Release Notes for Cisco ASR 9000 Series Aggregation Services Routers for Cisco IOS XR Software Release 4.2.3

NCS 6000 Series Router Key Features [Infographic]

Cisco IOS XR Software is a distributed operating system designed for continuous system operation combined with service flexibility and higher performance.

Note For information on Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3, see the Features Supported on the Cisco ASR 9000 Series Aggregation Services Router, on page 51 section.

These release notes describe the features provided on the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 and are updated as needed.

For a list of software caveats that apply to the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3, see the Caveats, on page 55 section. The caveats are updated for every release and are described at http://www.cisco.com.

Cisco IOS XR Software running on the Cisco ASR 9000 Series Router provides the following features and benefits:

- **IP and Routing—**This supports a wide range of IPv4 and IPv6 services and routing protocols such as Border Gateway Protocol (BGP), Routing Information Protocol (RIPv2), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), IP Multicast, Routing Policy Language (RPL), Hot Standby Router Protocol (HSRP), and Virtual Router Redundancy Protocol (VRRP) features.
- **Ethernet Services—**The following Ethernet features are supported:
  - Ethernet Virtual Connections (EVCs)
  - Flexible VLAN classification
  - Flexible VLAN translation
  - IEEE bridging
  - IEEE 802.1s Multiple Spanning Tree (MST)

  - MST Access Gateway
  - L2VPN
  - Virtual Private LAN Services (VPLS), Hierarchical VPLS (H-VPLS), Virtual Private Wire Service (VPWS), Ethernet over MPLS (EoMPLS), pseudo wire redundancy, and multi segment pseudo wire stitching.

- **BGP Prefix Independent Convergence—**This provides the ability to converge BGP routes within sub seconds instead of multiple seconds. The Forwarding Information Base (FIB) is updated, independent of a prefix, to converge multiple 100K BGP routes with the occurrence of a single failure. This convergence is applicable to both core and edge failures and with or without MPLS. This fast convergence innovation is unique to Cisco IOS XR Software.
- **Multiprotocol Label Switching (MPLS)—**This supports MPLS protocols, including Traffic Engineering (TE) [including TE-FRR and TW Preferred Path], Resource Reservation Protocol (RSVP), Label Distribution Protocol (LDP), Targeted LDP (T-LDP), Differentiated Services (DiffServ)-aware traffic engineering, and Layer 3 Virtual Private Network (L3VPN).
- **Multicast—**This provides comprehensive IP Multicast software including Source Specific Multicast (SSM) and Protocol Independent Multicast (PIM) in Sparse Mode only. The Cisco ASR 9000 Series Aggregation Services Router also supports Auto-Rendezvous Point (AutoRP), Multiprotocol BGP (MBGP), Multicast Source Discovery Protocol (MSDP), Internet Group Management Protocol Versions 2 and 3 (IGMPv2 and v3), and IGMPv2 and v3 snooping.
- **Quality of Service (QOS)—**This supports QoS mechanisms including policing, marking, queuing, random and hard traffic dropping, and shaping. Additionally, Cisco IOS XR supports modular QoS command-line interface (MQC). MQC is used to configure various QoS features on various Cisco platforms, including the Cisco ASR 9000 Series Aggregation Services Router. Supports the following:
  - Class-Based Weighted Fair Queuing (CBWFQ)
  - Weighted Random Early Detection (WRED)
  - Priority Queuing with propagation
  - 2-rate 3-color (2R3C) Policing
  - Modular QoS CLI (MQC)
  - 4-level Hierarchical-QoS
  - Shared Policy Instances
- **Manageability—**This provides industry-standard management interfaces including modular command-line interface (CLI), Simple Network Management Protocol (SNMP), and native Extensible Markup Language (XML) interfaces. Includes a comprehensive set of Syslog messages.
- **Security—**This provides comprehensive network security features including Layer 2 and Layer 3 access control lists (ACLs); routing authentications; Authentication, Authorization, and Accounting (AAA)/Terminal Access Controller Access Control System (TACACS+), Secure Shell (SSH), Management Plane Protection (MPP) for management plane security, and Simple Network Management Protocol version3 (SNMPv3). Control plane protections integrated into line card Application-Specific Integrated Circuits (ASICs) include Generalized TTL Security Mechanism (GTSM), RFC 3682, and Dynamic Control Plane Protection (DCPP).

- **Availability—**This supports rich availability features such as fault containment, fault tolerance, fast switchover, link aggregation, nonstop routing for ISIS, LDP and OSPF, and nonstop forwarding (NSF).
- **Enhanced core competencies:**
  - IP fast convergence with Fast Reroute (FRR) support for Intermediate System-to-Intermediate System (IS-IS)
  - IP fast convergence with Fast Reroute (FRR) support for Open Shortest Path First (OSPF)
  - Path Computation Element (PCE) capability for traffic engineering

System Requirements

This section describes the system requirements for Cisco ASR 9000 Series Aggregation Services Router Software Release 4.2.3.

To determine the software versions or levels of your current system, see the Determining Your Software Version section.

Feature Set Table

The Cisco ASR 9000 Series Aggregation Services Router Software is packaged in *feature sets* (also called *software images*). Each feature set contains a specific set of Cisco ASR 9000 Series Aggregation Services Router Software Release 4.2.3 features.

This table lists the Cisco ASR 9000 Series Aggregation Services Router Software feature set matrix (PIE files) and associated filenames available for the Release 4.2.3 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 1: Cisco IOS XR Software Release 4.2.3 PIE Files

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-p.pie-4.2.3	Contains the required core packages, including OS, Admin, Base, Forwarding, Forwarding Processor Card 40G, FPD, Routing, SNMP Agent, Diagnostic Utilities, and Alarm Correlation.
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-p.vm-4.2.3	Contains the required core packages including OS, Admin, Base, Forwarding, Forwarding Processor Card 40G, FPD, Routing, SNMP Agent, Diagnostic Utilities, and Alarm Correlation.
Optional Individual Packages (Packages are installed individually)		
Cisco IOS XR Manageability Package	asr9k-mgbl-p.pie-4.2.3	Common Object Request Broker Architecture (CORBA) agent, Extensible Markup Language (XML) Parser, and HTTP server packages. This PIE also contains some SNMP MIB infrastructure. Certain MIBs won't work if this PIE is not installed.
Cisco IOS XR MPLS Package	asr9k-mpls-p.pie-4.2.3	MPLS Traffic Engineering (MPLS-TE), Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI), Resource Reservation Protocol (RSVP), and Layer-3 VPN.

Cisco IOS XR Multicast Package	asr9k-mcast-p.pie-4.2.3	Multicast Routing Protocols (PIM, Multicast Source Discovery Protocol [MSDP], Internet Group Management Protocol [IGMP], Auto-RP), Tools (SAP, MTrace), and Infrastructure [(Multicast Routing Information Base [MRIB], Multicast-Unicast RIB [MURIB], Multicast forwarding [MFWD]), and Bidirectional Protocol Independent Multicast (BIDIR-PIM).
Cisco IOS XR Security Package	asr9k-k9sec-p-pie-4.2.3	Support for Encryption, Decryption, Secure Shell (SSH) and Secure Socket Layer (SSL)
Cisco IOS XR Advanced Video Package	asr9k-video-p.pie-4.2.3	Firmware for the advanced video feature for Cisco ASR 9000 Series Aggregation Services Router chassis.
Cisco IOS XR Optics Package	asr9k-optic-p.pie-4.2.3	Firmware for the optics feature for Cisco ASR 9000 Series Aggregation Services Router chassis.
Cisco IOS XR Upgrade Package	asr9k-upgrade-p.pie-4.2.3	Firmware for the upgrade feature for Cisco ASR 9000 Series Aggregation Services Router chassis.
Cisco IOS XR Documentation Package	asr9k-doc-p.pie-4.2.3	.man pages for Cisco IOS XR software on the Cisco ASR 9000 Aggregation Services Router chassis.
Cisco IOS XR Services Package	asr9k-services-p.pie-4.2.3	Includes binaries to support CGv6 on ISM.
Cisco IOS XR Satellite Package	asr9k-asr9000v-nV-p.pie-4.2.3	Includes Satellite software images.

Table 2: Cisco IOS XR Software Release 4.2.3 PX PIE Files, on page 5 lists the Cisco ASR 9000 Series Aggregation Services Router Software feature set matrix (PX PIE files) and associated filenames available for the Release 4.2.3 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 2: Cisco IOS XR Software Release 4.2.3 PX PIE Files

Feature Set	Filename	Description

Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-px.pie-4.2.3	Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation.
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-px.vm-4.2.3	Contains the required core packages including OS, Admin, Base, Forwarding, Forwarding Processor Card 40G, FPD, Routing, SNMP Agent, Diagnostic Utilities, and Alarm Correlation.
Optional Individual Packages (Packages are installed individually)		
Cisco IOS XR Manageability Package	asr9k-mgbl-px.pie-4.2.3	CORBA2 agent, XML3 Parser, and HTTP server packages. This PIE also contains some SNMP MIB infrastructure. Certain MIBs won't work if this PIE is not installed.
Cisco IOS XR MPLS Package	asr9k-mpls-px.pie-4.2.3	MPLS Traffic Engineering (MPLS-TE), Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI), Resource Reservation Protocol (RSVP), and Layer-3 VPN.
Cisco IOS XR Multicast Package	asr9k-mcast-px.pie-4.2.3	Multicast Routing Protocols (PIM, Multicast Source Discovery Protocol [MSDP], Internet Group Management Protocol [IGMP], Auto-RP), Tools (SAP, MTrace), and Infrastructure [(Multicast Routing Information Base [MRIB], Multicast-Unicast RIB [MURIB], Multicast forwarding [MFWD]), and Bidirectional Protocol Independent Multicast (BIDIR-PIM).

Cisco IOS XR Security Package	asr9k-k9sec-px.pie-4.2.3	Support for Encryption, Decryption, IP Security (IPSec), Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI) (Software based IPSec support—maximum of 500 tunnels)
Cisco IOS XR Advanced Video Package	asr9k-video-px.pie-4.2.3	Firmware for the advanced video feature for Cisco ASR 9000 Series Router chassis.
Cisco IOS XR Optics Package	asr9k-optic-px.pie-4.2.3	Firmware for the optics feature for Cisco ASR 9000 Series Aggregation Services Router Chassis. It enables Transport / OTN feature under interfaces.
Cisco IOS XR FPD Package	asr9k-fpd-px.pie-4.2.3	Firmware pie for all LC and RSP FPGA's and ASIC's.
Cisco IOS XR Documentation Package	asr9k-doc-px.pie-4.2.3	.man pages for Cisco IOS XR Software on the Cisco ASR 9000 Series Aggregation Services Router Chassis.
Cisco IOS XR Services Package	asr9k-services-px.pie-4.2.3	Includes binaries to support CGv6 on ISM.
Cisco IOS XR Satellite Package	asr9000v-nV-px.pie-4.2.3	Includes Satellite software images.

Caution A P image should be loaded only on RSP-2. PX PIE image files should be loaded only on RSP-440 and ASR-9922-RP.

Table 3: Cisco IOS XR Software Release 4.2.3 TAR Files, on page 8 lists the Cisco ASR 9000 Series Aggregation Services Router TAR files.

Table 3: Cisco IOS XR Software Release 4.2.3 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software	ASR9K-iosxr-p-4.2.3.tar	• Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR FPD Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR Advanced Video Package • Cisco IOS XR Optics Package • Cisco IOS XR Upgrade Package • Cisco IOS XR Documentation Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software 3DES	ASR9K-iosxr-p-k9-4.2.3.tar	• Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR Security Package • Cisco IOS XR FPD Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR Advanced Video Package • Cisco IOS XR Optics Package • Cisco IOS XR Upgrade Package • Cisco IOS XR Documentation Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP440 systems]	ASR9K-iosxr-px-4.2.3.tar	• Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR FPD Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR Advanced Video Package • Cisco IOS XR Optics Package • Cisco IOS XR Upgrade Package • Cisco IOS XR Documentation Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software 3DES [for RSP440 systems]	ASR9K-iosxr-px-k9-4.2.3.tar	• Cisco IOS XR IP Unicast Routing Core Bundle • Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR Multicast Package • Cisco IOS XR Security Package • Cisco IOS XR FPD Package • Cisco IOS XR Diagnostic Package • Cisco IOS XR Advanced Video Package • Cisco IOS XR Optics Package • Cisco IOS XR Upgrade Package • Cisco IOS XR Documentation Package

Memory Requirements

Caution If you remove the media in which the software image or configuration is stored, the router may become unstable and fail.

The minimum memory requirements for Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 consist of the following:

- minimum 6-GB memory on the RSP-440 and ASR9922 RP [A9K-RSP-4G and A9K-RSP-8G is 4-GB]
- maximum 12-GB memory on the RSP-440 and ASR9922 RP [A9K-RSP-4G and A9K-RSP-8G is 4-GB]
- minimum 2-GB compact flash on route switch processors (RSPs)
- minimum 4-GB memory on the line cards (LCs)

These minimum memory requirements are met with the base board design.

The supported ASR9K low memory and high memory RSP card PIDs are :

Description	PID	Release
ASR 9922 Route Processor 6GB for Packet Transport	ASR-9922-RP-TR	Release 4.2.2
ASR 9922 Route Processor 12GB for Service Edge	ASR-9922-RP-SE	Release 4.2.2
ASR9001 Route Switch Processor 8GB	—	Release 4.2.1
ASR9K Route Switch Processor with 440G/slot Fabric and 6GB	A9K-RSP440-TR	Release 4.2.0
ASR9K Route Switch Processor with 440G/slot Fabric and 12GB	A9K-RSP440-SE	Release 4.2.0
ASR9K Fabric, Controller 4G memory	A9K-RSP-4G	Release 3.7.2
Route Switch Processor 8G Memory	A9K-RSP-8G	Release 3.7.2
ASR 9900 Route Processor 12GB for Service Edge	ASR-9900-RP-SE	Release 4.3.2
ASR 9900 Route Processor 6GB for Packet Transport	ASR-9900-RP-TR	Release 4.3.2

RSP Memory Upgrade

This section describes the process to upgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a small memory model ASR-9922-RP-TR RSP card to a large memory model ASR-9922-RP-SE RSP card.

The upgrade sequence is as follows:

Procedure

Step 1 Remove the standby small memory (ASR-9922-RP-TR) RSP card.

Step 2 Insert the large memory (ASR-9922-RP-SE) RSP card.

Step 3 Boot up the large memory (ASR-9922-RP-SE) RSP card so that it comes up as standby.

Step 4 Failover from the active small memory (ASR-9922-RP-TR) RSP card to the standby large memory (ASR-9922-RP-SE) RSP card.

Step 5 Remove the standby small memory (ASR-9922-RP-TR) RSP card.

Step 6 Insert the second large memory (ASR-9922-RP-SE) RSP card. Boot up this second large memory (ASR-9922-RP-SE) RSP card so that it comes up as standby.

Upgrading from A9K-RSP440-TR to A9K-RSP440-SE RSP

The process to upgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a small memory model A9K-RSP440-TR RSP card to a large memory model A9K-RSP440-SE RSP card is as follows:

Procedure

Step 1 Remove the standby small memory A9K-RSP440-TR RSP card.

Step 2 Insert the large memory A9K-RSP440-SE RSP card.

Step 3 Boot up the large memory A9K-RSP440-SE RSP card so that it comes up as standby.

Step 4 Failover from the active small memory A9K-RSP440-TR RSP card to the standby large memory A9K-RSP440-SE RSP card.

Step 5 Remove the standby small memory A9K-RSP440-TR RSP card.

Step 6 Insert the second large memory A9K-RSP440-SE RSP card. Boot up this second large memory A9K-RSP440-SE RSP card so that it comes up as standby.

Upgrading from A9K-RSP-4G RSP to A9K-RSP-8G RSP

The process to upgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a small memory model A9K-RSP-4G RSP card to a large memory model A9K-RSP-8G RSP card is as follows:

Procedure

Step 1 Remove the standby small memory A9K-RSP-4G RSP card.

Step 2 Insert the large memory A9K-RSP-8G RSP card.

Step 3 Boot up the large memory A9K-RSP-8G RSP card so that it comes up as standby.

Step 4 Failover from the active small memoryA9K-RSP-4G RSP card to the standby large memory A9K-RSP-8G RSP card.

Step 5 Remove the standby small memoryA9K-RSP-4G RSP card.

Step 6 Insert the second large memory A9K-RSP-8G RSP card. Boot up this second large memory A9K-RSP-8G RSP card so that it comes up as standby.

RSP Memory Downgrade

This section describes the process to downgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a large memory model ASR-9922-RP-SE RSP card to a small memory model ASR-9922-RP-TR RSP card.

Caution Before attempting an RSP memory downgrade, measure the memory consumption of the current system configuration using the large memory model ASR-9922-RP-SE RSP card. You need to ensure that the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 is still able to run the system configuration using the small memory model ASR-9922-RP-TR RSP card.

The RSP memory downgrade sequence is as follows:

Procedure

Step 1 Verify that the memory consumption on the active large memory model (ASR-9922-RP-SE) RSP card can fit within the memory constraints of the small memory model (ASR-9922-RP-TR) RSP card.

Step 2 Remove the standby large memory model (ASR-9922-RP-SE) RSP card.

Step 3 Insert the small memory model (ASR-9922-RP-TR) RSP card. The system does not boot up the small memory model (ASR-9922-RP-TR) RSP card by default. Send user command to boot up the small memory model (ASR-9922-RP-TR) RSP card as standby.

Step 4 Failover from the active large memory model (ASR-9922-RP-SE) RSP card to the standby small memory model (ASR-9922-RP-TR) RSP card.

Step 5 Remove the standby large memory model (ASR-9922-RP-SE) RSP card.

Step 6 Insert the small memory model (ASR-9922-RP-TR) RSP card. Boot up this second small memory model (ASR-9922-RP-TR) RSP card as standby.

Downgrading from A9K-RSP440-SE to A9K-RSP440-TR

The process to downgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a large memory model A9K-RSP440-SE RSP card to a small memory model A9K-RSP440-TR RSP card is as follows:

Procedure

Step 1 Verify that the memory consumption on the active large memory model A9K-RSP440-SE RSP card can fit within the memory constraints of the small memory model A9K-RSP440-TR RSP card.

Step 2 Remove the standby large memory model A9K-RSP440-SE RSP card.

Step 3 Insert the small memory model A9K-RSP440-TR RSP card. The system does not boot up the small memory model A9K-RSP440-TR RSP card by default. Send user command to boot up the small memory model A9K-RSP440-TR RSP card as standby.

Step 4 Failover from the active large memory model A9K-RSP440-SE RSP card to the standby small memory model A9K-RSP440-TR RSP card.

Step 5 Remove the standby large memory model A9K-RSP440-SE RSP card.

Step 6 Insert the small memory model A9K-RSP440-TR RSP card. Boot up this second small memory model A9K-RSP440-TR RSP card as standby.

Downgrading from A9K-RSP-8G to A9K-RSP-4G

The process to downgrade the Cisco ASR 9000 Series Aggregation Services Router running Cisco IOS XR Software Release 4.2.3 from a large memory model A9K-RSP-8G RSP card to a small memory model A9K-RSP-4G RSP card is as follows:

Procedure

Step 1 Verify that the memory consumption on the active large memory model A9K-RSP-8G RSP card can fit within the memory constraints of the small memory model A9K-RSP-4G RSP card.

Step 2 Remove the standby large memory model A9K-RSP-8G RSP card.

Step 3 Insert the small memory model A9K-RSP-4G RSP card. The system does not boot up the small memory model A9K-RSP-4G RSP card by default. Send user command to boot up the small memory model A9K-RSP-4G RSP card as standby.

Step 4 Failover from the active large memory model A9K-RSP-8G RSP card to the standby small memory model A9K-RSP-4G RSP card.

Step 5 Remove the standby large memory model A9K-RSP-8G RSP card.

Step 6 Insert the small memory model A9K-RSP-4G RSP card. Boot up this second small memory model A9K-RSP-4G RSP card as standby.

Supported Hardware

Cisco IOS XR Software Release 4.2.3 supports Cisco ASR 9000 Series Aggregation Services Routers.

All hardware features are supported on Cisco IOS XR Software, subject to the memory requirements specified in the "Memory Requirements, on page 11" section.

The following tables lists the supported hardware components on the Cisco ASR 9000 Series Router and the minimum required software versions. For more information, see the Firmware Support section.

Table 4: Cisco ASR 9000 Series Aggregation Services Router Supported Hardware and Minimum Software Requirements

Component	Part Number	Support from Version
Cisco ASR 9000 Series Aggregation Services Router 22-Slot		
Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot AC Chassis w/ PEM V2	ASR-9922-AC	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot DC Chassis w/ PEM V2	ASR-9922-DC	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory Kit with grounding locks, guide rails etc	ASR-9922-ACC-KIT	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory - Cover for Power Shelves and Modules	ASR-9922-PWR-COV	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Reflector	ASR-9922-AIRREF	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory - Door (with lock) and Fan Tray Covers	ASR-9922-DOOR	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Fan Tray	ASR-9922-FAN	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Center	ASR-9922-FLTR-CEN	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Left & Right	ASR-9922-FLTR-LR	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor Filler	ASR-9922-RP-FILR	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 12GB for Service Edge	ASR-9922-RP-SE	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 6GB for Packet Transport	ASR-9922-RP-TR	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card Slot Filler	ASR-9922-SFC-FILR	Release 4.2.2

Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card/110G	ASR-9922-SFC110	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 2-RU		
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Route Processor	—	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Fan Tray	ASR-9001-FAN	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Line Card	ASR-9001-LC	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router	ASR-9001-TRAY	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router 6-Slot		
Cisco ASR 9000 Series Aggregation Services Router 6-Slot System	ASR-9006	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	ASR-9006-FAN	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Door Kit	ASR-9006-DOOR	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot AC Chassis	ASR-9006-AC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot DC Chassis	ASR-9006-DC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air		
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air Filter	ASR-9006-FILTER	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot		
Cisco ASR 9000 Series Aggregation Services Router 10-Slot System	ASR-9010	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray	ASR-9010-FAN	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Door Kit	ASR-9010-DOOR	Release 3.7.2

Cisco ASR 9000 Series Aggregation Services Router 10-Slot AC Chassis	ASR-9010-AC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot DC Chassis	ASR-9010-DC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 2 Post Mounting Kit	ASR-9010-2P-KIT	Release 3.7.2
Cisco ASR 9000 Series Aggregration Services Router 4 Post Mounting Kit	ASR-9010-2P-KIT	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air		
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Filter	ASR-9010-FILTER	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot External Exhaust Air Shaper	ASR-9010-AIRSHPR	NA
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Inlet Grill	ASR-9010-GRL	NA
Cisco ASR 9000 Series Aggregation Services Router Power		
Cisco ASR 9000 Series Aggregation Services Router 2KW DC Power Module, version 2	A9K-2KW-DC-V2	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 3KW AC Power Module, version 2	A9K-3KW-AC-V2	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router AC Power Entry Module Version 2	A9K-AC-PEM-V2	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router DC Power Entry Module Version 2	A9K-DC-PEM-V2	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router Power Entry Module Version 2 Filler	A9K-PEM-V2-FILR	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 1.5kW DC Power Module	A9K-1.5KW-DC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 2kW DC Power Module	A9K-2KW-DC	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 3kW AC Power Module	A9K-3KW-AC	Release 3.7.2

Cisco ASR 9000 Series Aggregation Services Router Line Cards		
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Service Edge Optimized	A9K-1X100GE-SE	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Packet Transport Optimized	A9K-1X100GE-TR	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Service Edge Optimized	A9K-36X10GE-SE	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Packet Transport Optimized LC	A9K-36X10GE-TR	Release 4.2.2
Cisco ASR 9000 Series Aggregation Services Router 2-Port Ten Gigabit Ethernet + Cisco ASR 9000 Series Aggregation Services Router 20-Port Gigabit Ethernet, Medium Queue	A9K-2T20GE-B	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 2-Port Ten Gigabit Ethernet + Cisco ASR 9000 Series Aggregation Services Router 20-Port Gigabit Ethernet, High Queue	A9K-2T20GE-E	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet, Medium Queue	A9K-4T-B	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet Extended Line Card, High Queue	A9K-4T-E	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet, Low Queue	A9K-4T-L	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, 80G Line Rate Extended Line Card, Medium Queue	A9K-8T-B	Release 4.0.1
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, 80G Line Rate Extended Line Card, High Queue	A9K-8T-E	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, 80G Line Rate Extended Line Card, Low Queue	A9K-8T-L	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, Medium Queue	A9K-8T/4-B	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten GE DX Extended Line Card, High Queue	A9K-8T/4-E	Release 3.7.2

Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, Low Queue	A9K-8T/4-L	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router 16-Port Ten Gigabit Ethernet, Medium Queue	A9K-4T-B	Release 4.0.1
Cisco ASR 9000 Series Aggregation Services Router 40-Port Ten Gigabit Ethernet, Medium Queue	A9K-40GE-B	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 40-Port Ten Gigabit Ethernet, High Queue	A9K-40GE-E	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router 40-Port Ten Gigabit Ethernet, Low Queue	A9K-40GE-L	Release 3.9.0
Cisco ASR 9000 Series Aggregation Services Router Line Card Filler	A9K-LC-FILR	Release 3.7.2
ISM (Integrated Service Module) Line Card	A9K-ISM-100	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 2-Port Hundred Gigabit Ethernet, Service Edge Optimized	A9K-2X100GE-SE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 2-Port Hundred Gigabit Ethernet, Packet Transport Optimized	A9K-2X100GE-TR	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 24-Port Ten Gigabit Ethernet, Service Edge Optimized	A9K-24X10GE-SE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 24-Port Ten Gigabit Ethernet, Packet Transport Optimized	A9K-24X10GE-TR	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router Modular Line Cards		
Cisco ASR 9000 Series Aggregation Services Router 80 Gig Modular Line Card, Service Edge Optimized	A9K-MOD80-SE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 80 Gig Modular Line Card, Packet Transport Optimized	A9K-MOD80-TR	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 160 Gig Modular Line Card, Service Edge Optimized	A9K-MOD160-SE	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router 160 Gig Modular Line Card, Packet Transport Optimized	A9K-MOD160-TR	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router Modular Port Adapters (MPAs)		
Cisco ASR 9000 Series Aggregation Services Router 1-port 40GE Modular Port Adapter	A9K-MPA-1X40GE	Release 4.2.3

Cisco ASR 9000 Series Aggregation Services Router 4-port 10GE Modular Port Adapter	A9K-MPA-4X10GE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 20-port 1GE Modular Port Adapter	A9K-MPA-20X1GE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router 2-port 10GE Modular Port Adapter	A9K-MPA-2X10GE	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-port 40GE Modular Port Adapter	A9K-MPA-2X40GE	Release 4.2.1
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor Cards		
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor, 4G Memory	A9K-RSP-4G	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor, 8G Memory	A9K-RSP-8G	Release 4.0.1
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor Filler	ASR-9000-RSP-FILR	Release 3.7.2
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Service Edge Optimized	A9K-RSP-440-SE	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Packet Transport Optimized	A9K-RSP-440-TR	Release 4.2.0
Cisco ASR 9000 Series Aggregation Services Router SIP and SPA Cards		
Cisco ASR 9000 SIP-700 SPA interface processor	A9K-SIP-700	Release 3.9.0
2-Port Channelized OC-12/DS0 SPA	SPA-2XCHOC12/DS0	Release 3.9.0
1-Port Channelized OC48/STM16 DS3 SPA	SPA-1XCHOC48/DS3	Release 4.0.1
2-Port OC-48/STM16 SPA	SPA-2XOC48POS/RPR	Release 4.0.1
8-Port OC12/STM4 SPA	SPA-8XOC12-POS	Release 4.0.1
1-Port OC-192/STM-64 POS/RPR SPA	SPA-OC192POS-XFP	Release 4.0.1
4-Port Clear Channel T3/E3 SPA	SPA-4XT3E3	Release 4.0.1
2-Port Clear Channel T3/E3 SPA	SPA-2XT3E3	Release 4.0.1
1-Port Channelized OC-3/STM-1 SPA	SPA-1XCHSTM1/OC3	Release 4.0.1

4-Port OC-3/STM-1 POS SPA	SPA-4XOC3	Release 4.0.1
8-Port OC-3/STM-1 POS SPA	SPA-8XOC3	Release 4.0.1
4-Port Channelized T3 to DS0 SPA	SPA-4XCT3/DS0	Release 4.1.0
8-Port Channelized T1/E1 SPA	SPA-8XCHT1/E1	Release 4.1.0
1-Port and 3-Port Clear Channel OC-3 ATM SPA	SPA-1/3XOC3ATM	Release 4.2.0
1-Port Clear Channel OC-12 ATM SPA	SPA-1XOC12ATM	Release 4.2.0
1-Port Channelized OC-3 ATM CEoP SPA	SPA-1XOC3-CE-ATM	Release 4.2.0

Software Compatibility

Cisco IOS XR Software Release 4.2.3 is compatible with the following Cisco ASR 9000 Series Aggregation Services Router systems.

- Cisco ASR 9000 Series Aggregation Services Router 6-Slot Line Card Chassis
- Cisco ASR 9000 Series Aggregation Services Router 10-Slot Line Card Chassis
- Cisco ASR 9000 Series Aggregation Services Router 22-Slot Line Card Chassis
- Cisco ASR 9000 Series Aggregation Services Router ASR-9001 Chassis

Table 5: Cisco ASR 9000 Series Aggregation Services Router Supported Software Licenses

Software License	Part Number
Cisco ASR 9000 Series Aggregation Services Router iVRF License	A9K-IVRF-LIC
Cisco ASR 9000 Series Aggregation Services Router Per Chassis Advanced Video License	A9K-ADV-VIDEO-LIC
Cisco ASR 9000 Series Aggregation Services Router Per Line Card Advanced Optical License	A9K-ADV-OPTIC-LIC
Cisco ASR 9000 Series Aggregation Services Router L3VPN License, Medium Queue and Low Queue Line Cards	A9K-AIP-LIC-B
Cisco ASR 9000 Series Aggregation Services Router L3VPN License, High Queue Line Cards	A9K-AIP-LIC-E

Note that error messages may display if features run without the appropriate licenses installed. For example, when creating or configuring VRF, if the A9K-IVRF-LIC license is not installed before creating a VRF, the following message displays:

```
RP/0/RSP0/CPU0:router#LC/0/0/CPU0:Dec 15 17:57:53.653 : rsi_agent[247]:
%LICENSE-ASR9K_LICENSE-2-INFRA_VRF_NEEDED : 5 VRF(s) are configured without license
A9K-iVRF-LIC in violation of the Software Right To Use Agreement. This feature may be
disabled by the system without the appropriate license. Contact Cisco to purchase the
license immediately to avoid potential service interruption.
```

For Cisco license support, please contact your Cisco Sales Representative or Customer Service at 800-553-NETS (6387) or 408-526-4000. For questions on the program other than ordering, please send e-mail to: cwm-license@cisco.com.

Cisco ASR 9000 Series Aggregation Services Router Right-To-Use (RTU) Licensing

Here are on-line locations of the Cisco ASR 9000 Series Aggregation Services Router Right-To-Use (RTU) licensing docs:
http://www.cisco.com/en/US/docs/routers/asr9000/hardware/Prodlicense/A9k-AIP-LIC-B.html

http://www.cisco.com/en/US/docs/routers/asr9000/hardware/Prodlicense/A9k-AIP-LIC-E.html

Note Layer 3 VPNs are only to be used after you have purchased a license. Cisco will enforce the RTU of L3VPNs in follow on releases. You should contact Cisco, or check the release notes for the follow on release before upgrading for directions on how to install the license as part of the upgrade - otherwise the L3VPN feature may be affected.

The activation of VRF capability still requires the use of the appropriate per line card license (A9K-IVRF-LIC / A9K-AIP-LIC-B / A9K-AIP-LIC-E). Please contact your sales representative for more details.

Firmware Support

To check the firmware code supported by the Cisco ASR 9000 Series Router, run the **show fpd package** command in admin mode.

Note In upgrading from Release 3.7.3 or earlier releases, you may be expected to do a one-time FPD upgrade for any firmware images that may have changed since the last release. Refer to the documents at http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html for upgrade instructions.

```
RP/0/RSP0/CPU0:router(admin)#show install active summary
Wed Sep 26 15:27:05.917 PDT
Default Profile:
  SDRs:
    Owner
  Active Packages:
    disk0:asr9k-services-p-px-4.2.3
    disk0:asr9k-9000v-nV-px-4.2.3
    disk0:asr9k-video-px-4.2.3
    disk0:asr9k-optic-px-4.2.3
    disk0:asr9k-mini-px-4.2.3
```

```
    disk0:asr9k-doc-px-4.2.3
    disk0:asr9k-k9sec-px-4.2.3
    disk0:asr9k-mpls-px-4.2.3
    disk0:asr9k-mgbl-px-4.2.3
    disk0:asr9k-mcast-px-4.2.3
    disk0:asr9k-fpd-px-4.2.3

RP/0/RSP0/CPU0:router(admin)#show fpd package
Wed Sep 26 15:27:17.812 PDT

=============================== ================================================
                                        Field Programmable Device Package
                                ================================================
                                                                SW     Min Req   Min Req
Card Type            FPD Description            Type Subtype   Version   SW Ver    HW Vers
==================== ========================== ==== ======= =========== ======== =========
A9K-40GE-B           Can Bus Ctrl (CBC) LC2     lc   cbc         2.03        0.00       0.1

                     CPUCtrl LC2                lc   cpld1       1.00        0.00       0.1

                     PHYCtrl LC2                lc   cpld2       0.06        0.00       0.1

                     PortCtrl LC2               lc   fpga2       0.10        0.00       0.1

                     Bridge LC2                 lc   fpga1       0.44        0.00       0.1

                     ROMMONB LC2                lc   rommon      1.05        0.00       0.1

------------------------------------------------------------------------------------------
A9K-4T-B             Can Bus Ctrl (CBC) LC2     lc   cbc         2.03        0.00       0.1

                     CPUCtrl LC2                lc   cpld1       1.00        0.00       0.1

                     PHYCtrl LC2                lc   cpld2       0.08        0.00       0.1

                     LCClkCtrl LC2              lc   cpld3       0.03        0.00       0.1

                     PortCtrl LC2               lc   fpga2       0.10        0.00       0.1

                     PHY LC2                    lc   fpga3      14.44        0.00       0.1

                     Bridge LC2                 lc   fpga1       0.44        0.00       0.1

                     ROMMONB LC2                lc   rommon      1.05        0.00       0.1

------------------------------------------------------------------------------------------
A9K-8T/4-B           Can Bus Ctrl (CBC) LC2     lc   cbc         2.03        0.00       0.1

                     CPUCtrl LC2                lc   cpld1       1.00        0.00       0.1

                     PHYCtrl LC2                lc   cpld2       0.08        0.00       0.1

                     LCClkCtrl LC2              lc   cpld3       0.03        0.00       0.1

                     PortCtrl LC2               lc   fpga2       0.10        0.00       0.1

                     PHY LC2                    lc   fpga3      14.44        0.00       0.1

                     Bridge LC2                 lc   fpga1       0.44        0.00       0.1

                     ROMMONB LC2                lc   rommon      1.05        0.00       0.1

------------------------------------------------------------------------------------------
A9K-2T20GE-B         Can Bus Ctrl (CBC) LC2     lc   cbc         2.03        0.00       0.1

                     CPUCtrl LC2                lc   cpld1       1.00        0.00       0.1

                     PHYCtrl LC2                lc   cpld2       0.11        0.00       0.1

                     LCClkCtrl LC2              lc   cpld3       0.10        0.00       0.1

                     PortCtrl LC2               lc   fpga2       0.16        0.00       0.1
```

	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-40GE-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.06	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-4T-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-8T/4-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	PHY LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-2T20GE-E	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.11	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.10	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.16	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-8T-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.07	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1

	LCClkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-16T/8-B	Can Bus Ctrl (CBC) LC3	lc	cbc	6.08	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCClkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-8T-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.07	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-16T/8-E	Can Bus Ctrl (CBC) LC3	lc	cbc	6.08	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCClkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-40GE-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.06	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1

	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-4T-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Serdes Upgrade LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-8T/4-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.03	0.00	0.1
	PortCtrl LC2	lc	fpga2	0.10	0.00	0.1
	Serdes Upgrade LC2	lc	fpga3	14.44	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-2T20GE-L	Can Bus Ctrl (CBC) LC2	lc	cbc	2.03	0.00	0.1
	CPUCtrl LC2	lc	cpld1	1.00	0.00	0.1
	PHYCtrl LC2	lc	cpld2	0.11	0.00	0.1
	LCClkCtrl LC2	lc	cpld3	0.10	0.00	0.1
	Tomcat LC2	lc	fpga2	0.16	0.00	0.1
	Bridge LC2	lc	fpga1	0.44	0.00	0.1
	ROMMONB LC2	lc	rommon	1.05	0.00	0.1
A9K-8T-L	Can Bus Ctrl (CBC) LC3	lc	cbc	6.07	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1
	PHYCtrl LC3	lc	cpld2	0.08	0.00	0.1
	LCClkCtrl LC3	lc	cpld3	0.03	0.00	0.1
	CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.11	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-16T/8-L	Can Bus Ctrl (CBC) LC3	lc	cbc	6.08	0.00	0.1
	CPUCtrl LC3	lc	cpld1	1.02	0.00	0.1

	PHYCtrl LC3	lc	cpld2	0.04	0.00	0.1
	LCClkCtrl LC3	lc	cpld3	0.01	0.00	0.1
	DB CPUCtrl LC3	lc	cpld4	1.03	0.00	0.1
	PortCtrl LC3	lc	fpga2	0.01	0.00	0.1
	Raven LC3	lc	fpga1	1.03	0.00	0.1
	ROMMONB LC3	lc	rommon	1.03	0.00	0.1
A9K-SIP-700	Can Bus Ctrl (CBC) LC5	lc	cbc	3.06	0.00	0.1
	CPUCtrl LC5	lc	cpld1	0.15	0.00	0.1
	QFPCPUBridge LC5	lc	fpga2	5.14	0.00	0.1
	NPUXBarBridge LC5	lc	fpga1	0.23	0.00	0.1
	ROMMONB LC5	lc	rommon	1.04	0.00	0.1
A9K-SIP-500	Can Bus Ctrl (CBC) LC5	lc	cbc	3.06	0.00	0.1
	CPUCtrl LC5	lc	cpld1	0.15	0.00	0.1
	QFPCPUBridge LC5	lc	fpga2	5.14	0.00	0.1
	NPUXBarBridge LC5	lc	fpga1	0.23	0.00	0.1
	ROMMONB LC5	lc	rommon	1.04	0.00	0.1
A9K-RSP-2G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.03	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1
	IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
	ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
	UTI RSP2	lc	fpga4	3.08	0.00	0.1
	PUNT RSP2	lc	fpga1	1.05	0.00	0.1
	HSBI RSP2	lc	hsbi	4.00	0.00	0.1
	ROMMONB RSP2	lc	rommon	1.06	0.00	0.1
A9K-RSP-4G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.03	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1
	IntCtrl RSP2	lc	fpga2	1.15	0.00	0.1
	ClkCtrl RSP2	lc	fpga3	1.23	0.00	0.1
	UTI RSP2	lc	fpga4	3.08	0.00	0.1
	PUNT RSP2	lc	fpga1	1.05	0.00	0.1
	HSBI RSP2	lc	hsbi	4.00	0.00	0.1
	ROMMONB RSP2	lc	rommon	1.06	0.00	0.1
A9K-RSP-8G	Can Bus Ctrl (CBC) RSP2	lc	cbc	1.03	0.00	0.1
	CPUCtrl RSP2	lc	cpld2	1.18	0.00	0.1

```
                    IntCtrl RSP2              lc   fpga2       1.15        0.00       0.1
                    ClkCtrl RSP2              lc   fpga3       1.23        0.00       0.1
                    UTI RSP2                  lc   fpga4       3.08        0.00       0.1
                    PUNT RSP2                 lc   fpga1       1.05        0.00       0.1
                    HSBI RSP2                 lc   hsbi        4.00        0.00       0.1
                    ROMMONB RSP2              lc   rommon      1.06        0.00       0.1
--------------------------------------------------------------------------------------------
A9K-RSP440-TR       Can Bus Ctrl (CBC) RSP3   lc   cbc        16.115       0.00       0.1
                    ClockCtrl0 RSP3           lc   fpga2       1.06        0.00       0.1
                    UTI RSP3                  lc   fpga3       4.09        0.00       0.1
                    CPUCtrl RSP3              lc   fpga1       0.09        0.00       0.1
                    ROMMONB RSP3              lc   rommon      0.62        0.00       0.1
--------------------------------------------------------------------------------------------
A9K-RSP440-SE       Can Bus Ctrl (CBC) RSP3   lc   cbc        16.115       0.00       0.1
                    ClockCtrl0 RSP3           lc   fpga2       1.06        0.00       0.1
                    UTI RSP3                  lc   fpga3       4.09        0.00       0.1
                    CPUCtrl RSP3              lc   fpga1       0.09        0.00       0.1
                    ROMMONB RSP3              lc   rommon      0.62        0.00       0.1
--------------------------------------------------------------------------------------------
ASR-9922-RP-TR      Can Bus Ctrl (CBC) MTRP   lc   cbc        25.02        0.00       0.1
                    Fabric Ctrl3 MTFC         lc   fpga10      1.01        0.00       0.1
                    Fabric Ctrl4 MTFC         lc   fpga11      1.01        0.00       0.1
                    Fabric Ctrl5 MTFC         lc   fpga12      1.01        0.00       0.1
                    Fabric Ctrl6 MTFC         lc   fpga13      1.01        0.00       0.1
                    CPUCtrl1                  lc   fpga2       1.03        0.00       0.1
                    ClkCtrl                   lc   fpga3       1.03        0.00       0.1
                    IntCtrl                   lc   fpga4       1.03        0.00       0.1
                    UTI                       lc   fpga5       4.09        0.00       0.1
                    Timex                     lc   fpga6       0.02        0.00       0.1
                    Fabric Ctrl0 MTFC         lc   fpga7       1.01        0.00       0.1
                    Fabric Ctrl1 MTFC         lc   fpga8       1.01        0.00       0.1
                    Fabric Ctrl2 MTFC         lc   fpga9       1.01        0.00       0.1
                    CPUCtrl0                  lc   fpga1       1.04        0.00       0.1
                    ROMMONB MTRP              lc   rommon      5.10        0.00       0.1
--------------------------------------------------------------------------------------------
ASR-9922-RP-SE      Can Bus Ctrl (CBC) MTRP   lc   cbc        25.02        0.00       0.1
                    Fabric Ctrl3 MTFC         lc   fpga10      1.01        0.00       0.1
                    Fabric Ctrl4 MTFC         lc   fpga11      1.01        0.00       0.1
                    Fabric Ctrl5 MTFC         lc   fpga12      1.01        0.00       0.1
```

	Fabric Ctrl6 MTFC	lc	fpga13	1.01	0.00	0.1
	CPUCtrl1	lc	fpga2	1.03	0.00	0.1
	ClkCtrl	lc	fpga3	1.03	0.00	0.1
	IntCtrl	lc	fpga4	1.03	0.00	0.1
	UTI	lc	fpga5	4.09	0.00	0.1
	Timex	lc	fpga6	0.02	0.00	0.1
	Fabric Ctrl0 MTFC	lc	fpga7	1.01	0.00	0.1
	Fabric Ctrl1 MTFC	lc	fpga8	1.01	0.00	0.1
	Fabric Ctrl2 MTFC	lc	fpga9	1.01	0.00	0.1
	CPUCtrl0	lc	fpga1	1.04	0.00	0.1
	ROMMONB MTRP	lc	rommon	5.10	0.00	0.1
ASR9001-RP	Can Bus Ctrl (CBC) IMRP	lc	cbc	22.114	0.00	0.1
	MB CPUCtrl	lc	fpga2	1.12	0.00	0.0
	ROMMONB IM RP	lc	rommon	1.29	0.00	0.1
A9K-24x10GE-SE	Can Bus Ctrl (CBC) LC6	lc	cbc	19.109	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.02	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.01	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC6	lc	rommon	1.28	0.00	0.0
A9K-2x100GE-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	21.108	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.07	0.00	0.0
	PortCtrl	lc	fpga3	1.03	0.00	0.0
	Imux	lc	fpga4	1.01	0.00	0.0
	Emux	lc	fpga5	1.03	0.00	0.0
	100GIGMAC	lc	fpga6	34.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.0
A9K-MOD80-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.115	0.00	0.1
	DB Ctrl	lc	fpga2	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.1
A9K-MOD160-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.115	0.00	0.1
	DB Ctrl	lc	fpga2	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0

	ROMMONB LC4	lc	rommon	1.28	0.00	0.1
A9K-24x10GE-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	19.109	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.02	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.01	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC6	lc	rommon	1.28	0.00	0.0
A9K-2x100GE-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	21.108	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.07	0.00	0.0
	PortCtrl	lc	fpga3	1.03	0.00	0.0
	Imux	lc	fpga4	1.01	0.00	0.0
	Emux	lc	fpga5	1.03	0.00	0.0
	100GIGMAC	lc	fpga6	34.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.0
A9K-MOD80-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.115	0.00	0.1
	DB Ctrl	lc	fpga2	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.1
A9K-MOD160-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.115	0.00	0.1
	DB Ctrl	lc	fpga2	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.1
A9K-8T-TEST	Can Bus Ctrl (CBC) LC17	lc	cbc	17.214	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	0.03	0.00	0.0
	ROMMONB LC6	lc	rommon	1.04	0.00	0.0
A9K-36x10GE-SE	Can Bus Ctrl (CBC) LC6	lc	cbc	15.101	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.00	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.00	0.00	0.0
	ROMMONB LC6	lc	rommon	1.28	0.00	0.0
A9K-36x10GE-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	15.101	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.00	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0

	LCCPUCtrl LC6	lc	fpga4	1.00	0.00	0.0
	ROMMONB LC6	lc	rommon	1.28	0.00	0.0
A9K-1x100GE-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	21.108	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.07	0.00	0.0
	PortCtrl	lc	fpga3	1.03	0.00	0.0
	Imux	lc	fpga4	1.01	0.00	0.0
	Emux	lc	fpga5	1.03	0.00	0.0
	100GIGMAC	lc	fpga6	34.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.0
A9K-1x100GE-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	21.108	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.07	0.00	0.0
	PortCtrl	lc	fpga3	1.03	0.00	0.0
	Imux	lc	fpga4	1.01	0.00	0.0
	Emux	lc	fpga5	1.03	0.00	0.0
	100GIGMAC	lc	fpga6	34.00	0.00	0.0
	ROMMONB LC4	lc	rommon	1.28	0.00	0.0
ASR-9922-SFC110	Can Bus Ctrl (CBC) MTFC	lc	cbc	28.03	0.00	0.1
ASR-9010-FAN	Can Bus Ctrl (CBC) FAN	lc	cbc	4.02	0.00	0.1
ASR-9006-FAN	Can Bus Ctrl (CBC) FAN	lc	cbc	5.02	0.00	0.1
ASR-9922-FAN	Can Bus Ctrl (CBC) MFAN	lc	cbc	29.09	0.00	0.1
ASR-9010-FAN-V2	Can Bus Ctrl (CBC) FAN	lc	cbc	29.09	0.00	0.1
ASR-9001-FAN	Can Bus Ctrl (CBC) FAN	lc	cbc	24.114	0.00	0.1
ASR-9922-BPID2	Can Bus Ctrl (CBC) BP2	lc	cbc	7.103	0.00	0.1
A9K-BPID2-10-SLOT	Can Bus Ctrl (CBC) BP2	lc	cbc	7.103	0.00	0.1
A9K-BPID2-6-SLOT	Can Bus Ctrl (CBC) BP2	lc	cbc	7.103	0.00	0.1
ASR9001-LC	Can Bus Ctrl (CBC) IMLC	lc	cbc	23.114	0.00	0.1
	DB CPUCtrl	lc	fpga2	1.15	0.00	0.0
	EP Gambit	lc	fpga3	0.08	0.00	0.0

	MB CPUCtrl	lc	fpga4	2.06	0.00	0.0
	EP Rogue	lc	fpga6	1.06	0.00	0.0
	EP Sage	lc	fpga7	1.02	0.00	0.0
	ROMMONB IM LC	lc	rommon	1.30	0.00	0.1
A9K-ISM-100	Can Bus Ctrl (CBC) LC6	lc	cbc	18.06	0.00	0.1
	CPUCtrl LC6	lc	cpld1	0.01	0.00	0.1
	Maintenance LC6	lc	fpga2	2.12	0.00	0.1
	Amistad LC6	lc	fpga1	0.30	0.00	0.20
	ROMMONB LC6	lc	rommon	1.02	0.00	0.1
A9K-RSP-3G	ClockCtrl0 RSP3	lc	fpga2	1.06	0.00	0.1
	UTI RSP3	lc	fpga3	4.09	0.00	0.1
	CPUCtrl RSP3	lc	fpga1	0.09	0.00	0.1
	ROMMONB RSP3	lc	rommon	0.62	0.00	0.1
A9K-RSP-24G	ClockCtrl0 RSP3	lc	fpga2	1.06	0.00	0.1
	UTI RSP3	lc	fpga3	4.09	0.00	0.1
	CPUCtrl RSP3	lc	fpga1	0.09	0.00	0.1
	ROMMONB RSP3	lc	rommon	0.62	0.00	0.1
SPA-4XT3/E3	SPA E3 Subrate FPGA	spa	fpga2	1.04	0.00	0.0
	SPA T3 Subrate FPGA	spa	fpga3	1.04	0.00	0.0
	SPA I/O FPGA	spa	fpga1	1.01	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-4XCT3/DS0	SPA T3 Subrate FPGA	spa	fpga2	0.11	0.00	0.100
	SPA T3 Subrate FPGA	spa	fpga2	1.04	0.00	0.200
	SPA I/O FPGA	spa	fpga1	2.08	0.00	0.100
	SPA ROMMON	spa	rommon	2.12	0.00	0.100
SPA-1XCHSTM1/OC3	SPA T3 Subrate FPGA	spa	fpga2	1.04	0.00	0.0
	SPA I/O FPGA	spa	fpga1	1.08	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.0
SPA-1CHOC3-CE-ATM	SPA OC3 Subrate FPGA	spa	fpga2	2.23	0.00	0.0
	SPA I/O FPGA	spa	fpga1	2.23	0.00	2.0
	SPA ROMMON	spa	rommon	1.04	0.00	0.0
SPA-1XCHOC48/DS3	SPA I/O FPGA	spa	fpga2	1.00	0.00	0.49
	SPA I/O FPGA	spa	fpga3	1.00	0.00	0.52

	SPA I/O FPGA	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON	spa	rommon	2.02	0.00	0.49
SPA-2XCHOC12/DS0	SPA FPGA2 swv1.00	spa	fpga2	1.00	0.00	0.0
	SPA FPGA swv1.36	spa	fpga1	1.36	0.00	0.49
	SPA ROMMON swv2.2	spa	rommon	2.02	0.00	0.49
A9K-MPA-20X1GE	EP I/O FPGA	spa	fpga3	0.08	0.00	0.0
A9K-MPA-2X10GE	EP I/O FPGA	spa	fpga6	1.06	0.00	0.0
A9K-MPA-4X10GE	EP I/O FPGA	spa	fpga6	1.06	0.00	0.0
A9K-MPA-2X40GE	EP Sage	spa	fpga7	1.03	0.00	0.0
A9K-MPA-1X40GE	EP Sage	spa	fpga7	1.03	0.00	0.0
SPA-8XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-8XCHT1/E1	SPA I/O FPGA	spa	fpga1	2.08	0.00	0.0
	SPA ROMMON	spa	rommon	2.12	0.00	0.140
SPA-OC192POS-XFP	SPA FPGA swv1.2 hwv2	spa	fpga1	1.02	0.00	2.0
SPA-2XOC48POS/RPR	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.0
SPA-4XOC48POS/RPR	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.0
SPA-8XOC3-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-2XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-4XOC12-POS	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-10X1GE-V2	SPA FPGA swv1.10	spa	fpga1	1.10	0.00	0.0
SPA-5X1GE-V2	SPA FPGA swv1.10	spa	fpga1	1.10	0.00	0.0
SPA-1X10GE-L-V2	SPA FPGA swv1.9	spa	fpga1	1.09	0.00	0.0
SPA-4XOC3-POS-V2	SPA FPGA swv1.0	spa	fpga1	1.00	0.00	0.5
SPA-1X10GE-WL-V2	SPA FPGA swv1.9	spa	fpga1	1.09	0.00	0.0
SPA-1XOC3-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-2XOC3-ATM-V2	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0

```
SPA-3XOC3-ATM-V2     SPA FPGA swv1.2            spa  fpga1       2.02        0.00      0.0
--------------------------------------------------------------------------------------------
SPA-1XOC12-ATM-V2    SPA FPGA swv1.2            spa  fpga1       2.02        0.00      0.0

RP/0/RP0/CPU0:megatron(admin)#
```

Determining Your Software Version

To determine the version of Cisco IOS XR Software running on your router, log in to the router and enter the **show version** command:

Procedure

Step 1 Establish a Telnet session with the router.

Step 2 Enter **show version** command from EXEC mode.

```
RP/0/RSP0/CPU0:router#show version
Wed Sep 26 15:28:32.572 PDT

Cisco IOS XR Software, Version 4.2.3[Default]
Copyright (c) 2012 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 5.10(c) 1994-2012 by Cisco Systems,  Inc.

megatron uptime is 1 day, 5 hours, 1 minute
System image file is "disk0:asr9k-os-mbi-4.2.3/0x100305/mbiasr9k-rsp3.vm"

cisco ASR9K Series (Intel 686 F6M14S4) processor with 6291456K bytes of memory.
Intel 686 F6M14S4 processor at 2133MHz, Revision 2.174
ASR 9922 20 Line Card Slot AC Chassis w/ PEM V2

4 Management Ethernet
40 GigabitEthernet/IEEE 802.3 interface(s)
20 GigabitEthernet
44 TenGigE
44 DWDM controller(s)
44 WANPHY controller(s)
503k bytes of non-volatile configuration memory.
6143M bytes of hard disk.
11817968k bytes of disk0: (Sector size 512 bytes).
11817968k bytes of disk1: (Sector size 512 bytes).

Configuration register on node 0/RP0/CPU0 is 0x102
Boot device on node 0/RP0/CPU0 is disk0:
Package active on node 0/RP0/CPU0:
iosxr-ce, V 4.2.3[00], Cisco Systems, at disk0:iosxr-ce-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-adv-video, V 4.2.3[00], Cisco Systems, at disk0:iosxr-adv-video-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
```

```
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-service-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-service-supp-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-optics-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-optics-supp-4.2.3
    Built on Mon Sep 24 06:13:33 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fwding, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fwding-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-cpp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-cpp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-ce, V 4.2.3[00], Cisco Systems, at disk0:asr9k-ce-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-9000v-nV-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-9000v-nV-supp-4.2.3
    Built on Mon Sep 24 06:13:47 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9K-doc-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9K-doc-supp-4.2.3
    Built on Mon Sep 24 06:11:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-scfclient, V 4.2.3[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.3
    Built on Mon Sep 24 06:03:42 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-service, V 4.2.3[00], Cisco Systems, at disk0:iosxr-service-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-security, V 4.2.3[00], Cisco Systems, at disk0:iosxr-security-4.2.3
    Built on Mon Sep 24 06:11:29 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mpls, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mpls-4.2.3
    Built on Mon Sep 24 06:10:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mgbl, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mgbl-4.2.3
    Built on Mon Sep 24 06:11:16 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mcast, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mcast-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-routing, V 4.2.3[00], Cisco Systems, at disk0:iosxr-routing-4.2.3
```

```
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-infra, V 4.2.3[00], Cisco Systems, at disk0:iosxr-infra-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-fwding, V 4.2.3[00], Cisco Systems, at disk0:iosxr-fwding-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-diags, V 4.2.3[00], Cisco Systems, at disk0:iosxr-diags-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-adv-video-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-adv-video-supp-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fpd, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fpd-4.2.3
    Built on Mon Sep 24 06:11:48 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-diags-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-k9sec-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-k9sec-supp-4.2.3
    Built on Mon Sep 24 06:11:29 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mgbl-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mgbl-supp-4.2.3
    Built on Mon Sep 24 06:11:16 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mcast-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mcast-supp-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-base, V 4.2.3[00], Cisco Systems, at disk0:asr9k-base-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-os-mbi, V 4.2.3[00], Cisco Systems, at disk0:asr9k-os-mbi-4.2.3
    Built on Mon Sep 24 06:06:05 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

Configuration register on node 0/RP1/CPU0 is 0x102
Boot device on node 0/RP1/CPU0 is disk0:
Package active on node 0/RP1/CPU0:
iosxr-ce, V 4.2.3[00], Cisco Systems, at disk0:iosxr-ce-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-adv-video, V 4.2.3[00], Cisco Systems, at disk0:iosxr-adv-video-4.2.3
```

```
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-service-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-service-supp-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-optics-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-optics-supp-4.2.3
    Built on Mon Sep 24 06:13:33 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fwding, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fwding-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-cpp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-cpp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-ce, V 4.2.3[00], Cisco Systems, at disk0:asr9k-ce-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-9000v-nV-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-9000v-nV-supp-4.2.3
    Built on Mon Sep 24 06:13:47 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9K-doc-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9K-doc-supp-4.2.3
    Built on Mon Sep 24 06:11:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-scfclient, V 4.2.3[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.3
    Built on Mon Sep 24 06:03:42 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-service, V 4.2.3[00], Cisco Systems, at disk0:iosxr-service-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-security, V 4.2.3[00], Cisco Systems, at disk0:iosxr-security-4.2.3
    Built on Mon Sep 24 06:11:29 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mpls, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mpls-4.2.3
    Built on Mon Sep 24 06:10:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mgbl, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mgbl-4.2.3
    Built on Mon Sep 24 06:11:16 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mcast, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mcast-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie
```

```
iosxr-routing, V 4.2.3[00], Cisco Systems, at disk0:iosxr-routing-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-infra, V 4.2.3[00], Cisco Systems, at disk0:iosxr-infra-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-fwding, V 4.2.3[00], Cisco Systems, at disk0:iosxr-fwding-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-diags, V 4.2.3[00], Cisco Systems, at disk0:iosxr-diags-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-adv-video-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-adv-video-supp-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fpd, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fpd-4.2.3
    Built on Mon Sep 24 06:11:48 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-diags-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-k9sec-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-k9sec-supp-4.2.3
    Built on Mon Sep 24 06:11:29 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mgbl-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mgbl-supp-4.2.3
    Built on Mon Sep 24 06:11:16 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mcast-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mcast-supp-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-base, V 4.2.3[00], Cisco Systems, at disk0:asr9k-base-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-os-mbi, V 4.2.3[00], Cisco Systems, at disk0:asr9k-os-mbi-4.2.3
    Built on Mon Sep 24 06:06:05 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
iosxr-ce, V 4.2.3[00], Cisco Systems, at disk0:iosxr-ce-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-adv-video, V 4.2.3[00], Cisco Systems, at disk0:iosxr-adv-video-4.2.3
```

```
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-service-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-service-supp-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-optics-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-optics-supp-4.2.3
    Built on Mon Sep 24 06:13:33 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fwding, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fwding-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-cpp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-cpp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-ce, V 4.2.3[00], Cisco Systems, at disk0:asr9k-ce-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-scfclient, V 4.2.3[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.3
    Built on Mon Sep 24 06:03:42 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-service, V 4.2.3[00], Cisco Systems, at disk0:iosxr-service-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mpls, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mpls-4.2.3
    Built on Mon Sep 24 06:10:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mcast, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mcast-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-routing, V 4.2.3[00], Cisco Systems, at disk0:iosxr-routing-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-infra, V 4.2.3[00], Cisco Systems, at disk0:iosxr-infra-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-fwding, V 4.2.3[00], Cisco Systems, at disk0:iosxr-fwding-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-diags, V 4.2.3[00], Cisco Systems, at disk0:iosxr-diags-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie
```

```
asr9k-adv-video-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-adv-video-supp-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-diags-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mcast-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mcast-supp-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-base, V 4.2.3[00], Cisco Systems, at disk0:asr9k-base-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-os-mbi, V 4.2.3[00], Cisco Systems, at disk0:asr9k-os-mbi-4.2.3
    Built on Mon Sep 24 06:06:05 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

Boot device on node 0/10/CPU0 is mem:
Package active on node 0/10/CPU0:
iosxr-ce, V 4.2.3[00], Cisco Systems, at disk0:iosxr-ce-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-adv-video, V 4.2.3[00], Cisco Systems, at disk0:iosxr-adv-video-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-service-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-service-supp-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-optics-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-optics-supp-4.2.3
    Built on Mon Sep 24 06:13:33 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fwding, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fwding-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-cpp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-cpp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-ce, V 4.2.3[00], Cisco Systems, at disk0:asr9k-ce-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-scfclient, V 4.2.3[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.3
    Built on Mon Sep 24 06:03:42 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-service, V 4.2.3[00], Cisco Systems, at disk0:iosxr-service-4.2.3
```

```
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mpls, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mpls-4.2.3
    Built on Mon Sep 24 06:10:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mcast, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mcast-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-routing, V 4.2.3[00], Cisco Systems, at disk0:iosxr-routing-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-infra, V 4.2.3[00], Cisco Systems, at disk0:iosxr-infra-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-fwding, V 4.2.3[00], Cisco Systems, at disk0:iosxr-fwding-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-diags, V 4.2.3[00], Cisco Systems, at disk0:iosxr-diags-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-adv-video-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-adv-video-supp-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-diags-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mcast-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mcast-supp-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-base, V 4.2.3[00], Cisco Systems, at disk0:asr9k-base-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-os-mbi, V 4.2.3[00], Cisco Systems, at disk0:asr9k-os-mbi-4.2.3
    Built on Mon Sep 24 06:06:05 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

Boot device on node 0/15/CPU0 is mem:
Package active on node 0/15/CPU0:
iosxr-ce, V 4.2.3[00], Cisco Systems, at disk0:iosxr-ce-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-adv-video, V 4.2.3[00], Cisco Systems, at disk0:iosxr-adv-video-4.2.3
    Built on Mon Sep 24 06:13:26 PDT 2012
```

```
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-service-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-service-supp-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-optics-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-optics-supp-4.2.3
    Built on Mon Sep 24 06:13:33 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-fwding, V 4.2.3[00], Cisco Systems, at disk0:asr9k-fwding-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-cpp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-cpp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-ce, V 4.2.3[00], Cisco Systems, at disk0:asr9k-ce-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-scfclient, V 4.2.3[00], Cisco Systems, at disk0:asr9k-scfclient-4.2.3
    Built on Mon Sep 24 06:03:42 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-service, V 4.2.3[00], Cisco Systems, at disk0:iosxr-service-4.2.3
    Built on Mon Sep 24 06:13:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mpls, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mpls-4.2.3
    Built on Mon Sep 24 06:10:35 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-mcast, V 4.2.3[00], Cisco Systems, at disk0:iosxr-mcast-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-routing, V 4.2.3[00], Cisco Systems, at disk0:iosxr-routing-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-infra, V 4.2.3[00], Cisco Systems, at disk0:iosxr-infra-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-fwding, V 4.2.3[00], Cisco Systems, at disk0:iosxr-fwding-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

iosxr-diags, V 4.2.3[00], Cisco Systems, at disk0:iosxr-diags-4.2.3
    Built on Mon Sep 24 06:03:41 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-adv-video-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-adv-video-supp-4.2.3
```

```
    Built on Mon Sep 24 06:13:26 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-diags-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-diags-supp-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-mcast-supp, V 4.2.3[00], Cisco Systems, at disk0:asr9k-mcast-supp-4.2.3
    Built on Mon Sep 24 06:10:52 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-base, V 4.2.3[00], Cisco Systems, at disk0:asr9k-base-4.2.3
    Built on Mon Sep 24 06:03:40 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie

asr9k-os-mbi, V 4.2.3[00], Cisco Systems, at disk0:asr9k-os-mbi-4.2.3
    Built on Mon Sep 24 06:06:05 PDT 2012
    By iox-bld3 in /auto/srcarchive6/production/4.2.3/all/workspace for pie
```

Software Features Introduced in Cisco IOS XR Software Release 4.2.3 for Cisco ASR 9000 Series Aggregation Service Router

MPLS TE End-to-End Path Protection

Path protection provides an end-to-end failure recovery mechanism for MPLS-TE tunnels. An alternate recovery mechanism is Fast Reroute (FRR), which protects MPLS-TE LSPs only from link and node failures by locally repairing the LSPs at the point of failure. The explicit paths are used to create backup autotunnels. The **protected-by** keyword is used to configure path protection for an explicit path that is protected by another explicit path.

Co-existence of FRR and path protection is supported; this means FRR and path-protection can be configured on the same tunnel at the same time.

For more information about the MPLS TE end-to-end path protection feature, see the *Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide* and *Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference*.

MPLS P2MP TE Inter-area Enhancements

The MPLS-TE inter-area tunneling feature allows you to establish P2P and P2MP TE tunnels that spans multiple Interior Gateway Protocol (IGP) areas and levels, thereby eliminating the requirement that headend and tailend routers reside in a single area. An enhancement to P2MP-TE inter-area allows ABRs to support loose hop ERO expansion to find path to the next ABR until it reaches to the tail-end LSR, without introducing remerge.

For more information about the P2MP TE inter-area enhancements feature, see the *Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide* and *Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference*.

Virtual Routing and Forwarding (vrf) Aware Source Interface for Syslog Transactions

A syslog message contains the IPv4 or IPv6 address of the interface used to exit the router. The virtual routing and forwarding aware source interface enables you to configure syslog packets to contain the IPv4 or IPv6 address of a particular interface for a VRF, regardless of which interface the packet uses to exit the router.

For more information about the vrf aware source interface for syslog transactions feature, see the *Implementing VRRP* module in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide*.

BGP Attribute Filtering

The BGP Attribute Filter feature checks integrity of BGP updates in BGP update messages and optimizes reaction when detecting invalid attributes. BGP Update message contains a list of mandatory and optional attributes. These attributes in the update message include MED, LOCAL_PREF, COMMUNITY etc. In some cases, if the attributes are malformed, there is a need to filter these attributes at the receiving end of the router. The BGP Attribute Filter functionality filters the attributes received in the incoming update message. The attribute filter can also be used to filter any attributes that may potentially cause undesirable behavior on the receiving router.

Some of the BGP updates are malformed due to wrong formatting of attributes such as the network layer reachability information (NLRI) or other fields in the update message. These malformed updates, when received, causes undesirable behavior on the receiving routers. Such undesirable behavior may be encountered during update message parsing or during re-advertisement of received NLRIs. In such scenarios, its better to filter these corrupted attributes at the receiving end.

For more information on BGP Attribute Filtering, see the *Implementing BGP module* in the *Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide*.

IPoDWDM Proactive Protection

Proactive maintenance automatically triggers Forward Error Correction-Fast Re-Route (FEC-FRR). Proactive maintenance requires coordinated maintenance between Layer 0 (L0) and Layer 3 (L3). L0 is the DWDM optical layer. FEC-FRR is an L3 protection mechanism. FEC-FRR detects failures before they happen and corrects errors introduced during transmission or that are due to a degrading signal.

Support for these commands was included on the A9K-1X100GE-SE, A9K-1X100GE-TR, A9K-2X100GE-SE, A9K-2X100GE-TR, as well as on the A9K-MPA-2X40GE and A9K-MPA-1X40GE Modular Port Adaptors(MPAs) which are used in the Mod80 and Mod160 line cards:

- Proactive
- Proactive revert threshold
- Proactive revert window

- Proactive trigger threshold
- Proactive trigger window

The status of the proactive protection will be displayed in the **show controller dwdm pro-active** command. For more information, see the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference*.

Link Autonegotiation for Ethernet Interfaces

Link autonegotiation ensures that devices that share a link segment are automatically configured with the highest performance mode of interoperation. Use the **negotiation auto** command in interface configuration mode to enable link autonegotiation on an Ethernet interface. On line card Ethernet interfaces, link autonegotiation is disabled by default. In Release 4.2.3, the **negotiation auto** and **flow-control** commands are supported on 1 GigE interfaces.

When you explicitly enable the sending of flow-control pause frames, the value you configured with the **flow-control** command overrides any autonegotiated value. This prevents a link from coming up if the value you set with the **flow-control** command conflicts with the allowable settings on the other end of the connection.

For more information, see the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide*.

Limitation on ISM Card

Cisco IOS XR Software Release 4.2.3 removes the software limitation that only allowed five ISM cards per Cisco ASR 9000 Series Aggregation Services Router chassis.

The following references can be used for more information on Cisco ASR 9000 Series Aggregation Services Router and ISM line card installation:

For more general Cisco ASR 9000 Series Aggregation Services Router hardware information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide* and the *Cisco ASR 9000 Series Aggregation Services Router Overview and Reference Guide* online.

For Cisco ASR 9000 Series Aggregation Services Router ISM line card hardware information, refer to the *Cisco ASR 9000 Series Aggregation Services Router ISM Line Card Installation Guide* online.

For Cisco ASR 9000 Series Aggregation Services Router ISM line card software configuration information, refer to the *Cisco TV CDS 2.4 RTSP Software Configuration Guide for the Cisco ISM (Integrated Service Module) Line Card* and the *Cisco TV CDS 2.4 Installation, Upgrade, and Maintenance Guide for the Cisco ISM (Integrated Service Module) Line Card online*.

For more information about the Cisco Internet Streamer Content Delivery System (CDS-IS), see the *Cisco Internet Streamer CDS 2.5 Software Configuration Guide*.

For a complete list of Cisco Internet Streamer Content Delivery System Command-Line Processing commands, see the *Cisco Internet Streamer CDS 2.5 Command Reference Guide*.

For information about CDS 2.5 Alarms and Error messages, see the *Cisco Internet Streamer CDS 2.5 Alarms and Error Messages Guide*.

Support for Multiple Integrated Service Module (ISM) Line Cards

Cisco IOS XR Software Release 4.2.3 supports a maximum of six ISM line cards in each Cisco ASR 9000 Series Aggregation Services Router chassis. For applications such as NAT44 and DS-Lite, the configuration can be independently applied to each ISM line card.

For NAT-44, a maximum of ten million sessions are supported by each ISM line card.

For DS-Lite, a maximum of twenty million sessions are supported by each ISM line card.

Note No additional configuration is required to support multiple ISM line cards.

CLI Enhancements on ISM Line Card

In Cisco IOS XR Software Release 4.2.3, two new commands are introduced on the ISM line card:

- map ip one-to-one
- map outsideserviceapp

- **map ip one-to-one**

  To map a single private IP address to a single public IP address, use the **map ip one-to-one** command in NAT44 configuration mode. To undo this mapping, use the **no** form of this command.

  map ip one-to-one

  no map ip one-to-one

  Syntax Description

  This command has no arguments and keywords.

  Command Default

  No default behavior or values.

  Command Modes

  CGN inside VRF NAT44 configuration mode

  Command History

Release	Modification
Release 4.2.3	This command was introduced.

  Usage Guidelines

  To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

  Task ID

Release	Modification

cgn	read, write

Example

This example shows how to configure one-to-one IP address mapping:

```
RP/0/RSP0/CPU0:PE51_ASR-9010#config
RP/0/RSP0/CPU0:PE51_ASR-9010(config)#service cgn cgn-inst1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn)#service-type nat44 nat-inst1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-nat44)#inside-vrf vrf1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-invrf)#map ip one-to-one
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-invrf)#
```

- **map outsideserviceapp**

  To explicitly pair the inside and the outside service applications, use the **map outsideserviceapp** command in NAT44 configuration mode. To undo the explicit pairing, use the **no** form of this command.

  map ousideserviceApp ServiceApp *number* **address-pool** *IP-address/prefix*

  no map ousideserviceApp ServiceApp *number* **address-pool** *IP-address/prefix*

  Syntax Description

ServiceApp	Service applications that need to be paired.
number	Number that indicates each service application. The range is from 1 to 2000.
address-pool	Address pool to which the inside VRF is mapped.
IP-address/prefix	The IP address and prefix of the address pool.

  Command Default

  No default behavior or values.

  Command Modes

  CGN inside VRF NAT44 configuration mode

  Command History

Release	Modification
Release 4.2.3	This command was introduced.

  Usage Guidelines

  To use this command, you must be in a user group associated with a task group that includes appropriate task IDs. If the user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Task ID

Release	Modification
cgn	read, write

Example

This example shows how to configure one-to-one IP address mapping:

```
RP/0/RSP0/CPU0:PE51_ASR-9010#config
RP/0/RSP0/CPU0:PE51_ASR-9010(config)#service cgn cgn-inst1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn)#service-type nat44 nat-inst1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-nat44)#inside-vrf vrf1
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-invrf)#map outsideserviceApp serviceApp 66
address-pool 10.2.2.23/24
RP/0/RSP0/CPU0:PE51_ASR-9010(config-cgn-invrf)
```

Cisco Express Forwarding (CEF) Load-Balancing Algorithm

CEF load-balancing algorithm feature enables you to configure a rotate bit count value to adjust (i.e. rotate) the hash result so that it can vary from a next-hop router in a cascaded setup. It also addresses traffic polarization issues in routers in a cascaded setup.

For more information about the CEF Load-balancing algorithm feature, see the *Implementing Cisco Express Forwarding* module in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide*.

nV Cluster RSP EoBC Link disable

The EoBC links are at the heart of the nV cluster and chassis-to-chassis control. The heart beats goes over this link. The ability to disable or enable the link by the operator provides flexibility during provisioning, or at times during troubleshooting.

nV Cluster EoBC MIB support

The IfMIb and entityMIB support have been added, which helps to receive traps for these MIBs. Using these features, you can also monitor the state of the links through SNMP.

QOS on IRL

The IRL links have default QoS characteristics for ingress and egress. This feature provides the operator with the ability to configure their own egress MQC QoS policy. Classification is done based on qos-group and discard-class.

Hardware Features Introduced in Cisco IOS XR Software Release 4.2.3 for Cisco ASR 9000 Series Aggregation Services Router

The following hardware features introduced in Cisco IOS XR Software Release 4.2.3 are supported on the Cisco ASR 9000 Series Aggregation Services Router platform:

- ASR 9000 Features:
  - ASR 9000v Satellite System 36-Port 10-Gigabit Ethernet Line Card support

    Cisco IOS XR Software Release 4.2.3 introduces support for connecting the A9K-36X10GE-TR (36-Port 10-Gigabit Ethernet Line Card, Packet Transport Optimized) and the A9K-36X10GE-SE (36-Port 10-Gigabit Ethernet Line Card, Service Edge Optimized) to the new Cisco ASR 9000v (a satellite system with the Cisco ASR 9000).

    The Cisco ASR 9000v satellite shelf provides 44xGE SFP ports and 4 10GE SFP+ ports.

    For more general Cisco ASR 9000v Satellite System hardware information, refer to the *Cisco ASR 9000 Hardware Installation Guide* online.

    For Cisco IOS XR software Ethernet port configuration and command information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference* and the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide* online.

  - ZR/DWDM 10GE SFP+ Optics

    Cisco IOS XR Software Release 4.2.3 introduces support for Cisco SFP for 10-Gigabit Ethernet Far Reach SFP+ transceivers

    For more general hardware information about the ZR/DWDM 10GE SFP+ transceivers, refer to the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide* online.

    For Cisco IOS XR software Ethernet port configuration and command information, refer to the*Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference* and the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide* online.

  - Cisco ASR 9922 Router

    Cisco IOS XR Software Release 4.2.2 introduces support for the new Cisco ASR 9922 router (a 22-slot chassis).

    The Cisco ASR 9922 router provides 22 slots. Up to seven FC cards are installed between the two RP cards in the middle cage of the chassis. Ten line cards are installed in slots 0 through 9 in the top card cage, and ten line cards are installed upside down in slots 10 through 19 in the bottom card cage.

    For more general Cisco ASR 9922 router hardware information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide* and the *Cisco ASR 9000 Series Aggregation Services Router Overview and Reference Guide* online.

For Cisco IOS XR software Ethernet port configuration and command information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference* and the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide* online.

- 36-Port 10-Gigabit Ethernet Line Card

  Cisco IOS XR Software Release 4.2.3 introduces support for the 36-Port 10-Gigabit Ethernet line card on the Cisco ASR 9000 Series Aggregation Services Router platform.

  For information about this newly introduced 36-Port 10-Gigabit Ethernet line card, refer to the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide* online.

  For Cisco IOS XR software Ethernet port configuration and command information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference* and the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide* online.

- 1-Port 100-Gigabit Ethernet Line Card

  Cisco IOS XR Software Release 4.2.3 introduces support for the 1-Port 100-Gigabit Ethernet line card on the Cisco ASR 9000 Series Aggregation Services Router platform.

  For information about this newly introduced 1-Port 100-Gigabit Ethernet line card, refer to the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide* online.

  For Cisco IOS XR software Ethernet port configuration and command information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Command Reference* and the *Cisco ASR 9000 Series Aggregation Services Router Interfaces and Hardware Component Configuration Guide* online.

- ASR 9001 Feature:

  - FAN OIR Support

    The Cisco ASR 9001 Router supports online insertion and removal (OIR) of fan tray. For more information on removing and replacing the fan tray, see the *Cisco ASR 9001 Router Hardware Installation Guide*.

Features Supported on the Cisco ASR 9000 Series Aggregation Services Router

The following sections describe the features supported on the Cisco ASR 9000 Series Aggregation Services Router platform:

Important Notes

For Cisco IOS XR Software Release 4.2, the Cisco ASR 9000 Series Aggregation Services Router does not support the following inventory schemas:

- vkg_invmgr_adminoper.xsd

- vkg_invmgr_common.xsd

- vkg_invmgr_oper.xsd

- Only MLPPP encapsulation channels on the OC-12 SONET interface can be protected by IP-FRR in Cisco IOS XR software Release 3.9.0 and above.
- For Cisco IOS XR software Release 3.9.0 and above the SIP 700 with the 2-Port Channelized OC-12/DS0 SPA does not support SDH (including all the mappings under SDH) or DS0 mappings.
- For Cisco IOS XR software Release 3.9.0 and above the SIP 700 with the 2-Port Channelized OC-12/DS0 SPA does not support ATM or POS.
- For Cisco IOS XR software Release 3.9.0 and above the SIP 700 with the 2-Port Channelized OC-12/DS0 SPA does not support MPLS/Traffic Engineering FRR.
- For Cisco IOS XR software Release 4.0.1 and above the SIP 700 with the 1-Port Channelized OC48/STM16 DS3 SPA does not support MPLS/Traffic Engineering FRR.
- For Cisco IOS XR software Release 4.0.1 and above the SIP 700 with the 1-Port Channelized OC48/STM16 DS3 SPA, the 2-Port Channelized OC-12/DS0 SPA , the 8-Port OC12/STM4 SPA , and the 2-Port OC-48/STM16 SPA Layer 2VPN support only includes FR.

- **Country-specific laws, regulations, and licenses—**In certain countries, use of these products may be prohibited and subject to laws, regulations, or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; customers must comply with all such applicable laws in the countries in which they intend to use the products.
- **Card fan controller, and RSP removal—**For all card removal and replacement (including fabric cards, line cards, fan controller, and RSP) follow the instructions provided by Cisco to avoid impact to traffic. See the *Cisco ASR 9000 Series Aggregation Services Router Getting Started Guide* for procedures.
- **Exceeding Cisco testing—**If you intend to test beyond the combined maximum configuration tested and published by Cisco, contact your Cisco Technical Support representative to discuss how to engineer a large-scale configuration maximum for your purpose.

- **Installing a Line Card—**For a fully populated 40-port high density Line Card with cable optics, maintenance time required for card replacement is higher. For more information about Line Card installation and removal, refer to the *Cisco ASR 9000 Aggregation Services Router Ethernet Line Card Installation Guide*.
- **Serial Interfaces Out of Order in "show ip interface brief" Command—**The show ip interface brief command might display interfaces out of order if different types of serialization are used on the SPA cards.

  The serial interfaces are displayed in the show ip interface brief command output in the order shown in the example below:

The ordering is based on:

1. Slot
2. SPA
3. Type
4. T3
5. T3/T1
6. vt15-T1
7. multilink

This may be confusing (the interfaces appear out of order) for the user who is accustomed to IOS.

Example output:

With multiple cards:

```
Serial0/2/0/1/1/1:0  (t3/t1)
Serial0/2/0/1/2/1:0
Serial0/2/0/1/3/1:0
Serial0/2/0/1/4/1:0
Serial0/2/0/1/5/1:0
Serial0/2/0/1/6/1:0
Serial0/2/0/1/7/1:0
Serial0/2/0/1/8/1:0
Serial0/2/0/1/9/1:0
Serial0/2/0/1/10/1:0
Serial0/2/0/1/11/1:0
Serial0/2/0/1/12/1:0
Serial0/2/0/0/1/1/1:0  (vt15)
Serial0/2/0/0/2/1/1:0
Serial0/2/0/0/3/1/1:0
Serial0/2/0/0/4/1/1:0
Serial0/2/0/0/5/1/1:0
Serial0/2/0/0/6/1/1:0
Serial0/2/0/0/7/1/1:0
Serial0/2/0/0/8/1/1:0
Serial0/2/0/0/9/1/1:0
Serial0/2/0/0/10/1/1:0
Serial0/2/0/0/11/1/1:0
Serial0/2/0/0/12/1/1:0
Multilink 0/2/0/0/1
Serial0/2/1/0/1  (t3)
Serial0/2/1/1/1/1:0  (t3/t1)
Serial0/2/1/1/2/1:0
Serial0/2/1/1/3/1:0
Serial0/2/1/1/4/1:0
Serial0/2/1/1/5/1:0
Serial0/2/1/1/6/1:0
Serial0/2/1/1/7/1:0
Serial0/2/1/1/8/1:0
Serial0/2/1/1/9/1:0
Serial0/2/1/1/10/1:0
Serial0/2/1/1/11/1:0
Serial0/2/1/1/12/1:0
```

```
Serial0/6/0/1/1/1:0
Serial0/6/0/1/2/1:0
Serial0/6/0/1/3/1:0
Serial0/6/0/1/4/1:0
Serial0/6/0/1/5/1:0
Serial0/6/0/1/6/1:0
Serial0/6/0/1/7/1:0
Serial0/6/0/1/8/1:0
Serial0/6/0/1/9/1:0
Serial0/6/0/1/10/1:0
Serial0/6/0/1/11/1:0
Serial0/6/0/1/12/1:0
Serial0/6/0/0/1/1/1:0
Serial0/6/0/0/2/1/1:0
Serial0/6/0/0/3/1/1:0
Serial0/6/0/0/4/1/1:0
Serial0/6/0/0/5/1/1:0
Serial0/6/0/0/6/1/1:0
Serial0/6/0/0/7/1/1:0
Serial0/6/0/0/8/1/1:0
Serial0/6/0/0/9/1/1:0
Serial0/6/0/0/10/1/1:0
Serial0/6/0/0/11/1/1:0
Serial0/6/0/0/12/1/1:0
Multilink 0/6/0/0/1
Serial0/6/1/0/1
Serial0/6/1/1/1/1:0
Serial0/6/1/1/2/1:0
Serial0/6/1/1/3/1:0
Serial0/6/1/1/4/1:0
Serial0/6/1/1/5/1:0
Serial0/6/1/1/6/1:0
Serial0/6/1/1/7/1:0
Serial0/6/1/1/8/1:0
Serial0/6/1/1/9/1:0
Serial0/6/1/1/10/1:0
Serial0/6/1/1/11/1:0
Serial0/6/1/1/12/1:0
```

- Starting with Cisco IOS XR Software Release 3.9 the **pw-class class name encapsulation mpls** command **control-word** option default is now **disable** -In Cisco IOS XR Software Release 3.9 and above the control word is disabled by default. To configure the control word, enter the control-word keyword shown in the following example:

  ```
  pw-class class1 encapsulation mpls control-word
  ```

- For configured policer rates of less than 1 Mbps, the actual policer rate can be approximately 10 percent less than the configured rate. For example, for a configured policer rate of 500 kbps, the actual policer rate is 448 kbps due to a granularity round down in hardware.
- In Cisco ASR 9000 Series Aggregation Services Router Software Release 4.0.0, the minimum configurable logging buffered size has been increased to 307200. Any configuration with a value less than 307200 fails to upgrade to Release 4.0.1.
  - Run the **show configuration failed startup** command on startup to display the failed configuration.
  - Workaround: Prior to upgrading to Release 4.0.1, set the logging buffer size to a value of 307200 or greater (**logging buffered 307200)** .

- **dsu mode Command Default—** For E3 interfaces on the 4-Port Clear Channel T3/E3 SPA that interoperate with E3 interfaces on a Cisco 10000 Series router, the default data service unit (DSU) mode is digital-link. To change the DSU mode to cisco, configure scrambling.

- Starting from Cisco IOS XR Software Release 4.0.0, the **hw-module location <LOC> reload warm** command is disabled. As a result, the warm reload feature also has been disabled.

- In Cisco ASR 9000 Series Aggregation Services Router Software Release 4.1.0, you use the **cablelength short** command to set a cable length of 655 feet or shorter for a DS1 link on a 4-Port Channelized T1/E1 SPA. The **cablelength short** command options are listed as follows:

```
RP/0/RSP0/CPU0:vkg_ro1_a(config-t1)#cablelength short ?

  133ft  0-133ft

  266ft  134-266ft

  399ft  267-399ft

  533ft  400-533ft

  655ft  534-655ft
```

  However, when using the **cablelength short** command on a 4-Port Channelized T1/E1 SPA in Cisco ASR 9000 Series Aggregation Services Router Software Release 4.1.0, only the 133ft option (for cable lengths from 0 to 133 feet) works. The other values that are greater than 133 feet (266, 399, 533, or 655) all cause the T1 controller to go down. The workaround is to restart the controller after you set the cable length to 266, 399, 533, or 655 feet. The **cablelength long** command works correctly

Caveats

Caveats describe unexpected behavior in Cisco IOS XR Software releases. Severity-1 caveats are the most serious caveats; severity-2 caveats are less serious.

This section lists the caveats for Cisco ASR 9000 Series Aggregation Services Router Software Release 4.2.3 and the Cisco ASR 9000 Series Aggregation Services Router platform.

Cisco IOS XR Caveats

The following open caveats apply to Cisco IOS XR Software Release and are not platform specific:

- **CSCtt38345**

  Basic Description:

  The SNMP duplicate request dropping feature is not working.

  Symptom:

  SNMP duplicate request dropping feature is supposed to drop requests from the same NMS and port with the same request ID, and if the number of requests in queue is greater than 20.

  Conditions:

  SNMP duplicate request dropping feature is supposed to drop requests from the same NMS and port with the same request ID and if the number of requests in queue is greater than 20.

  Workaround:

None.

- **CSCti50227**

  Basic Description:

  Not able to modify RPL and delete prefix-set in a single commit.

  Symptom:

  When a policy that is attached directly or indirectly to an attach point needs to be modified, a single commit operation cannot be performed when:

  - Removing a set or policy referred by another policy that is attached to any attach point directly or indirectly.
  - Modifying the policy to remove the reference to the same set or policy that is getting removed.

  Workaround:

  The commit must be performed in two steps:

  1. Modify the policy to remove the reference to the policy or set and then commit.
  2. Remove the policy or set and commit.

- **CSCub15328**

  Basic Description:

  underscore "_" in a RPL regexp does not match the start of a AS-SET segment denoted as {a, b, c, ...}.

  Symptom:

  The underscore symbol "_" in an RPL regexp does not match the start of a AS-SET segment denoted as {a, b, c, ...}.

  Conditions:

  When an RPL regexp is used in either inbound route-policy or outbound route-policy, the AS-PATH string contains AS-SET segment {a, b, c, ...}.

  Workaround:

  Use rpl native as-path semantics such as as-path neighbor-is, as-path originates-from or as-path passes-through instead of the regular expressions.

  As-Path native semantics are more superior to ios regex. Use of regular expressions is computation intensive since regular expression is stored as a string.

- **CSCub98462**

  Basic Description:

  Radiusd mem leak occurred while executing all radius related CLI on router, which is used more than 10000 bytes for each and every radius CLI.

  Symptom:

  The **show radius** command triggers memory leak in 'radiusd' on routers with LC nodes, more so on MC (Multi-Chassis) routers than on SC routers.

  Conditions:

  The radius is configured on the router.

Workaround:

Use 'location' option with the **show radius** command to get statistics from a particular node. On non-BNG platforms (Carrier Routing System, Gigabit Switch Router, Aggregation Service Router) statistics from only dSC/dLRSC nodes are relevant because 'radiusd' that runs on other nodes are not used for non-BNG deployments. Therefore, dSC/dLRSC node-name can be given as input to 'location' option without any loss of functionality (statistics) of the **show radius** command.

Alternately, restart 'radiusd' if heap memory has accumulated.

- **CSCuc30874**

  Basic Description:

  MGMT fails to resolve NH in ingress LC(0/6/cpu0) if prefix and NH are from different VRF (V500:U31) and imported via export-map.

  Symptom:

  Routes imported from another vrf (on another LC) shows as unresolved in cef.

  Conditions:

  When prefix (from a vrf on a LC) is exported via export route-policy with additive route-target instead of export route-target configuration to another vrf on another LC.

  Workaround:

  Use export route-target configuration to export the routes in stead of route-policy or disable selective vrf download.

Caveats Specific to the Cisco ASR 9000 Series Aggregation Services Router

The following caveats are specific to the Cisco ASR 9000 Series Aggregation Services Router platform:

- **CSCuc11537**

  Basic Description:

  During a negative testing to measure convergence, multi AS BGP failed to switch the packet received MPBGP link. Whenever it receives labelled traffic on MP BGP link, router drops at ingress point.

  Symptom:

  In a special scenario where traffic destination is a IP address1/prefix which belongs to a VRF and the nexthop is a labelled path associated with a IPaddress/prefix which also is part of a VRF. In such a situation,Router1 does not push any label(vrf label) on the packet before sending it to Router2. This causes Router2 to fail the lookup since it cannot identify the VRF to look up inside without the VRF label pushed on the packet. The traffic will drop on Router2 because IPaddress1 cannot be found in the global routing table (since its part of a VRF table).

  Conditions:

  ASR9000 routers should be running release 4.2.0 or 4.2.1 release. Traffic should be going to an IP address in a VRF which is recursively reachable over a Label nexthop with nexthop being in a VRF as well. Its only applicable to ASR 9000 Ethernet Line Card and ASR 9000 Enhanced Ethernet Line Card based Line Cards.

  Workaround:

  None.

- **CSCtz94343**

  Basic Description:

  Upon trying to initiate imdr, it fails due to ifo_ea error with 30I image.

  Symptom:

  imDR fails in presence of satellite configurations on router.

  Conditions:

  This condition is observed when a satellite configuration on a router, imdr is configured on a ASR 9000 Enhanced Ethernet Line Card.

  Workaround:

  None.

- **CSCua51573**

  Basic Description:

  For 3 routers topology, Use TE Tunnel as a backup path. When OSPF LFA FRR occurs, all FRR packets dropped due to RESOLVE_UTURNCHECK_FRR_DROP.

  Symptom:

  Traffic is dropped under OSPF Basic LFA FRR due to RESOLVE_UTURNCHECK_FRR_DROP.

  Conditions:

  This is seen only in a three-router topology with the backup path configured over a TE-Tunnel.

  Workaround:

  Don't have a backup path over a TE-tunnel with basic LFA FRR in 4.2.3. This issue will be resolved in a future release-release 4.3.1. The Remote LFA FRR feature support is also planned for release during Release 4.3.1.

Caveats Specific to the ASR 9001 Router

- **CSCts82447**

  Basic Description:

  attachCon not working.

  Symptom:

  After running attachCon, the console will not connect to Line card. The below message is seen on console:

  attachCon is not supported in this release in this chassis type

  Conditions:

  This feature is not supported in 4.2.3 as well and will be supported from 4.3.0 onwards.

  Workaround:

  Convert AUX port as LC console from RP KSH using the command **fill –l 0xd2000198 0x4 0x80000001**. To revert back to AUX port, use **fill –l 0xd2000198 0x4 0x0**.

  Recovery:

None.

Upgrading Cisco IOS XR Software

Cisco IOS XR Software is installed and activated from modular packages, allowing specific features or software patches to be installed, upgraded, or downgraded without affecting unrelated processes. Software packages can be upgraded or downgraded on all supported card types, or on a single card (node).

Software packages are installed from package installation envelope (PIE) files that contain one or more software components.

Refer to Table 1: Cisco IOS XR Software Release 4.2.3 PIE Files, on page 3 for a list of the Cisco ASR 9000 Series Aggregation Services Router Software feature set matrix (PIE files) and associated filenames available for the Cisco IOS XR Software Release 4.2.3 supported on the Cisco ASR 9000 Series Aggregation Services Router.

The following URL contains links to information about how to upgrade Cisco IOS XR Software:

http://www.cisco.com/web/Cisco_IOS_XR_Software/index.html

Troubleshooting

For information on troubleshooting Cisco IOS XR Software, see the *Cisco ASR 9000 Series Aggregation Services Routers Getting Started Guide* and the *Cisco ASR 9000 Series Router Troubleshooting Feature Module*

Resolving Upgrade File Issues

Note In some very rare cases inconsistencies in the content of the internal configuration files can appear. In such situations, to avoid configuration loss during upgrade, the following steps can be optionally done before activating packages:

1. Clear the NVGEN cache:

```
RP/0/RSP0/CPU0:router# run nvgen -F 1
```

2. Create a dummy config commit:

```
RP/0/RSP0/CPU0:router# config
RP/0/RSP0/CPU0:router(config)# hostname <hostname>
RP/0/RSP0/CPU0:rotuer(config)# commit
RP/0/RSP0/CPU0:router(config)# end
```

3. Force a commit update by using the **reload** command. Press **n** when the confirmation prompt appears:

```
RP/0/RSP0/CPU0:router# reload

Updating Commit Database. Please wait...[OK]

Proceed with reload? [confirm]
```

4 Press **n**

In some cases other activity may preclude a reload. The following message may display:

```
RP/0/RSP0/CPU0:router# reload

Preparing system for backup. This may take a few minutes .....System
configuration backup in progress [Retry later]
```

If you receive this message wait and then retry the command after some time.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*, at: http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html.

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