Release Notes for Cisco ASR 9000 Series Aggregation Services Routers for Cisco IOS XR Software Release 5.1.0

Release Notes for Cisco ASR 9000 Series Routers 5.1.0

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 Routers running Cisco IOS XR Software Release 5.1.0, see the Important Notes, on page 58.

This release notes describe the features provided on the Cisco ASR 9000 Series Aggregation Services Routers running Cisco IOS XR Software Release 5.1.0 and are updated as needed.

For a list of software caveats that apply to the Cisco ASR 9000 Series Aggregation Services Routers running Cisco IOS XR Software Release 5.1.0, see the Caveats, on page 60 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 TE 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), IGMPv2 and v3 snooping, Multicast Listener Discovery (MLD) versions 1 and 2, and MLD snooping versions 1 and 2.
- **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, 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 .

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 5.1.0.

This table lists the Cisco ASR 9000 Series Aggregation Services Router Software feature set matrix (PX PIE files) and associated filenames available for the Release 5.1.0 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 1: Cisco IOS XR Software Release 5.1.0 PX PIE Files

Feature Set	Filename	Description
Composite Package		
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-px.pie-5.1.0	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-5.1.0	Contains the required core packages including OS, Admin, Base, Forwarding, Forwarding Processor Card 40G, Routing, SNMP Agent, Diagnostic Utilities, and Alarm Correlation.
Optional Individual Packages (Packages are installed individually)		
Cisco IOS XR Manageability Package	asr9k-mgbl-px.pie-5.1.0	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-5.1.0	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-5.1.0	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 Advanced Video Package	asr9k-video-px.pie-5.1.0	Firmware for the advanced video feature for Cisco ASR 9000 Series Router chassis.
Cisco IOS XR Optics Package	asr9k-optic-px.pie-5.1.0	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-5.1.0	Firmware pie for all LC and RSP FPGAs and ASICs.
Cisco IOS XR Documentation Package	asr9k-doc-px.pie-5.1.0	.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-5.1.0	Includes binaries to support CGv6 on ISM.
Cisco IOS XR Satellite Package - ASR9000v	asr9000v-nV-px.pie-5.1.0	Includes binaries to support Cisco ASR9000v Series Router Software and to support Cisco ASR 9000v Series Router as a satellite for Cisco ASR 9000 Series Router.

Cisco IOS XR BNG Package	asr9k-bng-px.pie-5.1.0	Includes binaries to support BNG features.
Cisco IOS XR Satellite Package - ASR903	asr9k-asr903-nV-px.pie-5.1.0	Includes binaries to support Cisco ASR 903 Series Router software and to support Cisco ASR 903 Series Router as a satellite for Cisco ASR 9000 Series Router.
Cisco IOS XR Satellite Package - ASR901	asr9k-asr901-nV-px.pie-5.1.0	Includes binaries to support Cisco ASR 901 Series Router software and to support Cisco ASR 901 Series Router as a satellite for Cisco ASR 9000 Series Router.
Cisco IOS XR Security Package	asr9k-k9sec-px.pie-5.1.0	Support for Encryption, Decryption, IP Security (IPSec), Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI) (IPSec is supported only for OSPFv3).

Note

- PX PIE image files are the only option on all ASR9000 platforms including RSP-2 and ASR9001 starting from Cisco IOS XR Software Release 4.3.0.
- Starting Cisco IOS XR Software Release 4.3.0 of the Cisco ASR 9000 Aggregation Services Router platform, P images are no longer required. The P images are now converged with PX. Through the normal upgrade process the migration will happen to PX.

This table lists the Cisco ASR 9000 Series Aggregation Services Router TAR files.

Table 2: Cisco IOS XR Software Release 5.1.0 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP440 systems]	ASR9K-iosxr-px-5.1.0.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-k9-5.1.0.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 5.1.0 consist of the following:

- minimum 6 GB memory on the RSP-440, and ASR9922 RP
- 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:

Table 3: ASR 9000 Low and High Memory RSPs with PIDs and Minimum Software Requirement

Description	PID	Release
ASR 9922 Route Processor 6 GB for Packet Transport	ASR-9922-RP-TR	Release 4.2.2
ASR 9922 Route Processor 12 GB for Service Edge	ASR-9922-RP-SE	Release 4.2.2
ASR9001 Route Switch Processor 8 GB	ASR9001-RP	Release 4.2.1
ASR9K Route Switch Processor with 440G/slot Fabric and 6 GB	A9K-RSP440-TR	Release 4.2.0
ASR9K Route Switch Processor with 440G/slot Fabric and 12 GB	A9K-RSP440-SE	Release 4.2.0
ASR9K Fabric, Controller 4 GB memory	A9K-RSP-4G	Release 3.7.2
Route Switch Processor 8 GB Memory	A9K-RSP-8G	Release 3.7.2
ASR 9900 Route Processor 12 GB for Service Edge	ASR-9900-RP-SE	Release 4.3.2
ASR 9900 Route Processor 6 GB for Packet Transport	ASR-9900-RP-TR	Release 4.3.2
ASR Route Processor 32 GB for Service Edge	A99-RP2-SE	Release 5.3.0

Supported Hardware

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

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

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

Component	Part Number	Support from Release
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	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot DC Chassis w/ PEM V2	ASR-9922-DC	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	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Center	ASR-9922-FLTR-CEN	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Left & Right	ASR-9922-FLTR-LR	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor Filler	ASR-9922-RP-FILR	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 12GB for Service Edge	ASR-9922-RP-SE	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 6GB for Packet Transport	ASR-9922-RP-TR	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card Slot Filler	ASR-9922-SFC-FILR	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card/110G	ASR-9922-SFC110	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 2-RU		
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Route Processor	—	4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Fan Tray Version 2	ASR-9001-FAN-V2	

Cisco ASR 9000 Series Aggregation Services Router 2-Slot Fan Tray	ASR-9001-FAN	4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Line Card	ASR-9001-LC	4.2.1
Cisco ASR 9000 Series Aggregation Services Router	ASR-9001-TRAY	4.2.1
Cisco ASR 9000 Series Aggregation Services Router 6-Slot		
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray Version 2	ASR-9006-FAN-V2	
Cisco ASR 9000 Series Aggregation Services Router 6-Slot System	ASR-9006	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	ASR-9006-FAN	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Door Kit	ASR-9006-DOOR	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot AC Chassis	ASR-9006-AC	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot DC Chassis	ASR-9006-DC	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	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot		
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray Version 2	ASR-9010-FAN-V2	
Cisco ASR 9000 Series Aggregation Services Router 10-Slot System	ASR-9010	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray	ASR-9010-FAN	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Door Kit	ASR-9010-DOOR	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot AC Chassis	ASR-9010-AC	3.7.2

Cisco ASR 9000 Series Aggregation Services Router 10-Slot DC Chassis	ASR-9010-DC	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 2 Post Mounting Kit	ASR-9010-2P-KIT	3.7.2
Cisco ASR 9000 Series Aggregration Services Router 4 Post Mounting Kit	ASR-9010-2P-KIT	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	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	PWR-2KW-DC-V2	4.2.0
Cisco ASR 9000 Series Aggregation Services Router 3KW AC Power Module, version 2	PWR-3KW-AC-V2	4.2.0
Cisco ASR 9000 Series Aggregation Services Router AC Power Entry Module Version 2	A9K-AC-PEM-V2	4.2.0
Cisco ASR 9000 Series Aggregation Services Router DC Power Entry Module Version 2	A9K-DC-PEM-V2	4.2.0
Cisco ASR 9000 Series Aggregation Services Router Power Entry Module Version 2 Filler	A9K-PEM-V2-FILR	4.2.0
Cisco ASR 9000 Series Aggregation Services Router 1.5kW DC Power Module	A9K-1.5KW-DC	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 2kW DC Power Module	A9K-2KW-DC	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 3kW AC Power Module	A9K-3KW-AC	3.7.2
Cisco ASR 9000 Series Aggregation Services Router Line Cards		

Cisco ASR 9000 Series Aggregation Services Router Virtualized Services Module (VSM) line card	A9K-VSM-500	5.1.2
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Service Edge Optimized	A9K-1X100GE-SE	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Packet Transport Optimized	A9K-1X100GE-TR	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Service Edge Optimized	A9K-36X10GE-SE	4.2.2
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Packet Transport Optimized LC	A9K-36X10GE-TR	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	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	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, Low Queue	A9K-2T20GE-L	3.9.1
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet, Medium Queue	A9K-4T-B	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet Extended Line Card, High Queue	A9K-4T-E	3.7.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet, Low Queue	A9K-4T-L	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	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	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	3.9.0
Cisco ASR 9000 Series Aggregation Services Router 8-Port Ten Gigabit Ethernet, Medium Queue	A9K-8T/4-B	3.7.2

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

Cisco ASR 9000 Series Aggregation Services Router 8-port 10GE Modular Port Adapter	A9K-MPA-8x10GE	4.3.1
Cisco ASR 9000 Series Aggregation Services Router 1-port 40GE Modular Port Adapter	A9K-MPA-1x40GE	4.2.3
Cisco ASR 9000 Series Aggregation Services Router 4-port 10GE Modular Port Adapter	A9K-MPA-4x10GE	4.2.0
Cisco ASR 9000 Series Aggregation Services Router 20-port 1GE Modular Port Adapter	A9K-MPA-20x1GE	4.2.0
Cisco ASR 9000 Series Aggregation Services Router 2-port 10GE Modular Port Adapter	A9K-MPA-2x10GE	4.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-port 40GE Modular Port Adapter	A9K-MPA-2x40GE	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	3.7.2
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor, 8G Memory	A9K-RSP-8G	4.0.1
Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor Filler	ASR-9000-RSP-FILR	3.7.2
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Service Edge Optimized	A9K-RSP-440-SE	4.2.0
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Packet Transport Optimized	A9K-RSP-440-TR	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	3.9.0
2-Port Channelized OC-12/DS0 SPA	SPA-2XCHOC12/DS0	3.9.0
1-Port Channelized OC48/STM16 DS3 SPA	SPA-1XCHOC48/DS3	4.0.1
2-Port OC-48/STM16 SPA	SPA-2XOC48POS/RPR	4.0.1
8-Port OC12/STM4 SPA	SPA-8XOC12-POS	4.0.1
1-Port OC-192/STM-64 POS/RPR SPA	SPA-OC192POS-XFP	4.0.1

4-Port Clear Channel T3/E3 SPA	SPA-4XT3E3	4.0.1
2-Port Clear Channel T3/E3 SPA	SPA-2XT3E3	4.0.1
1-Port Channelized OC-3/STM-1 SPA	SPA-1XCHSTM1/OC3	4.0.1
4-Port OC-3/STM-1 POS SPA	SPA-4XOC3	4.0.1
8-Port OC-3/STM-1 POS SPA	SPA-8XOC3	4.0.1
4-Port Channelized T3 to DS0 SPA	SPA-4XCT3/DS0	4.1.0
8-Port Channelized T1/E1 SPA	SPA-8XCHT1/E1	4.1.0
1-Port and 3-Port Clear Channel OC-3 ATM SPA	SPA-1/3XOC3ATM	4.2.0
1-Port Clear Channel OC-12 ATM SPA	SPA-1XOC12ATM	4.2.0
1-Port Channelized OC-3 ATM CEoP SPA	SPA-1XOC3-CE-ATM	4.2.0

Software Compatibility

Cisco IOS XR Software Release 5.1.0 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 documents:
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 running on the Cisco ASR 9000 Series Router, run the **show fpd package** command in admin mode.

If 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 fpd package

================================ ============================================
                                          Field Programmable Device Package
                                 ============================================
                                                              SW      Min Req   Min Req
Card Type            FPD Description            Type Subtype  Version  SW Ver    HW Vers
==================== ========================== ==== ======= ========== ========  =========
ASR-9904-BPID2       Can Bus Ctrl (CBC) BP2     bp   cbc          7.104       0.00      0.1

--------------------------------------------------------------------------------------------
ASR-9912-BPID2       Can Bus Ctrl (CBC) BP2     bp   cbc          7.104       0.00      0.1
```

	Can Bus Ctrl (CBC) BP2	lc	cbc	7.104	0.00	0.1
ASR-9922-BPID2	Can Bus Ctrl (CBC) BP2	bp	cbc	7.104	0.00	0.1
	Can Bus Ctrl (CBC) BP2	lc	cbc	7.104	0.00	0.1
A9K-BPID2-10-SLOT	Can Bus Ctrl (CBC) BP2	bp	cbc	7.104	0.00	0.1
	Can Bus Ctrl (CBC) BP2	lc	cbc	7.104	0.00	0.1
A9K-BPID2-6-SLOT	Can Bus Ctrl (CBC) BP2	bp	cbc	7.104	0.00	0.1
	Can Bus Ctrl (CBC) BP2	lc	cbc	7.104	0.00	0.1
ASR-9922-SFC110	Can Bus Ctrl (CBC) MTFC	fc	cbc	28.05	0.00	0.1
	Fabric Ctrl0 MTFC	fc	fpga7	1.02	0.00	0.1
	Can Bus Ctrl (CBC) MTFC	lc	cbc	28.05	0.00	0.1
ASR-9912-SFC110	Can Bus Ctrl (CBC) SSFC	fc	cbc	32.04	0.00	0.1
	Fabric Ctrl0 MTFC	fc	fpga7	1.02	0.00	0.1
ASR-9010-FAN	Can Bus Ctrl (CBC) FAN	ft	cbc	4.02	0.00	0.1
	Can Bus Ctrl (CBC) FAN	lc	cbc	4.02	0.00	0.1
ASR-9006-FAN	Can Bus Ctrl (CBC) FAN	ft	cbc	5.02	0.00	0.1
	Can Bus Ctrl (CBC) FAN	lc	cbc	5.02	0.00	0.1
ASR-9922-FAN	Can Bus Ctrl (CBC) MFAN	ft	cbc	29.11	0.00	0.1
	Can Bus Ctrl (CBC) MFAN	lc	cbc	29.11	0.00	0.1
ASR-9912-FAN	Can Bus Ctrl (CBC) SFAN	ft	cbc	31.04	0.00	0.1
ASR-9010-FAN-V2	Can Bus Ctrl (CBC) FAN	ft	cbc	29.11	0.00	0.1
	Can Bus Ctrl (CBC) FAN	lc	cbc	29.11	0.00	0.1
ASR-9904-FAN	Can Bus Ctrl (CBC) SFAN	ft	cbc	31.04	0.00	0.1
ASR-9001-FAN	Can Bus Ctrl (CBC) FAN	ft	cbc	24.114	0.00	0.1
	Can Bus Ctrl (CBC) FAN	lc	cbc	24.114	0.00	0.1
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	6.11	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	6.12	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	6.11	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	6.12	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	6.11	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	6.12	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-SIP-700-8G	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	1.35	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
	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
	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
	ROMMONB RSP2	lc	rommon	1.06	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	1.02	0.00	0.1
	Fabric Ctrl4 MTFC	lc	fpga11	1.02	0.00	0.1
	Fabric Ctrl5 MTFC	lc	fpga12	1.02	0.00	0.1
	Fabric Ctrl6 MTFC	lc	fpga13	1.02	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	1.04	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	1.02	0.00	0.1
	Fabric Ctrl1 MTFC	lc	fpga8	1.02	0.00	0.1
	Fabric Ctrl2 MTFC	lc	fpga9	1.02	0.00	0.1
	CPUCtrl0	lc	fpga1	1.04	0.00	0.1
	ROMMONB MTRP	lc	rommon	5.11	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	1.02	0.00	0.1
	Fabric Ctrl4 MTFC	lc	fpga11	1.02	0.00	0.1
	Fabric Ctrl5 MTFC	lc	fpga12	1.02	0.00	0.1
	Fabric Ctrl6 MTFC	lc	fpga13	1.02	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	1.04	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	1.02	0.00	0.1
	Fabric Ctrl1 MTFC	lc	fpga8	1.02	0.00	0.1
	Fabric Ctrl2 MTFC	lc	fpga9	1.02	0.00	0.1
	CPUCtrl0	lc	fpga1	1.04	0.00	0.1
	ROMMONB MTRP	lc	rommon	5.11	0.00	0.1
ASR-9900-RP-TR	Can Bus Ctrl (CBC) MTRP	lc	cbc	25.02	0.00	0.1
	Fabric Ctrl3 MTFC	lc	fpga10	1.02	0.00	0.1
	Fabric Ctrl4 MTFC	lc	fpga11	1.02	0.00	0.1
	Fabric Ctrl5 MTFC	lc	fpga12	1.02	0.00	0.1
	Fabric Ctrl6 MTFC	lc	fpga13	1.02	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	1.04	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	1.02	0.00	0.1

	Fabric Ctrl1 MTFC	lc	fpga8	1.02	0.00	0.1
	Fabric Ctrl2 MTFC	lc	fpga9	1.02	0.00	0.1
	CPUCtrl0	lc	fpga1	1.04	0.00	0.1
	ROMMONB MTRP	lc	rommon	5.11	0.00	0.1
ASR-9900-RP-SE	Can Bus Ctrl (CBC) MTRP	lc	cbc	25.02	0.00	0.1
	Fabric Ctrl3 MTFC	lc	fpga10	1.02	0.00	0.1
	Fabric Ctrl4 MTFC	lc	fpga11	1.02	0.00	0.1
	Fabric Ctrl5 MTFC	lc	fpga12	1.02	0.00	0.1
	Fabric Ctrl6 MTFC	lc	fpga13	1.02	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	1.04	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	1.02	0.00	0.1
	Fabric Ctrl1 MTFC	lc	fpga8	1.02	0.00	0.1
	Fabric Ctrl2 MTFC	lc	fpga9	1.02	0.00	0.1
	CPUCtrl0	lc	fpga1	1.04	0.00	0.1
	ROMMONB MTRP	lc	rommon	5.11	0.00	0.1
ASR9001-RP	Can Bus Ctrl (CBC) IMRP	lc	cbc	22.114	0.00	0.1
	MB CPUCtrl	lc	fpga2	1.14	0.00	0.0
	ROMMONB IM RP	lc	rommon	2.01	0.00	0.1
A9K-24x10GE-SE	Can Bus Ctrl (CBC) LC6	lc	cbc	19.111	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.03	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.01	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.07	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-2x100GE-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	21.110	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.08	0.00	0.0
	PortCtrl	lc	fpga3	1.05	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	39.00	0.00	0.0

	ROMMONB LC4	lc	rommon	2.00	0.00	0.0
A9K-MOD80-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.117	0.00	0.1
	DB Ctrl	lc	fpga2	1.04	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.1
A9K-MOD160-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	20.117	0.00	0.1
	DB Ctrl	lc	fpga2	1.04	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.1
A9K-24x10GE-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	19.111	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.03	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.01	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.07	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-2x100GE-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	21.110	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.08	0.00	0.0
	PortCtrl	lc	fpga3	1.05	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	39.00	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.0
A9K-MOD80-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.117	0.00	0.1
	DB Ctrl	lc	fpga2	1.04	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.1
A9K-MOD160-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	20.117	0.00	0.1
	DB Ctrl	lc	fpga2	1.04	0.00	0.0
	MB CPUCtrl	lc	fpga4	1.05	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	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	15.103	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.03	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-36x10GE_SC7-SE	Can Bus Ctrl (CBC) LC6	lc	cbc	15.103	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.03	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-36x10GE-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	15.103	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.03	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-36x10GE_SC7-TR	Can Bus Ctrl (CBC) LC6	lc	cbc	15.103	0.00	0.0
	DBCtrl LC6	lc	fpga2	1.01	0.00	0.0
	LinkCtrl LC6	lc	fpga3	1.00	0.00	0.0
	LCCPUCtrl LC6	lc	fpga4	1.03	0.00	0.0
	ROMMONB LC6	lc	rommon	2.00	0.00	0.0
A9K-1x100GE-SE	Can Bus Ctrl (CBC) LC4	lc	cbc	21.110	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.08	0.00	0.0
	PortCtrl	lc	fpga3	1.05	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	39.00	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.0
A9K-1x100GE-TR	Can Bus Ctrl (CBC) LC4	lc	cbc	21.110	0.00	0.1
	DB IO FPGA1	lc	cpld1	1.03	0.00	0.0
	MB CPUCtrl	lc	fpga2	1.08	0.00	0.0
	PortCtrl	lc	fpga3	1.05	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	39.00	0.00	0.0
	ROMMONB LC4	lc	rommon	2.00	0.00	0.0
ASR9001-LC	Can Bus Ctrl (CBC) IMLC	lc	cbc	23.114	0.00	0.1
	DB CPUCtrl	lc	fpga2	1.18	0.00	0.0
	EP Gambit	lc	fpga3	0.08	0.00	0.0
	MB CPUCtrl	lc	fpga4	2.07	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	2.01	0.00	0.1
ASR9001-LC-S	Can Bus Ctrl (CBC) IMLC	lc	cbc	23.114	0.00	0.1
	DB CPUCtrl	lc	fpga2	1.18	0.00	0.0
	EP Gambit	lc	fpga3	0.08	0.00	0.0
	MB CPUCtrl	lc	fpga4	2.07	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	2.01	0.00	0.1
A9K-ISM-100	Can Bus Ctrl (CBC) LC6	lc	cbc	18.08	0.00	0.1
	CPUCtrl LC6	lc	cpld1	0.01	0.00	0.1
	Maintenance LC6	lc	fpga2	2.13	0.00	0.1
	Amistad LC6	lc	fpga1	0.33	0.00	0.20
	ROMMONB LC6	lc	rommon	1.02	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-OC192POS-XFP	SPA FPGA swv1.101 hwv3	spa	fpga2	1.101	0.00	3.0
	SPA FPGA swv1.2 hwv2	spa	fpga1	1.02	0.00	2.0
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-24CHT1-CE-ATM	SPA T3 Subrate FPGA	spa	fpga2	1.10	0.00	1.0
	SPA I/O FPGA	spa	fpga1	2.32	0.00	1.0
	SPA ROMMON	spa	rommon	1.03	0.00	1.0
SPA-2CHT3-CE-ATM	SPA T3 Subrate FPGA	spa	fpga2	1.11	0.00	1.0
	SPA I/O FPGA	spa	fpga1	2.22	0.00	1.0
	SPA ROMMON	spa	rommon	1.04	0.00	1.0
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
A9K-MPA-8X10GE	EP I/O FPGA	spa	fpga8	1.00	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-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
--------------------------------------------------------------------------------
```

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:

SUMMARY STEPS

1. Establish a Telnet session with the router.
2. Enter **show version** command from EXEC mode.

DETAILED STEPS

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
Cisco IOS XR Software, Version 5.1.0[Default]
Copyright (c) 2013 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 1.06(20120210:003513) [ASR9K ROMMON],

A9K-PE4 uptime is 21 hours, 59 minutes
System image file is "bootflash:disk0/asr9k-os-mbi-5.1.0/0x100000/mbiasr9k-rp.vm"
```

```
cisco ASR9K Series (MPC8641D) processor with 4194304K bytes of memory.
MPC8641D processor at 1333MHz, Revision 2.2
ASR-9010

4 Management Ethernet
46 DWDM controller(s)
46 TenGigE
46 WANPHY controller(s)
20 GigabitEthernet
219k bytes of non-volatile configuration memory.
977M bytes of compact flash card.
67988M bytes of hard disk.
1906672k bytes of disk0: (Sector size 512 bytes).
1906672k bytes of disk1: (Sector size 512 bytes).

Configuration register on node 0/RSP0/CPU0 is 0x1922
Boot device on node 0/RSP0/CPU0 is disk0:
Package active on node 0/RSP0/CPU0:
asr9k-9000v-nV-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-9000v-nV-supp-5.1.0
    Built on Fri Sep  6 22:05:52 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-9000v-nV-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-9000v-nV-px-5.1.0
    Built on Fri Sep  6 22:05:55 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
iosxr-mgbl, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mgbl-5.1.0
    Built on Fri Sep  6 21:59:34 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mgbl-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mgbl-supp-5.1.0
    Built on Fri Sep  6 21:59:34 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mgbl-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mgbl-px-5.1.0
    Built on Fri Sep  6 21:59:54 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-security, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-security-5.1.0
    Built on Fri Sep  6 21:59:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-k9sec-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-k9sec-supp-5.1.0
    Built on Fri Sep  6 21:59:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-k9sec-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-k9sec-px-5.1.0
    Built on Fri Sep  6 22:01:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fpd, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fpd-5.1.0
    Built on Fri Sep  6 22:04:31 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fpd-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fpd-px-5.1.0
    Built on Fri Sep  6 22:05:25 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9K-doc-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9K-doc-supp-5.1.0
    Built on Fri Sep  6 22:02:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-doc-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-doc-px-5.1.0
    Built on Fri Sep  6 22:04:26 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
```

```
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Configuration register on node 0/RSP1/CPU0 is 0x1922
Boot device on node 0/RSP1/CPU0 is disk0:
Package active on node 0/RSP1/CPU0:
```

```
asr9k-9000v-nV-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-9000v-nV-supp-5.1.0
    Built on Fri Sep  6 22:05:52 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-9000v-nV-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-9000v-nV-px-5.1.0
    Built on Fri Sep  6 22:05:55 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mgbl, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mgbl-5.1.0
    Built on Fri Sep  6 21:59:34 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mgbl-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mgbl-supp-5.1.0
    Built on Fri Sep  6 21:59:34 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mgbl-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mgbl-px-5.1.0
    Built on Fri Sep  6 21:59:54 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-security, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-security-5.1.0
    Built on Fri Sep  6 21:59:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-k9sec-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-k9sec-supp-5.1.0
    Built on Fri Sep  6 21:59:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-k9sec-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-k9sec-px-5.1.0
    Built on Fri Sep  6 22:01:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fpd, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fpd-5.1.0
    Built on Fri Sep  6 22:04:31 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fpd-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fpd-px-5.1.0
    Built on Fri Sep  6 22:05:25 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9K-doc-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9K-doc-supp-5.1.0
    Built on Fri Sep  6 22:02:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-doc-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-doc-px-5.1.0
    Built on Fri Sep  6 22:04:26 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/0/CPU0 is mem:
Package active on node 0/0/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/1/CPU0 is mem:
Package active on node 0/1/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/2/CPU0 is mem:
Package active on node 0/2/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/3/CPU0 is mem:
Package active on node 0/3/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/4/CPU0 is mem:
Package active on node 0/4/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/5/CPU0 is mem:
Package active on node 0/5/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/6/CPU0 is mem:
Package active on node 0/6/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optics-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optics-supp-5.1.0
    Built on Fri Sep  6 22:05:37 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-optic-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-optic-px-5.1.0
    Built on Fri Sep  6 22:05:38 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
    Built on Fri Sep  6 21:58:43 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
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    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
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    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

Boot device on node 0/7/CPU0 is mem:
Package active on node 0/7/CPU0:
iosxr-adv-video, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-adv-video-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-adv-video-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-adv-video-supp-5.1.0
    Built on Fri Sep  6 22:05:30 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-video-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-video-px-5.1.0
    Built on Fri Sep  6 22:05:36 UTC 2013
```

```
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

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    Built on Fri Sep  6 22:05:37 UTC 2013
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iosxr-mpls, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mpls-5.1.0
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asr9k-mpls-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mpls-px-5.1.0
    Built on Fri Sep  6 21:59:02 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-mcast, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-mcast-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mcast-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-supp-5.1.0
    Built on Fri Sep  6 21:59:04 UTC 2013
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asr9k-mcast-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mcast-px-5.1.0
    Built on Fri Sep  6 21:59:32 UTC 2013
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iosxr-infra, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-infra-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-fwding, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-fwding-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-routing, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-routing-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-diags, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-diags-5.1.0
    Built on Fri Sep  6 21:49:53 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

iosxr-ce, V 5.1.0[Default], Cisco Systems, at disk0:iosxr-ce-5.1.0
    Built on Fri Sep  6 21:49:56 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-os-mbi, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-os-mbi-5.1.0
    Built on Fri Sep  6 21:53:18 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

```
asr9k-base, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-base-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-fwding, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-fwding-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-diags-supp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-diags-supp-5.1.0
    Built on Fri Sep  6 21:50:02 UTC 2013
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asr9k-scfclient, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-scfclient-5.1.0
    Built on Fri Sep  6 21:50:05 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-cpp, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-cpp-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-ce, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-ce-5.1.0
    Built on Fri Sep  6 21:49:57 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie

asr9k-mini-px, V 5.1.0[Default], Cisco Systems, at disk0:asr9k-mini-px-5.1.0
    Built on Fri Sep  6 21:58:28 UTC 2013
    By iox-bld5 in /auto/srcarchive8/production/5.1.0/all/workspace for pie
```

What's New in Cisco IOS XR Release 5.1.x

See the following links for a summary of new and changes features and commands in Release 5.1.x:

- Features Added and Changed in Release 5.1.x
- Commands Added and Changed in Release 5.1.x

Software Features Introduced in Cisco IOS XR Software Release 5.1.0 for Cisco ASR 9000 Series Aggregation Service Router

BFD Dampening

Bidirectional Forwarding Detection (BFD) is a mechanism used by routing protocols to quickly realize and communicate the reachability failures to their neighbors. When BFD detects a reachability status change of a client, its neighbors are notified immediately. Sometimes it might be critical to minimize changes in routing tables so as not to impact convergence, in case of a micro failure. An unstable link that flaps excessively can

cause other devices in the network to consume substantial processing resources, and that can cause routing protocols to lose synchronization with the state of the flapping link.

The BFD Dampening feature introduces a configurable exponential delay mechanism. This mechanism is designed to suppress the excessive effect of remote node reachability events flapping with BFD. The BFD Dampening feature allows the network operator to automatically dampen a given BFD session to prevent excessive notification to BFD clients, thus preventing unnecessary instability in the network. Dampening the notification to a BFD client suppresses BFD notification until the time the session under monitoring stops flapping and becomes stable.

Configuring the BFD Dampening feature, especially on a high-speed interface with routing clients, improves convergence time and stability throughout the network. BFD dampening can be applied to all types of BFD sessions, including IPv4/single-hop/multihop, Multiprotocol Label Switching-Transport Profile (MPLS-TP), and Pseudo Wire (PW) Virtual Circuit Connection Verification (VCCV).

BFD Session Dampening

You can configure the BFD Dampening feature at the BFD template level (both single-hop and multihop templates). Dampening is applied to all the sessions that use the BFD template. If you choose not to have a session to be dampened, you should use a new BFD template without dampening for a new session. By default, the dampening functionality is not enabled on a template.

BFD over IRB

In order for a VLAN to span a router, the router must be capable of forwarding frames from one interface to another, while maintaining the VLAN header. If the router is configured for routing a Layer 3 (network layer) protocol, it will terminate the VLAN and MAC layers at the interface on which a frame arrives. The MAC layer header can be maintained if the router bridges the network layer protocol. However, even regular bridging terminates the VLAN header.

Using the Integrated Routing Bridging (IRB) feature in Cisco IOS XR Software Release 5.1.0 or greater, a router can be configured for routing and bridging the same network layer protocol, on the same interface. This allows the VLAN header to be maintained on a frame while it transits a router from one interface to another. IRB provides the ability to route between a bridged domain and a routed domain with the Bridge Group Virtual Interface (BVI). The BVI is a virtual interface within the router that acts like a normal routed interface that does not support bridging, but represents the comparable bridge group to routed interfaces within the router. The interface number of the BVI is the number of the bridge group that the virtual interface represents. This number is the link between the BVI and the bridge group.

Because the BVI represents a bridge group as a routed interface, it must be configured only with Layer 3 (L3) characteristics, such as network layer addresses. Similarly, the interfaces configured for bridging a protocol must not be configured with any L3 characteristics.

BFD over IRB is a multipath single-hop session. In a BFD multipath session, BFD can be applied over virtual interfaces or between interfaces that are multihops away. The Cisco IOS XR Software BFD multihop is based on the *RFC 5883—Bidirectional Forwarding Detection (BFD) for Multihop Paths*. BFD over IRB is supported on IPv4 address, IPv6 global address, and IPv6 link-local address. The BFD over IRB is supported only in asynchronous mode and does not support echo mode. The BFD over IRB feature is supported only on the ASR 9000 enhanced Ethernet line cards.

EIGRP Multi-Instance

The Enhanced Interior Gateway Routing Protocol (EIGRP) Multi-Instance feature allows multiple process instances to handle different routing instances and service the same VRF. Each process instance handles the routing instances configured under it. The multiple EIGRP process instance implementation allows to configure the EIGRP using a virtual-name in addition to an autonomous-system number.

Graceful Shutdown for OSPFv3

The OSPFv3 Graceful Shutdown feature preserves the data plane capability in these circumstances:

- RP failure resulting in a switch-over to the backup processor
- Planned OSPFv3 process restart, such as a restart resulting from a software upgrade or downgrade
- Unplanned OSPFv3 process restart, such as a restart resulting from a process crash

In addition, OSPFv3 will unilaterally shutdown and enter the exited state when a critical memory event, indicating the processor is critically low on available memory, is received from the sysmon watch dog process.

This feature supports nonstop data forwarding on established routes while the OSPFv3 routing protocol restarts. Therefore, this feature enhances high availability of IPv6 forwarding.

Protocol Shutdown Mode

In this mode the OSPFv3 operation is completely disabled. This is accomplished by flushing self-originated link state advertisements (LSAs), immediately bringing down local OSPFv3-supported interfaces, and clearing the Link State Database (LSDB). The non-local LSDB entries are removed by OSPFv3, These are not flooded (MaxAged).

The protocol shutdown mode can be invoked either manually through the **protocol shutdown** command that disables the protocol instance or when the OSPFv3 process runs out of memory. These events occur when protocol shut down is performed:

- The local Router LSA and all local Link LSAs are flushed. All other LSAs are eventually aged out by other OSPFv3 routers in the domain.
- OSPFv3 neighbors not yet in Full state with the local router are brought down with the Kill_Nbr event.
- After a three second delay, empty Hello packets are immediately sent to each neighbor that has an active adjacency.
    - An empty Hello packet is sent periodically until the dead_interval has elapsed.
    - When the dead_interval elapses, Hello packets are no longer sent.

After a Dead Hello interval delay (4 X Hello Interval), the following events are then performed:

- The LSA database from that OSPFv3 instance is cleared.
- All routes from RIB that were installed by OSPFv3 are purged.

The router will not respond to any OSPF control packets it receives from neighbors while in protocol shutdown state.

Protocol Restoration

The method of restoring the protocol is dependent on the trigger that originally invoked the shut down. If the OSPFv3 was shut down using the **protocol shutdown** command, then use the **no protocol shutdown** command to restore OSPFv3 back to normal operation. If the OSPFv3 was shutdown due to a Critical Memory message from the sysmon, then a Normal Memory message from sysmon, which indicates that sufficient memory has been restored to the processor, restores the OSPFv3 protocol to resume normal operation. When OSPFv3 is shutdown due to the Critical Memory trigger, it must be manually restarted when normal memory levels are restored on the route processor. It will not automatically restore itself.

These events occur when the OSPFv3 is restored:

1. All OSPFv3 interfaces are brought back up using the Hello packets and database exchange.
2. The local router and link LSAs are rebuilt and advertised.
3. The router replies normally to all OSPFv3 control messages received from neighbors.
4. Routes learned from other OSPFv3 routers are installed in RIB.

OSPFv3 Sham Link Support for MPLS VPN

OSPFv3 sham link represents the VPN backbone as a single point-to-point connection between the two PEs. OSPFv3 treats the sham link as a point-to-point unnumbered interface, similar to virtual-link. When OSPFv3 sham link is configured, ensure that the route to the remote endpoint of the sham-link exists in the VRF RIB.

If the route to the remote endpoint exists, sham link interface is brought up. If the route to the remote endpoint of the sham-link is removed from the VRF RIB, OSPFv3 receives redistribution callback and brings the sham link down.

Graceful Restart Procedure over the Sham-link

OSPFv3 treats the sham link as any other interface during the switch-over or process restart. OSPFv3 assumes that all the configured sham links are UP and tries to form an adjacency over them.

If the sham link is down prior to the switch-over, OSPFv3 sends the Hello packets to the remote endpoint. Once the final convergence signal is received from the RIB, OSPFv3 keeps the sham link either up or down based on the BGP route for each configured sham link in the RIB.

OSPFv3 installs the high AD routes over the sham link only after the BGP convergence is complete.

ECMP and OSPFv3 Sham-link

Equal Cost Multipath (ECMP) mechanism is used to load-balance traffic on the Sham-link if there are multiple iBGP path for a prefix. If the sham link path and the backdoor path have the same cost, ECMP between the sham link path and backdoor path is not supported.

User Defined Martian Check

The Cisco IOS XR Software Release 5.1.0 allows to disable the Martian check for the following IP address prefixes:

- IPv4 address prefixes

- 0.0.0.0/8
- 127.0.0.0/8
- 224.0.0.0/4

- IPv6 address prefixes
  - ::
  - ::0002 - ::ffff
  - ::ffff:a.b.c.d
  - fe80:xxxx
  - ffxx:xxxx

Ethernet Data Plane Loopback

The Ethernet Data Plane Loopback feature allows you to test the services and throughput of an Ethernet port or a device using a test generator. You can verify the maximum rate of frame transmission with no frame loss. This feature allows bidirectional throughput measurement, and on-demand or out-of-service (intrusive) operation during service turn-up. This feature can be used for testing during service turn-up and troubleshooting of services after the turn-up.

For information on Ethernet Data Plane Loopback configuration, see the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide*.

Sampled Traffic Mirroring

Sampled Traffic Mirroring or Sampled SPAN is an extension of the SPAN feature which allows you to sample the packets based on a configured interval. Sampled SPAN can be applied on a physical port in order to include all the forwarding interfaces on that port. You can also configure the sampling rate of monitoring that is configured for each source port.

For more information on Sampled Traffic Mirroring, see the *Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide*.

Idle Timeout for IPoE and PPPoE Sessions

The Idle Timeout feature for IPoE and PPPoE sessions allows users to configure a maximum period of time that the subscriber sessions may remain idle. The subscriber sessions are terminated when this timeout period expires. The BNG monitors both the ingress and egress traffic for the determination of the idle time for the subscriber sessions. Control packets are not considered while determining session inactivity.

For more information about the Idle Timeout for IPoE and PPPoE Sessions feature, see the *Configuring Subscriber Features* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*. For complete command reference for this feature, see the *Control Policy Commands* chapter and *Dynamic Template Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

Routing Support on Subscriber Sessions

Routing support on subscriber sessions allows dynamic routes to be added on an individual subscriber basis for IPoE sessions. This allows to forward traffic from the default Virtual Routing and Forwarding (VRF) towards the subscriber, or to access the routes behind the subscriber. As opposed to static routes, dynamic routes must be added and removed when subscribers are created and deleted. Dynamic routes can belong to a VRF other than that of the subscriber and they are supported for IPv4 subscribers only.

For more information about routing support on subscriber session, see the *Configuring Subscriber Features* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*.

Traffic Mirroring on Subscriber Session

BNG supports the Traffic Mirroring feature on subscriber session. Traffic mirroring, also known as Switched Port Analyzer (SPAN), enables a user to monitor Layer 2 network traffic passing in or out of a set of Ethernet interfaces. This allows the mirroring of packets that pass through a source interface to a specified destination interface. The destination interface may then be attached to a network analyzer for debugging.

For more information about the Traffic Mirroring on Subscriber Session feature, see the *Configuring Subscriber Features* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*. For complete command reference for this feature, see the *Dynamic Template Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

Per-VLAN Rapid Spanning Tree

This feature is the IEEE 802.1w (RSTP) standard implemented per VLAN, and is also known as Rapid PVST or PVST+. A single instance of STP runs on each configured VLAN (if you do not manually disable STP). Each Rapid PVST+ instance on a VLAN has a single root switch. You can enable and disable STP on a per-VLAN basis when you are running Rapid PVST+.

PVRST uses point-to-point wiring to provide rapid convergence of the spanning tree. The spanning tree reconfiguration can occur in less than one second with PVRST (in contrast to 50 seconds with the default settings in the 802.1D STP).

For more information on configuring PVRST, see the Implementing Multiple Spanning Tree Protocol module in the *Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide*. For more information on PVRST commands, see the *Cisco ASR 9000 Series Aggregation Services Router VPN and Ethernet Services Command Reference*.

Virtual Private LAN Services Label Switched Multicast

Virtual Private LAN Services (VPLS) is a Layer 2 based solution that efficiently sends multicast traffic over a multiprotocol label switching (MPLS) network. Point-to-point (P2P) pseudowires (PWs) are setup at PE routers participating in a VPLS domain to provide VPLS emulation. VPLS Label Switched Multicast (LSM) is an effective multicast solution for overcoming the limitations of ingress replication. This solution employs point-to-multipoint (P2MP) label switched path (LSP) in the MPLS network to transport multicast traffic over a VPLS domain. P2MP LSP minimizes the replication of packets and allows any replication in the network at the most optimal node.

For more information on configuring VPLS LSM, see the Implementing Multipoint Layer 2 Services module in the *Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide*. For more information on commands to configure VPLS LSM, see the *Cisco ASR 9000 Series Aggregation Services Router VPN and Ethernet Services Command Reference*.

DHCPv4 Server

DHCP server accepts address assignment requests and renewals and assigns the IP addresses from predefined groups of addresses contained within Distributed Address Pools (DAPS). DHCP server can also be configured to supply additional information to the requesting client such as the IP address of the DNS server, the default router, and other configuration parameters. DHCP server can accept broadcasts from locally attached LAN segments or from DHCP requests that have been forwarded by other DHCP relay agents within the network.

The DHCP proxy performs all the functions of a relay and also provides some additional functions. The DHCP proxy conceals DHCP server details from DHCP clients. The DHCP proxy modifies the DHCP replies such that the client considers the proxy to be the server. In this state, the client interacts with the proxy as if it is the DHCP server.

The pool is configured under server-profile-mode and server-profile-class-sub-mode. The class-based pool selection is always given priority over profile pool selection.

For more information about the DHCPv4 Server feature, see the *Implementing the Dynamic Host Configuration Protocol* module in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide*. For complete command reference of the DHCP commands, see the *DHCP Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Command Reference*.

IPv6 ACL Based Forwarding Object Tracking

The IPv6 ACL based forwarding (ABF) object tracking feature enables ABF to decide which next hop address to use, based on the state of the object being tracked for the next hop. IPv6 SLA echos are used to determine reachability to the next hop address. If the primary route is unreachable, the secondary route is used to forward traffic. IPv6 ABF object tracking is supported on ASR 9000 Enhanced Ethernet line cards only.

For more information about the IPv6 ACL Based Forwarding Object Tracking feature, see the *Implementing Access Lists and Prefix Lists* module in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide*. For complete command reference of the access list commands, see the *Access List Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Command Reference*.

Set DF Bit

The Set DF Bit feature enables to apply 'set df (do not fragment)' policy to an interface. Any packet that matches with the set df policy will either clear the bit or set the bit.

The set df bit policy can be enabled to clear the df bit before forwarding the packet in IPv4 traffic.

For more information on Set DF Bit, see the *Implementing MPLS Traffic Engineering* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide*. For more information on Set DF Bit commands, see the *MPLS Traffic Engineering Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference*.

MPLS over IRB

The Integrated Routing and Bridging (IRB) feature in Cisco IOS XR Software enables routing of a given protocol between routed interfaces and bridge groups within a single router. IRB support for MPLS introduces these capabilities:

- Bridge-Group Virtual Interface (BVI) support under MPLS LDP
- Targeted LDP session to BVI neighbor
- MPLS OAM for BVI interfaces
- Netflow for BVI interfaces while MPLS is enabled
- L2VPN using targeted MPLS LDP to BVI destination
- L3VPN
- 6PE/6VPE

MPLS over IRB is supported completely on ASR 9000 Enhanced Ethernet Line Card and Cisco ASR 9001. MPLS over IRB is not supported on ASR 9000 Ethernet Line Card.

For more information on MPLS over IRB, see the *Implementing MPLS Label Distribution Protocol* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide*. For more information on MPLS over IRB commands, see the *MPLS Label Distribution Protocol Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference*.

P2MP-TE Auto-tunnels

The MPLS point-to-multi point traffic-engineering auto-tunnels (P2MP-TE Auto-tunnels) feature enables dynamic creation and management of P2MP auto-tunnels for the transport of VPLS traffic on Cisco IOS XR Software. The P2MP-TE auto-tunnel configuration is disabled by default. Use the **auto-tunnel p2mp-te tunnel-id** configuration to enable P2MP-TE Auto-tunnel. This configures the tunnel ID range that can be allocated to P2MP auto-tunnels. This also determines the maximum number of P2MP auto-tunnels that can be created.

For more information on P2MP_TE Auto-tunnels, see the *Implementing MPLS Traffic Engineering* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide*. For more information on Set DF Bit commands, see the *MPLS Traffic Engineering Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference*.

16 Queues Support

The ASR 9000 traffic manager (TM) for the enhanced Ethernet line cards now supports up to 16 Queues. The extension is from 8 queues to 16 queues at leaf level called L4 in a QoS policy.

The L3, L4 service profiles in 16 Q-mode are similar to that of the 8 Q-mode, with just an increase in the number of normal priority queues.

For more information on 16 Queues Support, see *Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide*.

4arg

4arg is Cisco's implementation of Object Size Checking (OSC). OSC is a useful static analysis utility and a critical runtime defense for the detection and prevention of buffer overflows. 4arg captures buffer overflows (at runtime) that are otherwise undetected by code analysis tools and human review. 4arg also carries a reporting and logging component.

4arg refers to a theoretical fourth argument to a string copy function representing the destination buffer size.

Session MIB support on subscriber sessions

SNMP monitoring requires information about subscribers of all types. The CISCO-SUBSCRIBER-SESSION-MIB is defined to model per-subscriber data as well as aggregate subscriber (PPPoE) data. It is required to support notifications (traps) for aggregate session counts crossing configured thresholds. Generic MIB Data Collector Manager (DCM) support for CISCO-SUBSCRIBER-SESSION-MIB, helps faster data collection and also better handling of parallel data.

Implementing Traffic Storm Control under a VPLS Bridge

Traffic storm control provides Layer 2 port security under a Virtual Private LAN Services (VPLS) bridge by preventing excess traffic from disrupting the bridge. This module describes how to implement traffic storm control.

Traffic storm control can be configured at the bridge domain level. Support has been added to allow storm control rate to be configured in kbps. For more information about the Traffic Storm Control feature, see the *Implementing Traffic Storm Control under a VPLS Bridge* module in the *Cisco ASR 9000 Series Aggregation Services Router System Security Configuration Guide*. For complete command reference of Traffic Storm Control commands, see the *Traffic Storm Control Commands* chapter in the *Cisco ASR 9000 Series Aggregation Services Router System Security Command Reference*.

Hardware Features Introduced in Cisco IOS XR Software Release 5.1.0 for the Cisco ASR 9000 Series Router

- Cisco IOS XR Software Release 5.1.0 introduces support for the Cisco ASR 9904 Router, the latest addition to the Cisco ASR 9000 Series Routers. With the same innovations for high capacity brought by the Cisco ASR 9922 and Cisco ASR 9912 Routers, the Cisco ASR 9904 supports 2 line-cards slots, with each slot capable of switching up to 2 Tb/s of bi-directional traffic. In a small 6 RU form factor, the Cisco ASR 9904 can provide up to 4 Tb/s in one single chassis. It also provides 1+1 redundancy with 2 Route Switch Processors (RSPs), and the same modular power design common to the ASR 9000 Series Routers. For more information on installing the Cisco ASR 9904 Router, see the *Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide and Cisco ASR 9000 Series Aggregation Services Router Overview and Reference Guide* at http://www.cisco.com/en/US/products/ps9853/prod_installation_guides_list.html.
- Cisco IOS XR Software Release 5.1.0 introduces support for the lead-free (Pb-free) version of the SPA-OC192POS-XFP module.

Important Notes

- 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 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 ipv4 interface brief or show ipv6 interface briefcommand—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
```

Caveats

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

This section contains the caveats for Cisco ASR 9000 Series Aggregation Services Router Software Release5.1.0 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:

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:

- **CSCuh35357**

  Basic Description:

  The Cisco ASR9000 router sends two traps for BVI interfaces when it flaps with two R-ID.

  Symptom

  The Cisco ASR9000 router sends two link-state traps when BVI interface goes down and two link-state traps when BVI interface comes up.

  Conditions:

  Thos occurs when the BVI interface flaps.

  Workaround:

  None.

- **CSCui39371**

  Basic Description:

  "No CGN config" errors reported with ALG traffic for long hours.

  Symptom

  The console displays "No CGN config" error.

  Conditions:

  This occurs when running all types of ALG tests for a long duration.

  Workaround:

None.

- **CSCui93201**

  Basic Description:

  ingress drop at A9K-SIP-700 line card when bundle-pos is part of tunnel-te interface.

  Symptom

  The L3VPN trafffic is dropped in PE ingress interface as the mplsUnclassified drops.

  Conditions:

  When the A9K-SIP-700 line card is core facing, VPN label is not getting programmed properly.

  Workaround:

  None.

- **CSCui78505**

  Basic Description:

  Copy error in pkg/bin/pfilter_ea when applying ACL on 100G line card.

  Symptom

  The console displays the "pfilter_ea[294]: %OS-DATACORRUPTION-1-DATAINCONSISTENCY : copy error" message.

  Conditions:

  This occurs when compression level 1 or 3 is used in ACL.

  Workaround:

  None.

- **CSCui29635**

  Basic Description:

  OSPFv3 sham link is not up if core facing line card does not have VRF interface.

  Symptom

  OSPFv3 neighborship does not form over sham links.

  Conditions:

  This happens due to dropping of all the OSPFv3 sham link packets when the core facing line card is not the same as the edge facing line card and if OSPFv3 is not enabled on the core facing interface or line card.

  Workaround:

  Enable OSPFv3 on the ingress interface or line card and enable the OSPFv3 VRF on a dummy interface on the ingress line card.

- **CSCuh66582**

  Basic Description:

  The dhcpd process crashes when setting up more than 100,000 IPoEv4 sessions at high CPS.

  Symptom

  The dhcpd process crashes when setting up more than 100,000 IPoEv4 sessions at high CPS.

Conditions:

Thi happens at full supported scale when the FSOL rate is beyond 200 CPS.

Workaround:

Reduce the scale to <=100,000 and control the FSOL rate.

- **CSCud37497**

  Basic Description:

  System configuration fails when downgrading to Cisco IOS XR Software Release 4.2.x from Cisco IOS XR Software Release 4.3.1.

  Symptom

  The system displays the following logs (sample logs) continuously on console and system configuration never completes, while downgrading from Cisco IOS XR Software Release 4.3.1 to Cisco IOS XR Software Release 4.2.x.

```
RP/0/RSP0/CPU0: cfgmgr-rp[161]:
%MGBL-CONFIG-0-INIT_FAILURE : Configuration Manager was unable to initialize
the Configuration Namespace Version History module.
Error: 'Result too large'.
Initialization will be tried again after 60 seconds.
```

  Conditions:

  The issue recurs and it is observed while downgrading of Cisco IOS XR Software Release 4.3.1 to Cisco IOS XR Software Releaes 4.2.x.

  Workaround:

  Use the disk boot procedure and set the ROM Monitor (rommon) variable TURBOBOOT explicitly with format option, to downgrade successfully from Cisco IOS XR Software Release 4.3.1 to Cisco IOS XR Software Release 4.2.x.

  Ensure to backup the running-configurations if any, so as to apply the configurations later, after downgrade.

Caveats Specific to the ASR 9001 Router

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.

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.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. RSS feeds are a free service.