logged every time link comes up
CSCUy11775	sh platform software fed switch x vlan prints incorrect l3if handle
CSCUx27336	RTU behavior in 16.1.1 is slightly different than IOS-XE 03.07.xx
CSCUx25383	Passwords still encrypted after encryption key is removed
CSCUw94893	Uplink FRU module hardware authentication fails intermittently
CSCUv11888	"no switchport" reapplies Hidden "dot1x supplicant" config
CSCUx11081	SVI IP assignment using "ip address dhcp" does not work w/ DHCP snooping
CSCUx07225	Inaccurate values under show stack-power load-shedding
CSCUx71689	'?' character allowed on PSK via config file upload and CLI
CSCUw99419	WebUI: AAA Radius Server, default value for port numbers to be changed
CSCUw69672	WebUI: ACL - "any" option for mask not disabled when it is not supported
CSCUx24971	WebUI: Configure>Access Points>Radio takes 3 minutes to load
CSCUx23861	WebUI: Few scenarios - refreshing issue related to AP with 11AC module
CSCUw89782	WebUI: System UP time does not get displayed in webui
CSCUx82444	3650 Upgrade to Denali causes ports 25-32 to fail
CSCUx62751	Memory leak seen @ dup_classmap_runtime
CSCUy46011	Software rollback fails between 16.1.1 and 16.1.2/16.2.1
CSCUx04001	Mobility Capwap i/f counters not populated - no functionality impact
CSCUx35423	TACACS mgmt over wireless not working
CSCUx22276	vlan pooling-static ip client is not passing traffic for wireless dot1x
CSCUw77872	CTS Untrusted Port with SGT not updated by SISF for IP-SGT
CSCUv47300	CTS: In loopback interface, config of IP SGT map should not be allowed
CSCUw49457	SGT still present for client's STALE state after removing client IP
CSCUx89701	CFD QMUL: session comes up after port-security violation
CSCUy15931	Critical auth reinitialize on RADIUS alive not working in legacy mode
CSCUy11133	Observing memory leaks with EPM after CoA
CSCUy05242	With invalid downloadable ACL in ACS 5.2 server, wireless client joined
CSCUw79758	Duplicate IP detected in Windows 7/8 clients with "tracking" enabled
CSCUy05272	nginx process restarting when ssl handshakes failing
CSCUw57306	Wireless: WGB is not getting ip address in export anchor scenario
CSCUw90085	No version of parameter-map cmd allowed when active session exists
CSCUx41983	Issue in upgrade or download the switch, when it is in Install mode
CSCUx83436	Observing issue with show dot1x all count
CSCUw71101	CFD CSCul84467:PAGP/LACP port channel issues on bring up/sw intermittely

Identifier	Description
CSCuw56905	Error msg "FMFP_ACL-3-ACL_OBJECT_DOWNLOAD" seen after SSO
CSCux29357	WebUI: Not able to access AP CDP neighbor after viewing local profiling
CSCux15917	CTS: Memory leak when PAC/ENV data get refreshed (once in ~24 hrs)
CSCuw95002	show inventory missing for 2nd power supply when inserted later
CSCuw91350	Intermittent issue with FQDN with central web authentication
CSCuw63309	CFD: CSCus98694 Throttling of AAA RADIUS Records is not working

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

Obtaining Documentation and Submitting a Service Request

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