Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.1

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Note *This software release has reached end-of-life status. For more information, see the* End-of-Life and End-of-Sale Notices.

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Cisco IOS XR Release 6.3.1 is a limited availability (LA) release. All Cisco IOS XR Release 6.3.1 features are available in Cisco IOS XR Release 6.3.2, which is a general availability (GA) release. For more information on IOS XR Release 6.3.2, refer Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.2

Cisco ASR 9000 Series Aggregation Services Routers (ASR 9000 Series) deliver unprecedented scale, service flexibility, and high availability for service providers' fixed and mobile networks, data centers, and transport networks. The routers are powered by Cisco IOS XR Software, an innovative, self-healing, distributed operating system designed for always-on operation while scaling system capacity into multiple terabits per second (Tbps).

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

This release notes describe the features provided in the Cisco IOS XR Software Release 6.3.1 for the Cisco ASR 9000 Series router. See the Software Features Introduced in Cisco IOS XR Software Release 6.3.1 section in this document for information about new features provided on the Cisco ASR 9000 Series.

From Release 6.1.1 onwards, Cisco introduces support for the 64 bit Linux-based IOS XR operating system. Extensive feature parity is maintained between legacy 32-bit and new 64 bit environments.

IOS XR 64 bit on ASR 9000 is the next generation IOS XR running in virtualized environment with underlying 64 bit Linux kernel. Cisco IOS XR operating system delivers greater agility, automation and simplicity, while reducing the cost of operating the networks. Here are a few key capabilities:

- Flexible Packaging—Flexible packaging is an enhancement that modularizes and delivers the Cisco IOS XR operating system as RPM packages. The base software is becoming leaner that contains only required mandatory packages. Other optional packages are separated out and made available as individually installable RPM packages. Users have the flexibility to select and install the services they want by choosing relevant RPMs. Redhat Packet Manager (RPM) based delivery of packages enable easier and faster system updates.

- Data Models—Data models are a programmatic and standards-based way of configuring and collecting operational data of a network device, replacing the process of manual configuration. Using Data models, Cisco IOS XR operating system supports the automating of configurations that belong to multiple routers across the network. Data models are written in a standard, industry-defined language, which can define a new configuration and state an existing configuration on a network. Cisco IOS XR supports the YANG data modeling language. YANG can be used with the Network Configuration Protocol (Netconf) or with gRPC (google-defined Remote Procedure Calls) to automate programmable network operations.
- Application Hosting—Application hosting gives administrators a platform for leveraging their own tools and utilities. Cisco IOS XR supports third-party off-the-shelf applications built using Linux tool chains. Users can run custom applications cross-compiled with the software development kit that Cisco provides. Application hosting is offered in two variants: Native and Container. Cisco IOS XR uses a 64 bit Linux-based operating system that simplifies the integration of applications, configuration management tools, and industry-standard zero touch provisioning mechanisms to meet the DevOps style workflows for service providers.
- Telemetry—Streaming telemetry lets users direct data to a configured receiver for analysis and troubleshooting purposes in order to maintain the health of the network. This is achieved by leveraging the capabilities of machine-to-machine communication. Tuning a network based on real-time data is crucial for seamless operation of the network. Instead of a pull model, using a push model to continuously stream data out of the network enhances the operational performance and reduces the troubleshooting time. Data can be pushed out at intervals determined by the administrator, at a cadence as low as 10 seconds. Using sophisticated algorithms, a back-end server can then analyze data received from the Cisco IOS XR operating system. The data can be encoded in JavaScript Object Notation (JSON) or Google Protocol Buffers (GPB). This analysis enables back-end management systems to measure and even predict control-plane and data-plane trends.

To migrate from Cisco IOS XR to Cisco IOS XR 64 bit operating system on the ASR 9000 series routers, see Migrating from IOS XR to IOS XR 64 Bit guide.

For a list of software caveats that apply to this Release, see the Caveats section. The caveats are updated for every release and are described at:

http://www.cisco.com

Supported Packages and System Requirements

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

Feature Set Table

Cisco IOS XR

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 features for Cisco ASR 9000 Series Aggregation Services Router IOS XR Release 6.3.1.

This table lists the Cisco ASR 9000 Series Aggregation Services Router Software feature set matrix (PX PIE files) and associated filenames available for the Cisco IOS XR Release 6.3.1 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 1: Cisco IOS XR Software Release 6.3.1 PX PIE Files

Composite Package		
Feature Set	**Filename**	**Description**

Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-px.pie-6.3.1	Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation. The mini pie file is used for upgrading to the new release
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-px.vm-6.3.1	Contains the required core packages including OS, Admin, Base, Forwarding, Routing, SNMP Agent, Diagnostic Utilities, and Alarm Correlation. The mini VM file is used for turbobooting the device.
Individually-Installable Optional Packages		
Feature Set	**Filename**	**Description**
Cisco IOS XR Manageability Package	asr9k-mgbl-px.pie-6.3.1	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. IPSLA and environment MIBs are part of the mgbl pie.
Cisco IOS XR CGv6 VSM Package	asr9k-services-infra.pie- 6.3.1	Contains iso images and version details of System Admin Virtual Machine (VM) and Kernel-based Virtual Machine (KVM).
Cisco IOS XR MPLS Package	asr9k-mpls-px.pie-6.3.1	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-6.3.1	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-6.3.1	Software providing the vidmon and video quality monitoring feature for Cisco ASR 9000 Series Router chassis.
Cisco IOS XR Optics Package	asr9k-optic-px.pie-6.3.1	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-6.3.1	Firmware pie for all LC and RSP FPGAs and ASICs.
Cisco IOS XR Services Package	asr9k-services.pie-6.3.1	Includes binaries to support CGv6 on VSM.
Cisco IOS XR Documentation Package	asr9k-doc-px.pie-6.3.1	.man pages for Cisco IOS XR Software on the Cisco ASR 9000 Series Aggregation Services Router Chassis.
Cisco IOS XR Satellite Package - ASR9000v	asr9000v-nV-px.pie-6.3.1	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 Satellite Package - NCS 5001 and 5002	asr9k-ncs500x-nV-px.pie-6.3.1	Includes binaries to support Cisco NCS 5001/5002 Series Router Software and to support Cisco NCS 5001/5002 Series Router as a satellite for Cisco ASR 9000 Series Router.
Cisco IOS XR BNG Package	asr9k-bng-px.pie-6.3.1	Includes binaries to support BNG features.
Cisco IOS XR Lawful Intercept (LI) Package	asr9k-li-px.pie-6.3.1	Includes LI software images.
Cisco IOS XR Security Package	asr9k-k9sec-px.pie-6.3.1	Support for Encryption, Decryption,, Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI).

This table lists the Cisco IOS XR Software feature set matrix (TAR files) and associated filenames available for the Cisco IOS XR Software Release 6.3.1 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 2: Cisco IOS XR Software Release 6.3.1 TAR Files

Feature Set	**Filename**	**Description**
Cisco IOS XR IP/MPLS Core Software [for RSP440, RSP880 and RP systems]	ASR9K-iosxr-px-6.3.1-turboboot.tar	Contains only the mini.vm package.

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP440, RSP880 and RP systems]	ASR9K-iosxr-px-6.3.1-pies.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 BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Services Package • Cisco IOS XR Satellite Package • Cisco IOS XR Documentation Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software 3DES [for RSP-2, RSP440, RSP880 and RP systems]	ASR9K-iosxr-px-6.3.1-k9-pies.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 BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Services Package • Cisco IOS XR Satellite Package • Cisco IOS XR Documentation Package
Cisco IOS XR Bridge and SMUs	ASR9k-iosxr-px-6.3.1-bridge_smus.tar	Contains all bridge SMUs

Caution Before upgrading to a new release, you must install all available bridge SMUs of the current release.

Cisco IOS XR 64 bit

From Release 6.1.1 onwards, Cisco introduced support for the 64-bit IOS XR operating system.

This table lists the feature set matrix (ISO and RPM files) and associated filenames available for the Cisco IOS XR 64 bit 6.3.1 supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 3: Cisco IOS XR 64 bit Software Release 6.3.1 ISO and RPM Files

Composite Package		
Feature Set	**Filename**	**Description**

Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-x64-6.3.1.iso	Contains the required core packages, including OS, Admin, Base,Forwarding, Modular Services Card, Routing, SNMP Agent, and Alarm Correlation. The mini iso file is used for upgrading to the new release
Individually-Installable Optional Packages		
Feature Set	**Filename**	**Description**
Cisco IOS XR 64-bit EIGRP package	asr9k-eigrp-x64-1.0.0.0-r631.x86_64.rpm	Includes EIGRP protocol support software
Cisco IOS XR 64-bit ISIS package	asr9k-isis-x64-1.1.0.0-r631.x86_64.rpm	Includes IS-IS Link state protocol support software
Cisco IOS XR 64-bit OSPF package	asr9k-ospf-x64-1.1.0.0-r631.x86_64.rpm	Includes OSPF link state protocol support software
Cisco IOS XR 64-bit M2M package	asr9k-m2m-x64-2.0.0.0-r631.x86_64.rpm	Machine to Machine communication software
Cisco IOS XR Manageability Package	asr9k-mgbl-x64-3.0.0.0-r631.x86_64.rpm	CORBA2 agent, XML3 Parser, and HTTP server packages. This PIE also contains some SNMP MIB infrastructure. Certain MIBs won't work if this RPM is not installed. IPSLA and environment MIBs are part of the mgbl rpm.
Cisco IOS XR 64-bit MPLS-TE and RSVP package	asr9k-mpls-te-rsvp-x64-1.2.0.0-r631.x86_64.rpm	MPLS Traffic Engineering (MPLS-TE), Resource Reservation Protocol (RSVP).
Cisco IOS XR 64-bit MPLS Package	asr9k-mpls-x64-2.1.0.0-r631.x86_64.rpm	Label Distribution Protocol (LDP), MPLS Forwarding, MPLS Operations, Administration, and Maintenance (OAM), Link Manager Protocol (LMP), Optical User Network Interface (OUNI) and Layer-3 VPN.
Cisco IOS XR 64-bit Multicast Package	asr9k-mcast-x64-2.0.0.0-r631.x86_64.rpm	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 64-bit Optics Package	asr9k-optic-x64-1.0.0.0-r631.x86_64.rpm	Firmware for the optics feature for Cisco ASR 9000 Series Aggregation Services Router Chassis. It enables Transport / OTN feature under interfaces.
Cisco IOS XR 64-bit Lawful Intercept (LI) Package	asr9k-li-x64-1.1.0.0-r631.x86_64.rpm	Includes LI software images.
Cisco IOS XR Security Package	asr9k-k9sec-x64-3.1.0.0-r631.x86_64.rpm	Support for Encryption, Decryption,, Secure Shell (SSH), Secure Socket Layer (SSL), and Public-key infrastructure (PKI).
Cisco IOS XR Satellite Package -ASR9000v	asr9k-9000v-nV-x64-1.0.0.0-r631.x86_64.rpm	Includes rpm to support Cisco ASR9000v Series Router Software and to support Cisco ASR 9000v Series Router as a satellite for Cisco ASR 9000 Series Router

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 consist of the following:

- minimum 16 GB memory on the RSP880, RSP880-LT, RP2, A99-RSP-TR and A99-RSP-SE
- minimum 16 GB memory on the RP2 transport optimised (TR) variant and 32 GB memory on the RP2 service edge (SE) variant
- minimum 2 GB compact flash on route switch processors (RSPs)
- minimum 4 GB memory on the line cards (LCs) running Cisco IOS XR 32 bit image
- minimum 8 GB memory on the line cards (LCs) running Cisco IOS XR 64 bit image

Supported Hardware

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

All hardware features are supported on Cisco IOS XR Software, subject to the memory requirements specified in the "Memory Requirements, on page 9" section.

For information on the end-of-sale and end-of-life dates for the Cisco ASR 9000 Series Router hardware, refer to the End-of-Life and End-of-Sale Notices page.

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

Cisco ASR 9000 Series Aggregation Services Router Route Switch Processor Cards			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**

ASR 9000 Route Switch Processor 5 for Service Edge	A9K-RSP5-SE	Not Supported	Release 6.5.15
ASR 9000 Route Switch Processor 5 for Packet Transport	A9K-RSP5-TR	Not Supported	Release 6.5.15
Cisco ASR 9000 Series Aggregation Services Router RSP880-Lite, Packet Transport Optimized	A9K-RSP880-LT-TR	Release 6.2.2	Release 6.4.1
Cisco ASR 9000 Series Aggregation Services Router RSP880-Lite, Service Edge Optimized	A9K-RSP880-LT-SE	Release 6.2.2	Release 6.4.1
Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Service Edge Optimized for ASR 9910 from Release 6.0.1.	A99-RSP-SE	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Packet Transport Optimized for ASR 9910 from Release 6.0.1.	A99-RSP-TR	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Packet Transport Optimized for ASR 9906 supported from Release 6.3.1	A99-RSP-TR	Release 6.3.1	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Service Edge Optimized for ASR 9906 from Release 6.3.1.	A99-RSP-SE	Release 6.3.1	Release 6.3.1
ASR9K Route Switch Processor with 880G/slot and 32 GB for Service Edge	A9K-RSP880-SE	Release 5.3.0	Release 6.1.2
ASR9K Route Switch Processor with 880G/slot and 16 GB for Packet Transport	A9K-RSP880-TR	Release 5.3.0	Release 6.1.2
ASR Route Processor 32 GB for Service Edge	A99-RP2-SE	Release 5.3.0	Release 6.1.2
ASR Route Processor 16 GB for Packet Transport	A99-RP2-TR	Release 5.3.0	Release 6.1.2
ASR 9001 Route Switch Processor 8 GB	ASR9001-RP	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Service Edge Optimized	A9K-RSP-440-SE	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router Next Generation Route Switch Processor, Service Edge Optimized	A9K-RSP-440-TR	Release 4.2.0	Unsupported
ASR 9900 Route Processor 12 GB for Service Edge	ASR-9900-RP-SE	4.3.2	Unsupported
ASR 9900 Route Processor 6 GB for Packet Transport	ASR-9900-RP-TR	4.3.2	Unsupported
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 4-Slot			

Cisco ASR 9000 Series Aggregation Services Router 4-Slot 2 Line Card Slot AC Chassis w/ PEM V2	ASR-9904-AC	Release 5.1.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Slot 2 Line Card Slot DC Chassis w/ PEM V2	ASR-9904-DC	Release 5.1.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Slot Fan Tray	ASR-9904-FAN	Release 5.1.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Slot Filter	ASR-9904-FILTER	Release 5.1.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Slot Baffle	ASR-9904-BAFFLE	Release 5.1.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 12-Slot			
Cisco ASR 9000 Series Aggregation Services Router 12-Slot 10 Line Card Slot AC Chassis w/ PEM V2	ASR-9912-AC	Release 4.3.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 12-Slot 10 Line Card Slot DC Chassis w/ PEM V2	ASR-9912-DC	Release 4.3.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 12-Slot Fan Tray	ASR-9912-FAN	Release 4.3.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Fabric Card	A99-SFC2	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot AC Chassis w/ PEM V2	ASR-9922-AC	Release 4.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot DC Chassis w/ PEM V2	ASR-9922-DC	Release 4.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory Kit with grounding locks, guide rails etc	ASR-9922-ACC-KIT	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory - Cover for Power Shelves and Modules	ASR-9922-PWR-COV	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Reflector	ASR-9922-AIRREF	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Accessory - Door (with lock) and Fan Tray Covers	ASR-9922-DOOR	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Fan Tray	ASR-9922-FAN	Release 4.2.2	Release 6.1.2

Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Center	ASR-9922-FLTR-CEN	Release 4.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Left & Right	ASR-9922-FLTR-LR	Release 4.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor Filler	ASR-9922-RP-FILR	Release 4.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 12GB for Service Edge	ASR-9922-RP-SE	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor 6GB for Packet Transport	ASR-9922-RP-TR	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card Slot Filler	ASR-9922-SFC-FILR	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Switch Fabric Card/110G	ASR-9922-SFC110	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 22-Slot Version 2 Fan Tray	ASR-9922-FAN-V2	Release 5.2.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 2-RU			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 2RU	ASR-9001	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Fan Tray	ASR-9001-FAN	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 2-Slot Line Card	ASR-9001-LC	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router	ASR-9001-TRAY	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 6-Slot			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 6-Slot System	ASR-9006-SYS	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	ASR-9006-FAN	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Door Kit	ASR-9006-DOOR	Release 3.7.2	Release 6.1.2

Cisco ASR 9000 Series Aggregation Services Router 6-Slot AC Chassis	ASR-9006-AC	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot DC Chassis	ASR-9006-DC	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air Filter	ASR-9006-FILTER	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6-Slot -ASR 9906			
Cisco ASR 9000 Series Aggregation Services Router 6-Slot chassis	ASR-9906	Release 6.3.1	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	ASR-9906-FAN	Release 6.3.1	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Filter	ASR-9906-FILTER	Release 6.3.1	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot			
Cisco ASR 9000 Series Aggregation Services Router 10-Slot System	ASR-9010-SYS	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray	ASR-9010-FAN	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Door Kit	ASR-9010-DOOR	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot AC Chassis	ASR-9010-AC	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot DC Chassis	ASR-9010-DC	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 2 Post Mounting Kit	ASR-9010-2P-KIT	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregration Services Router 4 Post Mounting Kit	ASR-9010-2P-KIT	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**

Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Filter	ASR-9010-FILTER	Release 3.7.2	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 10-Slot External Exhaust Air Shaper	ASR-9010-AIRSHPR	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Inlet Grill	ASR-9010-GRL	NA	NA
Cisco ASR 9000 Series Aggregation Services Router 10-Slot 21 RU			
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) System	ASR-9910	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot(9910) Fan Tray	ASR-9910-FAN	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Accessory Kit	ASR-9910-ACC-KIT	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) 4 Post Rack Mounting Kit	ASR-9910-4P-KIT	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) 2 Post Rack Mounting Kit	ASR-9910-2P-KIT	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Air Reflector	ASR-9910-AIRREF	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Air Filter	ASR-9910-FILTER	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Switch Fabric Card	A99-SFC-S	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router Power			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 2KW DC Power Module, version 2	PWR-2KW-DC-V2	Release 4.2.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 3KW AC Power Module, version 2	PWR-3KW-AC-V2	Release 4.2.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router AC Power Entry Module Version 2	A9K-AC-PEM-V2	Release 4.2.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router DC Power Entry Module Version 2	A9K-DC-PEM-V2	Release 4.2.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router Power Entry Module Version 2 Filler	A9K-PEM-V2-FILR	Release 4.2.0	Release 6.1.2

Cisco ASR 9000 Series Aggregation Services Router 1.5kW DC Power Module	A9K-1.5KW-DC	Release 3.7.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 2kW DC Power Module	A9K-2KW-DC	Release 3.7.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 3kW AC Power Module	A9K-3KW-AC	Release 3.7.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router AC Power Enclosure Module Version 3	A9K-AC-PEM-V3	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router DC Power Enclosure Module Version 3	A9K-DC-PEM-V3	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 6kW AC Power Module Version 3	PWR-6KW-AC-V3	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4.4kW DC Power Module Version 3	PWR-4.4KW-DC-V3	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router Line Cards			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
ASR9000 48-port dual-rate 10G/1G service edge–optimized line card	A9K-48X10GE-1G-SE	Release 6.2.1	Release 6.3.2
ASR9000 48-port dual-rate 10G/1G packet transport–optimized line card	A9K-48X10GE-1G-TR	Release 6.2.1	Release 6.3.2
ASR9000 24-port dual-rate 10G/1G service edge–optimized line card	A9K-24X10GE-1G-SE	Release 6.2.1	Release 6.3.2
ASR9000 24-port dual-rate 10G/1G packet transport–optimized line card	A9K-24X10GE-1G-TR	Release 6.2.1	Release 6.3.2
ASR 9900 8-port 100GE Service Edge optimized	A99-8X100GE-SE	Release 6.0.1	Release 6.1.2
ASR 9900 8-port 100GE Packet Transport optimized	A99-8X100GE-TR	Release 6.0.1	Release 6.1.2
ASR 9900 8-port 100GE Consumption Model	A99-8X100GE-CM	Release 6.0.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 12-Port 100-Gigabit Ethernet Line Card	A99-12X100GE	Release 6.0.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 12-port 100GE Ethernet Line card CM	A99-12X100GE-CM	Release 6.0.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 8-Port 100- Gigabit Ethernet, Consumption Model Optimized with CPAK	A9K-8X100GE-CM	Release 5.3.2	Release 6.1.2

Cisco ASR 9000 Series Aggregation Services Router 8-Port 100- Gigabit Ethernet, Service Edge Optimized	A9K-8X100GE-SE	Release 5.3.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 8-Port 100-Gigabit Ethernet, Packet Transport Optimized	A9K-8X100GE-TR	Release 5.3.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4--Port 100-Gigabit Ethernet, Service Edge Optimized	A9K-4X100GE-SE	Release 5.3.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port 100- Gigabit Ethernet, Packet Transport Optimized	A9K-4X100GE-TR	Release 5.3.1	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 8-port High Density 100GE Ethernet Line Card, Service Edge Optimized	A9K-8X100GE-L-SE	Release 5.3.0	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet + Cisco ASR 9000 Series Aggregation Services Router 16-Port Gigabit Ethernet, Packet Transport Optimized	A9K-4T16GE-TR	Release 5.3.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 4-Port Ten Gigabit Ethernet + Cisco ASR 9000 Series Aggregation Services Router 16-Port Gigabit Ethernet, Service Edge Optimized	A9k-4T16GE-SE	Release 5.3.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router Virtualized Services Module (VSM) line card	A9K-VSM-500	Release 5.1.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Service Edge Optimized	A9K-1X100GE-SE	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 1-port 100GE, Packet Transport Optimized	A9K-1X100GE-TR	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Service Edge Optimized	A9K-36X10GE-SE	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 36-port 10GE, Packet Transport Optimized LC	A9K-36X10GE-TR	Release 4.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router Line Card Filler	A9K-LC-FILR	Release 3.7.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 2-Port Hundred Gigabit Ethernet, Service Edge Optimized	A9K-2X100GE-SE	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 2-Port Hundred Gigabit Ethernet, Packet Transport Optimized	A9K-2X100GE-TR	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 24-Port Ten Gigabit Ethernet, Service Edge Optimized	A9K-24X10GE-SE	Release 4.2.0	Unsupported

Cisco ASR 9000 Series Aggregation Services Router 24-Port Ten Gigabit Ethernet, Packet Transport Optimized	A9K-24X10GE-TR	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 40-Port Ten Gigabit Ethernet, Packet Transport Optimized	A9K-40GE-TR	Release 5.2.2	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 40-Port Ten Gigabit Ethernet, Service Edge Optimized	A9K-40GE-SE	Release 5.2.2	Unsupported
2-Port 100G + 20-Port 10 GE Combination IPoDWDM Line Card with CFP2 and SFP+, Packet Transport Optimized	A9K-400GE-DWDM-TR	Release 5.3.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router Modular Line Cards			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Packet Transport Optimized Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Service Edge Optimized	A9K-MOD200-TR A9K-MOD200-SE	Release 6.0.1	Release 6.3.1
Cisco ASR 9000 Modular 400G Consumption Model Line Card Bundle	A9K-MOD400-CM-BUN	Release 6.1.2	Release 6.2.1
Cisco ASR 9000 Modular 400G Consumption Model Line Card	A9K-MOD400-CM	Release 6.1.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Service Edge Optimized	A9K-MOD400-SE	Release 5.3.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Packet Transport Optimized	A9K-MOD400-TR	Release 5.3.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 80 Gig Modular Line Card, Service Edge Optimized	A9K-MOD80-SE	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 80 Gig Modular Line Card, Packet Transport Optimized	A9K-MOD80-TR	Release 4.2.0	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 160 Gig Modular Line Card, Service Edge Optimized	A9K-MOD160-SE	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router 160 Gig Modular Line Card, Packet Transport Optimized	A9K-MOD160-TR	Release 4.2.1	Unsupported
Cisco ASR 9000 Series Aggregation Services Router Modular Port Adapters (MPAs)			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**

Cisco ASR 9000 20x10GE Consumption Model MPA	A9K-MPA20X10GE-CM	Release 6.1.2	Release 6.5.1
Cisco ASR 9000 2x100GE Consumption Model MPA	A9K-MPA2X100GE-CM	Release 6.1.2	Release 6.5.1
Cisco ASR 9000 Series Aggregation Services Router 1-port 100-Gigabit Modular Port Adapter	A9K-MPA-1X100GE	Release 6.0.1	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router 2-port 100-Gigabit Modular Port Adapter	A9K-MPA-2X100GE	Release 6.0.1	Release 6.2.2
20-Port 10-Gigabit Ethernet Modular Port Adapter with SFP+	A9K-MPA-20x10GE	Release 5.3.2	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 8-port 10GE Modular Port Adapter	A9K-MPA-8X10GE	Release 4.3.1	Release 6.3.2
Cisco ASR 9000 Series Aggregation Services Router 1-port 40GE Modular Port Adapter	A9K-MPA-1X40GE	Release 4.2.3	Release 6.3.1
Cisco ASR 9000 Series Aggregation Services Router 4-port 10GE Modular Port Adapter	A9K-MPA-4X10GE	Release 4.2.0	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 20-port 1GE Modular Port Adapter	A9K-MPA-20X1GE	Release 4.2.0	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router 2-port 10GE Modular Port Adapter	A9K-MPA-2X10GE	Release 4.2.1	Release 6.3.2
Cisco ASR 9000 Series Aggregation Services Router 2-port 40GE Modular Port Adapter	A9K-MPA-2X40GE	Release 4.2.1	Release 6.3.1
Cisco ASR 9000v Satellite Shelf			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000v Satellite Shelf Version 2 DC power ANSI chassis	A9KV-V2-DC-A=	Release 5.2.2	Release 6.2.1
Cisco ASR 9000v Satellite Shelf Version 2 DC power chassis	A9KV-V2-DC-E=	Release 5.2.2	Release 6.2.1
Cisco ASR 9000v Satellite Shelf AC power chassis	A9KV-V2-AC=	Release 5.2.2	Release 6.2.1
Cisco ASR 9000v Satellite Shelf Version 2 Fan Tray	A9KV-V2-FAN=	Release 5.2.2	Release 6.2.1
Cisco NCS 5000 Satellite Shelf			
Cisco NCS 5001 Series Router	NCS-5001	Release 6.0.1	Release 6.2.1
Cisco NCS 5002 Series Router	NCS-5002	Release 6.0.1	Release 6.2.1
Cisco NCS 5001 Router Accessory Kit	NCS-5001-ACSR	Release 6.0.1	Release 6.2.1

Cisco NCS 5002 Router Accessory Kit	NCS-5002-ACSR	Release 6.0.1	Release 6.2.1
Cisco NCS 5001 Router Fan Back to Front AirFlow	NCS-5001-FN-BK	Release 6.0.1	Release 6.2.1
Cisco NCS 5002 Router Fan Back to Front AirFlow	NCS-5002-FN-BK	Release 6.0.1	Release 6.2.1
Cisco NCS 5001 Air Filter Back to Front Airflow	NCS-5001-FLT-BK	Release 6.0.1	Release 6.2.1
Cisco NCS 5002 Air Filter Back to Front Airflow	NCS-5002-FLT-BK	Release 6.0.1	Release 6.2.1
Cisco NCS 5001 Fan Front to Back Airflow	NCS-5001-FN-FR	Release 6.0.1	Release 6.2.1
Cisco NCS 5002 Fan Front to Back Airflow	NCS-5002-FN-FR	Release 6.0.1	Release 6.2.1
Cisco NCS 5001 Air Filter Front to Back Airflow	NCS-5001-FLT-FR	Release 6.0.1	Release 6.2.1
Cisco NCS 5002 Air Filter Front to Back Airflow	NCS-5002-FLT-FR	Release 6.0.1	Release 6.2.1
Cisco ASR 9000 Series Aggregation Services Router SIP and SPA Cards			
Component	**Part Number**	**Support Initially Provided in IOS XR Release**	**Support Initially Provided in IOS XR 64 bit Release**
Cisco ASR 9000 SIP-700 SPA interface processor	A9K-SIP-700	Release 3.9.0	Unsupported
2-Port Channelized OC-12/DS0 SPA	SPA-2XCHOC12/DS0	Release 3.9.0	Unsupported
1-Port Channelized OC48/STM16 DS3 SPA	SPA-1XCHOC48/DS3	Release 4.0.1	Unsupported
2-Port OC-48/STM16 SPA	SPA-2XOC48POS/RPR	Release 4.0.1	Unsupported
Cisco 4-Port OC-12c/STM-4 POS SPA	SPA-4XOC12-POS	Release 6.4.2	Unsupported
8-Port OC12/STM4 SPA	SPA-8XOC12-POS	Release 4.0.1	Unsupported
1-Port OC-192/STM-64 POS/RPR SPA	SPA-OC192POS-XFP	Release 4.0.1	Unsupported
4-Port Clear Channel T3/E3 SPA	SPA-4XT3E3	Release 4.0.1	Unsupported
2-Port Clear Channel T3/E3 SPA	SPA-2XT3E3	Release 4.0.1	Unsupported
1-Port Channelized OC-3/STM-1 SPA	SPA-1XCHSTM1/OC3	Release 4.0.1	Unsupported
4-Port OC-3/STM-1 POS SPA	SPA-4XOC3	Release 4.0.1	Unsupported
8-Port OC-3/STM-1 POS SPA	SPA-8XOC3	Release 4.0.1	Unsupported
4-Port Channelized T3 to DS0 SPA	SPA-4XCT3/DS0	Release 4.1.0	Unsupported
8-Port Channelized T1/E1 SPA	SPA-8XCHT1/E1	Release 4.1.0	Unsupported
1-Port and 3-Port Clear Channel OC-3 ATM SPA	SPA-1/3XOC3ATM	Release 4.2.0	Unsupported
1-Port Clear Channel OC-12 ATM SPA	SPA-1XOC12ATM	Release 4.2.0	Unsupported
1-Port Channelized OC-3 ATM CEoP SPA	SPA-1XOC3-CE-ATM	Release 4.2.0	Unsupported

1000BASE-BX40-D for Single-Fiber Bidirectional Applications	GLC-BX40-DA-I GLC-BX40-D-I	Release 5.1.2	Release 6.3.2
1000BASE-BX40-U for Single-Fiber Bidirectional Applications	GLC-BX40-U-I	Release 5.1.2	Unsupported
1000BASE-BX80-D for Single-Fiber Bidirectional Applications	GLC-BX80-D-I	Release 5.1.2	Unsupported
1000BASE-BX80-U for Single-Fiber Bidirectional Applications	GLC-BX80-U-I	Release 5.1.2	Unsupported
The Cisco 10GBASE Coarse Wavelength-Division Multiplexing (CWDM) Small Form-Factor Pluggable (SFP+)	CWDM-SFP10G-1470 CWDM-SFP10G-1490 CWDM-SFP10G-1510 CWDM-SFP10G-1530 CWDM-SFP10G-1550 CWDM-SFP10G-1570 CWDM-SFP10G-1590 CWDM-SFP10G-1610	Release 5.2.2	Unsupported
The Cisco Dense Wavelength-Division Multiplexing (DWDM) Tunable SFP+ 10 Gigabit Ethernet Transceiver Module	DWDM-SFP10G-C	Release 5.2.2	Unsupported
1000BASE-TX Extended Temperature SFP	GLC-TE	Release 5.2.2	Release 7.0.1
10GBASE-DWDM single wavelength Edge Performance XFP , dual LC connector, individual wavelength pluggable module	ONS-XC-10G-EPXX.Y	Release 5.2.2	Unsupported
10GBASE-DWDM single wavelength Edge Performance SFP+ pluggable module	ONS-SC-10G-EPXX.Y	Release 5.2.2	Unsupported
Dual Rate SFP	GLC-GE-DR-LX Dual Rate 100M/1G)	Release 5.2.2	Unsupported
1-Port 40G CPAK adapter module	CVR-CPAK-QSFP40	Release 5.3.2	Unsupported

Software Compatibility

Cisco IOS XR Software Release 6.3.1 is compatible with the following Cisco ASR 9000 Series Aggregation Services Router systems.

- Cisco ASR 9900 Series Chassis
  - 22-Slot (ASR-9922) Line Card Chassis
  - 12-Slot (ASR-9912) Line Card Chassis
  - 10-Slot (ASR-9910) Line Card Chassis

    - 6-Slot (ASR-9906) Line Card Chassis
    - 4-slot (ASR-9904) Line Card Chassis
    - 1-Slot (ASR-9901) Line Card Chassis
- Cisco ASR 9000 Series Chassis
    - 10-Slot (ASR-9010) Line Card Chassis
    - 6-Slot (ASR-9006) Line Card Chassis
    - 1-Slot (ASR-9001) Line Card Chassis

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.

Determining Installed Packages

To determine the version of Cisco IOS XR Software packages installed on your router, log in to the router and enter the **show install committed summary** command:

Cisco IOS XR

```
RP/0/RSP0/CPU0:router# show install committed summary
Default Profile:
  SDRs:
    Owner
  Committed Packages:
    disk0:asr9k-9000v-nV-px-6.3.1
    disk0:asr9k-mcast-px-6.3.1
    disk0:asr9k-mgbl-px-6.3.1
    disk0:asr9k-mpls-px-6.3.1
    disk0:asr9k-fpd-px-6.3.1
    disk0:asr9k-mini-px-6.3.1
    disk0:asr9k-k9sec-px-6.3.1
    disk0:asr9k-bng-px-6.3.1
```

Cisco IOS XR 64 bit

```
RP/0/RSP0/CPU0:router# show install committed summary
# Committed Packages: 8
        asr9k-xr-6.3.1 version=6.3.1 [Boot image]
        asr9k-isis-x64-1.1.0.0-r631
        asr9k-mpls-x64-2.0.0.0-r631
        asr9k-mpls-te-rsvp-x64-1.2.0.0-r631
        asr9k-mgbl-x64-2.0.0.0-r631
        asr9k-ospf-x64-1.0.0.0-r631
        asr9k-mcast-x64-2.0.0.0-r631
        asr9k-k9sec-x64-2.1.0.0-r631
```

Software Features Introduced in Cisco IOS XR Software Release 6.3.1

OAM for BGP-SR

The OAM for BGP-SR feature provides support for ping, traceroute, and treetrace (traceroute multipath) operations for LSPs signaled via BGP for IPv4 Prefix SIDs. This feature adds support for Segment Routing OAM operations in deployments with combinations of BGP and LDP signaled LSPs.

For more information on this feature, see the Using Segment Routing OAM chapter in the *Segment Routing Configuration Guide for Cisco ASR 9000 Series Aggregation Services Router*

Segment Routing Local Block

The Segment Routing Local Block (SRLB) is a range of label values preserved for the manual allocation of adjacency segment identifiers (SIDs). These labels are locally significant and are only valid on the nodes that allocate the labels. The default SRLB range is from 15000 to 15999.

For more information on this feature, see the Configure Segment Routing Global Block and Segment Routing Local Block chapter in the *Segment Routing Configuration Guide for Cisco ASR 9000 Series Aggregation Services Router*

Manual Adjacency Segment Identifiers

This feature allows you to manually configure explicit adjacency segment identifiers (SIDs) from the segment routing local block (SRLB). In contrast to dynamically allocated adjacency SIDs, explicit adjacency SIDs can be applied to a set of parallel links (allowing traffic to be load-balanced across these links), and different adjacency SIDs can be applied to a given link. Explicit adjacency SID label values are retained over reloads.

For more information on this feature, see the Configure Segment Routing for IS-IS Protocol chapter in the *Segment Routing Configuration Guide for Cisco ASR 9000 Series Aggregation Services Router*

Bandwidth-Based Local Unequal Cost Multipath

This feature allows you to enable Unequal Cost Multipath (UCMP) functionality locally between Equal Cost Multipath (ECMP) paths based on the bandwidth of the local links.

When the capacity of a bundle interface changes because a link or line card goes down and then comes back up, traffic continues to use the affected bundle interface regardless of how many of the provisioned bundle members are available. If some bundle members are not available due to the link or line card up/down event, the bundle interface could become overloaded. To address the bundle capacity changes, bandwidth-based local UCMP uses the bandwidth of the local links of a Layer 2 bundle interface to load balance traffic when bundle capacity changes. Bandwidth-based local UCMP is performed for prefixes and manual adjacency SIDs.

For more information on this feature, see the Configure Segment Routing for IS-IS Protocol chapter in the *Segment Routing Configuration Guide for Cisco ASR 9000 Series Aggregation Services Router*

Command to disable USB Port

A new command, **hw-module external-usb disable**, has been introduced to disable USB ports on a RSP. Disabling unused USB ports ensures a higher level of security. However, this command cannot be executed on Line Cards. The command is executed in **Admin Configuration mode**.

For more information on this command, see *System Management Command Reference for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*.

Command to disable Console Management Port

A new command, **hw-module cmp disable**, has been introduced to disable Console Management Port (CMP) on a RSP880/RP2. Disabling unused ports ensures a higher level of security. However, this command cannot be executed on Line Cards. The command is executed in **Admin Configuration mode**.

For more information on this command, see *System Management Command Reference for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*.

Parallel Power Module FPD Upgrade

Parallel Power Module FPD upgrade procedure lets you perform FPD upgrades on multiple power modules simultaneously. This ensures that the power modules are upgraded in lesser time than upgrading the modules separately. It also eliminates the need for manual supervision. Currently, this feature is not supported on Cisco IOS XR 64 bit.

For more information see, *Upgrading FPD* chapter in *System Management Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*.

AAA Security Type 8 and Type 9 Password Hashing Security Enhancement

This feature provides the options for Type 8 and Type 9 encryption methods in AAA security services. The Type 8 and Type 9 encryption methods enable more secure and robust support for saving passwords w.r.t each username. Thus, in scenarios where a lot of confidential data need to be maintained, these encryption methods ensure that the admin and other user passwords are strongly protected.

The implementation of Type 8 encryption method uses SHA256 hashing algorithm, and the Type 9 encryption method uses scrypt hashing algorithm.

Note The Type 8 and Type 9 encryption methods are not supported on the IOS XR 64-bit OS.

To implement the Type 8 and Type 9 encryption methods, the **username name secret** command is updated to include the new keywords: **8** and **9**, as follows:

username name secret {0 password | 5 encrypted-secret | 8 | 9}

For more information about this feature, see *Type 8 And Type 9 Encryption Methods* and *Configuring Users* sections of the *Configuring AAA Services* chapter of the *Cisco ASR 9000 Series Aggregation Services Router System Security Configuration Guide*.

Zero Touch Provisioning (ZTP) on Data Port

Zero Touch Provisioning (ZTP) is executed inside the global Virtual Routing and Forwarding (VRF) network namespace with full access to all the data interfaces. Manual ZTP invocation is also supported.

To see what Zero Touch Provisioning (ZTP) can do and how to manually invoke ZTP, see *Implementing Zero Touch Provisioning* chapter in the System Management Configuration Guide for Cisco ASR 9000 Series Routers.

Reset Router to Factory Settings

A router can be restord to its factory settings using zapdisk commmand. The router resets after a cleanup of all the logical volumes of the disk including the files saved in harddisk: location, and resets ROMMON parameters on all CPU boards. After enabling the zapdisk command, the router is reset to its factory settings during the next reimage of the router.

To enable the zapdisk command to reset the router to its default factory settings, see the *Upgrading and Managing Software on Cisco ASR 9000 Series Router* chapter in the System Management Configuration Guide for Cisco ASR 9000 Series Routers.

EVPN Anycast Gateway All-Active Static Pseudowire

The EVPN Anycast Gateway All-active Static Pseudowire (PW) feature enables all-active multhoming support for static PWs. When static PWs are configured, it overrides the default behavior of single-active, and the node becomes all-active per flow (AApF).

For more information on this feature, see the *EVPN Features* chapter in the *L2VPN and Ethernet Services Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.1*.

CFM Support for EVPN

Ethernet Connectivity Fault Management (CFM) is a service-level OAM protocol that provides tools for monitoring and troubleshooting end-to-end Ethernet services per VLAN. This includes proactive connectivity monitoring, fault verification, and fault isolation. CFM can be deployed in an EVPN network. You can monitor the connections between the nodes using CFM in an EVPN network.

For more information on this feature, see the *EVPN Features* chapter in the *L2VPN and Ethernet Services Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.1*.

HTTP Redirect URL with Subscriber Information

The existing HTTP Redirect feature in BNG is enhanced to provide subscriber information in addition to the redirect portal address in the redirect URL. This information includes the user name of the subscriber (in a Cisco Attribute-Value-Pair named *parsed-user-name*), the IP address of the subscriber and the source-identifier of the BNG. This functionality provides a mechanism to authenticate the subscriber as well as to enhance the web server, which in turn can be used in multiple use cases of redirect scenarios. One such use case is, providing a subscriber-specific web page to the subscriber in a redirect scenario. This feature works with both RADIUS and DIAMETER protocols.

For more information about this 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, see the *Control Policy Commands* chapter in *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

Multiple State Control Routes for Each SRG

The state control route feature in BNG is extended to have multiple state control routes for each subscriber redundancy group (SRG), as opposed to allowing only single state control route for each SRG. This functionality is available for PPPoE and IPoE subscribers. Users can also add summary route for a subscriber for a specific VRF, rather than limiting it to a default VRF. This feature thereby allows service providers to terminate multiple subnets of subscribers in a particular SRG.

For more information about this feature, see the *BNG Geo Redundancy* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*. For complete command reference, see the *Subscriber and Session Redundancy Commands* chapter in *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

BNG on Cisco IOS XR 64-bit ASR 9000 Series Routers

The Broadband Network Gateway (BNG) functionality is supported on Cisco IOS XR 64-bit ASR 9000 Series Routers, in addition to the Cisco IOS XR 32-bit ASR 9000 Series Routers. This functionality is available on Cisco ASR 9000 Series Routers with RSP880, RSP 880-LT and Cisco ASR 9000 High Density 100GE Ethernet line cards (LCs) having more CPU cycles and per-process virtual memory, which in turn increases the scale and performance of the Cisco ASR 9000 Series Router as a BNG.

For more information about this feature, see the *Broadband Network Gateway Overview* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*. For complete command reference, see *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

SRG Support for BNG SLAAC Sessions

BNG introduces the support for subscriber redundancy group (SRG) for Stateless Address Auto-Configuration (SLAAC) sessions, wherein the subordinate BNG router allocates the same Neighbor Discovery (ND) prefix as that of primary BNG router to the subscriber. This feature ensures a seamless traffic flow for SLAAC sessions in the event of a BNG switchover.

For more information about this feature, see the *BNG Geo Redundancy* chapter in the *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Configuration Guide*. For complete command reference, see the *Subscriber and Session Redundancy Commands* chapter in *Cisco ASR 9000 Series Aggregation Services Router Broadband Network Gateway Command Reference*.

Small Frame Padding Support for nV System

The Small-frame-padding command, which when configured on a satellite nV access interface, pads outgoing undersize packets to 64 bytes. When this feature is enabled, it prevents the subsequent routers from dropping those packets as runts.

For more information on this feature, see the *Configuring the Satellite Network Virtualization (nV) System* chapter in the *nV System Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*

SyncE Offload Per Interface Configuration for nV System

Synchronous Ethernet (SyncE) Offload Per Interface Configuration allows the user to enable syncE only on specific satellite nV access interfaces. In earlier releases, syncE offload configuration on the Satellite nV fabric links was automatically fanned out to all the cross-linked Satellite nV access interfaces. So this enhancement provides the user with a great amount of flexibility to offload syncE configuration on a per-fabric per-access-interface basis.

For more information on this feature, see the *Configuring the Satellite Network Virtualization (nV) System* chapter in the *nV System Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*

Minimum Inter-Chassis Links for nV System

Minimum Inter-Chassis Links (ICL) feature enables the user to configure the minimum number of bundle members which must be active in order for traffic to go through the ICL bundle of an nV system in hub and spoke topology. As a result, this feature enables the Customer Edge devices, which are connected to the satellite nV device, to immediately detect whenever bandwidth degradation has occured and thereby reroute traffic immediately.

For more information on this feature, see the *Configuring the Satellite Network Virtualization (nV) System* chapter in the *nV System Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*

SMU Install for NCS 5000 Series Satellite

The following new features have been added as part of SMU Install for NCS 5000 Series Satellite:

- Support for installing native Cisco NCS 5000 Series SMU
- Introduction of new commands in order to install updates and references

This provides a greater amount of flexibilty to the users to install the native Cisco NCS 5000 Series SMU directly from the ASR 9000 Series Router host. It also allows the user to transfer and activate a SMU, a base package or a list of files in a single operation.

For more information on this feature, see the *Configuring the Satellite Network Virtualization (nV) System* chapter in the *nV System Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 6.3.x*

RFC 6724 Compliance

This feature introduces an enhancement to the PING and TRACEROUTE applications. With this enhancement, you can find the best source-IPv6 address that you can use for ping and traceroute application, thus providing a seamless interaction with dynamic interfaces such as PPPoE/IP0E.

For more information, see the Implementing Host Services and Applications chapter in *IP Addresses and Services Configuration Guide for Cisco ASR 9000 Series Routers*.

DHCPv6 Link Address Enhancement for PPPoE Session

This feature allows you to configure DHCP IPv6 proxy mode for Point-to-Point Protocol over Ethernet (PPPoE) sessions. After applying the configuration, the link local address field of SOLICIT message will include the IPv6 address along with the Router Advertisement prefix.

To see how to configure the link local address at proxy level, see *Establishing Subscriber Sessions* chapter in the Broadband Network Gateway Configuration Guide for Cisco ASR 9000 Series Routers.

IPv6 Stateless Address Auto Configuration (SLAAC) Support

IPv6 Stateless Address Auto Configuration (SLAAC) is supported on management interface. This feature enables automated provisioning of the routers.

To see how to enable IPv6 SLAAC, see *Advanced Configuration and Modification of the Management Ethernet Interface* chapter in the Interface and Hardware Component Configuration Guide for Cisco ASR 9000 Series Routers.

VRF Support on Docker and LXC Containers

Cisco IOS XR Release 6.3.1 supports the configuration of multiple VRFs and multi-VRF docker containers on XR. The applications hosted in third-party LXCs can communicate with VRFs configured on XR, after east-west communication has been enabled on the VRFs.

For more information, see the *Configuring Multiple VRFs for Application Hosting*, and *Configuring a Docker with Multiple VRFs* sections in the *Cisco IOS XR Application Hosting Configuration Guide* .

YANG Model Support for IOS XR Admin Plane

YANG data models are supported for IOS XR admin plane. All the IOS XR actions are supported in System Admin plane.The actions introduced in this release are:

- System Process Mgmt : process (restart)
- System Process Mgmt : Reload (System Admin virtual machine (VM) reload, line card (LC) reload)
- System Process Mgmt : Reload (IOS XR VM node reload from System Admin)

To see the list of actions and an example to use a System Admin action, see *Components to Use Data Models* chapter in the Programmability Configuration Guide for Cisco ASR 9000 Series Routers.

Event-based Telemetry

Telemetry provides a mechanism to stream data from the router at regular intervals. Event-based telemetry is used to collect data when a state transition occurs. This feature optimises the need to collect state information even when a change in the state does not occur, thus eliminating the data overhead at the router and the receiver.

For more information about state transitions, and collecting event-based telemetry data, see *Configure Event-based Telemetry* chapter in the Telemetry Configuration Guide for Cisco ASR 9000 Series Routers.

Initializing the ARP Cache for IS-IS Adjacencies

This feature pre-loads the ARP cache when an IS-IS adjacency is established, which eliminates packet loss on Ethernet interfaces when the adjacency is first used.

Selective Exclusion of PFM Alarms

The **show operational PlatformFaultManager** command enables you to view all fault alarms on the system. This command has been enhanced to exclude some of the alarms from the command output as specified by the user. A maximum of three faults can be excluded. This is useful when there are known faults that the system operator is not interested in viewing so as to focus on other critical faults. To exclude faults from the command output use the command syntax as shown here:

```
RP/0/RP1/CPU0:ios#show operational PlatformFaultManager Exclude Fault1 <fault name> Fault2 <fault name> Fault3
 <fault name>
```

Optics Support

This feature enables support for the Cisco ASR 9000 High Density 100GE Ethernet line cards on Cisco ASR 9000 Series 24-port and 48-port dual-rate 10GE/1GE line cards. The ports on Cisco ASR 9000 Series 24-port and 48-port dual-rate 10GE/1GE line cards are dual rate 10G &1G capable and are compatible with all the chassis in the ASR 9000 products and inter-op with all the Cisco ASR 9000 Enhanced Ethernet line cards and the Cisco ASR 9000 High Density 100GE Ethernet line cards.

The Cisco ASR 9000 High Density 100GE Ethernet line cards come in two version with three variants each:

- 24-port 10/1G Service Edge optimized (-SE) line card
- 24-port 10/1G Packet Transport optimized (-TR) line card
- 24-port 10/1G Consumption Model (-CM) line card
- 48-port 10/1G Service Edge optimized (-SE) line card
- 48-port 10/1G Packet Transport optimized (-TR) line card
- 48-port 10/1G Consumption Model (-CM) line card

G.8273.2 Support

This feature enables compliance for A9K-24X10GE-1G-SE/TR and A9K-48X10GE-1G-SE/TR line cards in combination with RSP880 and ITU-T G.8273.2 standards.

ITU-T G.8273.2 specifies minimum requirements for time and phase for the telecom boundary clocks and telecom time slave clocks that you use in the synchronization network equipment. A synchronization network equipment operates in the network architecture as defined in Recommendations ITU-T G.8275.1 that supports time and/or phase synchronization distribution for packet-based networks.

Software Feature Enhancements Introduced in Cisco IOS XR Software Release 6.3.1

Enhancements to Model-driven Telemetry

The enhancments to model-driven telemetry (MDT) includes:

- VRF-aware MDT, sourced from L3 VRF interface
- gRPC protocol supports sending and receiving traffic on a VRF
- Support for JSON encoder

For more information, see *Configure Model-based Telemetry* chapter in the Telemetry Configuration Guide for Cisco ASR 9000 Series Routers.

Atomic Commit Operation Enhancement

With this enhancement, you can specify the FLEX CLI configuration group definition, and apply-group and exclude-group in any order as long as the entire commit has all the group definitions needed.

For more information, see *Apply Groups Priority Inheritance* chapter in the System Management Configuration Guide for Cisco ASR 9000 Series Routers.

Increase in Number Range for BVI Interfaces

This feature enables increase in number range for BVI interfaces from <1-65535> to <1-4294967295>.

New Hardware Introduced in Cisco IOS XR Software Release 6.3.1

This release introduces following new hardware:

- The Cisco ASR 9906 Router chassis is centered on a redundant pair of RSP cards, four line cards, and five fabric cards. The 6-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets. The chassis uses a version 3 power tray, with three AC or four DC power modules in each tray. The ASR 9906 Router is supported with the RSP4-S and the SFC-T fabric card.

Note The RSP4-S shipped with IOS XR 6.3.1 supports IOS XR 32-bit and 64-bit on the Cisco ASR 9906 Router. If you are installing a previously shipped RSP4-S (for example, from an Cisco ASR 9910 Router) in a Cisco ASR 9906 Router, you need to perform a Field Programmable Device (FPD) upgrade (available in IOS XR 6.3.1) in order to support IOS XR 64-bit. For more information, refer to field notice FN-70022: https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-field-notices-list.html

Note The Cisco ASR 9906 Router supports A9K-VSM-500 and Tomahawk-based line cards; it does not support SIP-700, A9K-ISM-100, Trident-based, or Typhoon-based line cards. Refer to *ASR 9000 Series Line Card Types* for information on line card types.

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

Hardware Enhancements Introduced in Cisco IOS XR Software 6.3.1

The MOD-400 modular line card (A9K-MOD400-TR, A9K-MOD400-SE) is supported on the IOS XR 64-bit platform with the following MPA and optics:

- A9K-MPA-1X40GE
- A9K-MPA-2X40GE
- A9K-MPA-1x100GE
    - CPAK-100G-SR10
    - CPAK-100G-LR4
    - CPAK-10X10G-LR

The MOD-200 modular line card (A9K-MOD200-TR, A9K-MOD200-SE) is supported on the IOS XR 64-bit platform with the following MPA and optics:

- A9K-MPA-1X40GE
- A9K-MPA-2X40GE
- A9K-MPA-1x100GE and A9K-MPA-2x100GE
    - CPAK-100G-SR10
    - CPAK-100G-LR4
    - CPAK-10X10G-LR
- A9K-MPA-20X1GE
- A9K-MPA-20x10GE
    - SFP-10G-SR-S
    - SFP-10G-LR-S
    - SFP-10G-ER-S
    - SFP-10G-ZR-S

For more information, refer to the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide*.

Firmware Support on Cisco IOS XR

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

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-9906-BPID2             Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9910-BPID2             Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
                           Can Bus Ctrl (CBC) BP2     lc   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9904-BPID2             Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9912-BPID2             Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
                           Can Bus Ctrl (CBC) BP2     lc   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-BPID2             Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
                           Can Bus Ctrl (CBC) BP2     lc   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-BPID2-E-10-SLOT        Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-BPID2-E-6-SLOT         Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-BPID2-10-SLOT          Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
                           Can Bus Ctrl (CBC) BP2     lc   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-BPID2-6-SLOT           Can Bus Ctrl (CBC) BP2     bp   cbc         7.105       0.00      0.1
                           Can Bus Ctrl (CBC) BP2     lc   cbc         7.105       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-SFC110            Can Bus Ctrl (CBC) MTFC    fc   cbc        28.06        0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fpga7       1.03        0.00      0.1
                           Can Bus Ctrl (CBC) MTFC    lc   cbc        28.06        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9912-SFC110            Can Bus Ctrl (CBC) SSFC    fc   cbc        32.05        0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fpga7       1.03        0.00      0.1
-----------------------------------------------------------------------------------------------
A99-SFC2                   Can Bus Ctrl (CBC) MTFC    fc   cbc        37.20        0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fcfsbl      1.100       0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fclnxfw     1.100       0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fpga8       0.37        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9912-SFC220            Can Bus Ctrl (CBC) MTFC    fc   cbc        37.20        0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fcfsbl      1.100       0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fclnxfw     1.100       0.00      0.1
                           Fabric Ctrl0 MTFC          fc   fpga8       0.37        0.00      0.1
-----------------------------------------------------------------------------------------------
A99-SFC-S                  Can Bus Ctrl (CBC) SHFC    fc   cbc        44.02        0.00      0.1
                           Fabric Ctrl0 SHFC          fc   fcfsbl      1.100       0.00      0.1
                           Fabric Ctrl0 SHFC          fc   fclnxfw     1.100       0.00      0.1
                           Fabric Ctrl0 SHFC          fc   fpga8       0.37        0.00      0.1
-----------------------------------------------------------------------------------------------
A99-SFC-T                  Can Bus Ctrl (CBC) TWFC    fc   cbc        44.02        0.00      0.1
                           Fabric Ctrl0 TWFC          fc   fcfsbl      1.100       0.00      0.1
                           Fabric Ctrl0 TWFC          fc   fclnxfw     1.100       0.00      0.1
                           Fabric Ctrl0 TWFC          fc   fpga8       0.37        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9010-FAN               Can Bus Ctrl (CBC) FAN     ft   cbc         4.03        0.00      0.1
                           Can Bus Ctrl (CBC) FAN     lc   cbc         4.03        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9006-FAN               Can Bus Ctrl (CBC) FAN     ft   cbc         5.04        0.00      0.1
```

```
                         Can Bus Ctrl (CBC) FAN     lc   cbc         5.04        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-FAN             Can Bus Ctrl (CBC) MFAN    ft   cbc        29.12        0.00      0.1
                         Can Bus Ctrl (CBC) MFAN    lc   cbc        29.12        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9912-FAN             Can Bus Ctrl (CBC) SFAN    ft   cbc        31.05        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9010-FAN-V2          Can Bus Ctrl (CBC) FAN     ft   cbc        29.12        0.00      0.1
                         Can Bus Ctrl (CBC) FAN     lc   cbc        29.12        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9904-FAN             Can Bus Ctrl (CBC) SFAN    ft   cbc        31.05        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-FAN-V2          Can Bus Ctrl (CBC) MFAN    ft   cbc        40.07        0.00      0.1
                         Fan Controller MFAN        ft   fpga9       2.06        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9006-FAN-V2          Can Bus Ctrl (CBC) FAN     ft   cbc         5.04        0.00      0.1
                         Can Bus Ctrl (CBC) FAN     lc   cbc         5.04        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9910-FAN             Can Bus Ctrl (CBC) SHFAN   ft   cbc        45.02        0.00      0.1
                         Fan Controller SHFAN       ft   fpga9       2.06        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9906-FAN             Can Bus Ctrl (CBC) TWFAN   ft   cbc        56.01        0.00      0.1
                         Fan Controller TWFAN       ft   fpga9       2.06        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9001-FAN             Can Bus Ctrl (CBC) FAN     ft   cbc        24.115       0.00      0.1
                         Can Bus Ctrl (CBC) FAN     lc   cbc        24.115       0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9001-FAN-V2          Can Bus Ctrl (CBC) FAN     ft   cbc        24.115       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       0.24        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       0.24        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       0.24        0.00      0.1
                         ROMMONB LC5                lc   rommon      1.35        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-RSP440-TR            Can Bus Ctrl (CBC) RSP3    lc   cbc        16.116       0.00      0.1
                         ClockCtrl0 RSP3            lc   fpga2       1.10        0.00      0.1
                         UTI RSP3                   lc   fpga3       4.09        0.00      0.1
                         CPUCtrl RSP3               lc   fpga1       0.11        0.00      0.1
                         ROMMONB RSP3               lc   rommon      0.76        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-RSP440-SE            Can Bus Ctrl (CBC) RSP3    lc   cbc        16.116       0.00      0.1
                         ClockCtrl0 RSP3            lc   fpga2       1.10        0.00      0.1
                         UTI RSP3                   lc   fpga3       4.09        0.00      0.1
                         CPUCtrl RSP3               lc   fpga1       0.11        0.00      0.1
                         ROMMONB RSP3               lc   rommon      0.76        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-RP-TR           Can Bus Ctrl (CBC) MTRP    lc   cbc        25.03        0.00      0.1
                         Fabric Ctrl3 MTFC          lc   fpga10      1.03        0.00      0.1
                         Fabric Ctrl4 MTFC          lc   fpga11      1.03        0.00      0.1
                         Fabric Ctrl5 MTFC          lc   fpga12      1.03        0.00      0.1
                         Fabric Ctrl6 MTFC          lc   fpga13      1.03        0.00      0.1
```

```
                         CPUCtrl1                  lc   fpga2       1.03        0.00      0.1
                         ClkCtrl                   lc   fpga3       1.05        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       1.03        0.00      0.1
                         Fabric Ctrl1 MTFC         lc   fpga8       1.03        0.00      0.1
                         Fabric Ctrl2 MTFC         lc   fpga9       1.03        0.00      0.1
                         CPUCtrl0                  lc   fpga1       1.05        0.00      0.1
                         ROMMONB MTRP              lc   rommon      5.16        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9922-RP-SE           Can Bus Ctrl (CBC) MTRP   lc   cbc        25.03        0.00      0.1
                         Fabric Ctrl3 MTFC         lc   fpga10      1.03        0.00      0.1
                         Fabric Ctrl4 MTFC         lc   fpga11      1.03        0.00      0.1
                         Fabric Ctrl5 MTFC         lc   fpga12      1.03        0.00      0.1
                         Fabric Ctrl6 MTFC         lc   fpga13      1.03        0.00      0.1
                         CPUCtrl1                  lc   fpga2       1.03        0.00      0.1
                         ClkCtrl                   lc   fpga3       1.05        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       1.03        0.00      0.1
                         Fabric Ctrl1 MTFC         lc   fpga8       1.03        0.00      0.1
                         Fabric Ctrl2 MTFC         lc   fpga9       1.03        0.00      0.1
                         CPUCtrl0                  lc   fpga1       1.05        0.00      0.1
                         ROMMONB MTRP              lc   rommon      5.16        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9900-RP-TR           Can Bus Ctrl (CBC) MTRP   lc   cbc        25.03        0.00      0.1
                         Fabric Ctrl3 MTFC         lc   fpga10      1.03        0.00      0.1
                         Fabric Ctrl4 MTFC         lc   fpga11      1.03        0.00      0.1
                         Fabric Ctrl5 MTFC         lc   fpga12      1.03        0.00      0.1
                         Fabric Ctrl6 MTFC         lc   fpga13      1.03        0.00      0.1
                         CPUCtrl1                  lc   fpga2       1.03        0.00      0.1
                         ClkCtrl                   lc   fpga3       1.05        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       1.03        0.00      0.1
                         Fabric Ctrl1 MTFC         lc   fpga8       1.03        0.00      0.1
                         Fabric Ctrl2 MTFC         lc   fpga9       1.03        0.00      0.1
                         CPUCtrl0                  lc   fpga1       1.05        0.00      0.1
                         ROMMONB MTRP              lc   rommon      5.16        0.00      0.1
-----------------------------------------------------------------------------------------------
ASR-9900-RP-SE           Can Bus Ctrl (CBC) MTRP   lc   cbc        25.03        0.00      0.1
                         Fabric Ctrl3 MTFC         lc   fpga10      1.03        0.00      0.1
                         Fabric Ctrl4 MTFC         lc   fpga11      1.03        0.00      0.1
                         Fabric Ctrl5 MTFC         lc   fpga12      1.03        0.00      0.1
                         Fabric Ctrl6 MTFC         lc   fpga13      1.03        0.00      0.1
                         CPUCtrl1                  lc   fpga2       1.03        0.00      0.1
                         ClkCtrl                   lc   fpga3       1.05        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       1.03        0.00      0.1
                         Fabric Ctrl1 MTFC         lc   fpga8       1.03        0.00      0.1
                         Fabric Ctrl2 MTFC         lc   fpga9       1.03        0.00      0.1
                         CPUCtrl0                  lc   fpga1       1.05        0.00      0.1
                         ROMMONB MTRP              lc   rommon      5.16        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-RSP440-LT            Can Bus Ctrl (CBC) RSP3   lc   cbc        16.116       0.00      0.1
                         ClockCtrl0 RSP3           lc   fpga2       1.11        0.00      0.1
                         UTI RSP3                  lc   fpga3       4.09        0.00      0.1
                         CPUCtrl RSP3              lc   fpga1       0.11        0.00      0.1
                         ROMMONB RSP3              lc   rommon      0.76        0.00      0.1
```

```
-----------------------------------------------------------------------------------------------
A9K-RSP880-TR             Can Bus Ctrl (CBC) RSP4    lc   cbc        34.38        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       0.57        0.00      0.0
                          DBCtrl                     lc   fpga3       0.16        0.00      0.0
                          DBCtrl                     lc   fpga4       0.16        0.00      0.0
                          DBCtrl                     lc   fpga5       0.12        0.00      0.0
                          PUNT FPGA                  lc   fpga6       0.06        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4               lc   rommon     10.58        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-RSP880-SE             Can Bus Ctrl (CBC) RSP4    lc   cbc        34.38        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       0.57        0.00      0.0
                          DBCtrl                     lc   fpga3       0.16        0.00      0.0
                          DBCtrl                     lc   fpga4       0.16        0.00      0.0
                          DBCtrl                     lc   fpga5       0.12        0.00      0.0
                          PUNT FPGA                  lc   fpga6       0.06        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4               lc   rommon     10.58        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-RSP880-LT-TR          Can Bus Ctrl (CBC) RSP4L   lc   cbc        50.01        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       0.13        0.00      0.0
                          DBCtrl                     lc   fpga3       0.05        0.00      0.0
                          DBCtrl                     lc   fpga4       0.04        0.00      0.0
                          DBCtrl                     lc   fpga5       0.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4L              lc   rommon     17.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-RSP880-LT-SE          Can Bus Ctrl (CBC) RSP4L   lc   cbc        50.01        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       0.13        0.00      0.0
                          DBCtrl                     lc   fpga3       0.05        0.00      0.0
                          DBCtrl                     lc   fpga4       0.04        0.00      0.0
                          DBCtrl                     lc   fpga5       0.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4L              lc   rommon     17.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-RSP-TR                Can Bus Ctrl (CBC) RSP4S   lc   cbc        43.02        0.00      0.1
                          MB CPUCtrl                 lc   fpga2       0.57        0.00      0.0
                          DBCtrl                     lc   fpga3       0.16        0.00      0.0
                          DBCtrl                     lc   fpga4       0.16        0.00      0.0
                          DBCtrl                     lc   fpga5       0.12        0.00      0.0
                          PUNT FPGA                  lc   fpga6       0.06        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4SHW            lc   rommon     16.08        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-RSP-SE                Can Bus Ctrl (CBC) RSP4S   lc   cbc        43.02        0.00      0.1
                          MB CPUCtrl                 lc   fpga2       0.57        0.00      0.0
                          DBCtrl                     lc   fpga3       0.16        0.00      0.0
                          DBCtrl                     lc   fpga4       0.16        0.00      0.0
                          DBCtrl                     lc   fpga5       0.12        0.00      0.0
                          PUNT FPGA                  lc   fpga6       0.06        0.00      0.0
                          Fsbl                       lc   fsbl        1.103       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RSP4SHW            lc   rommon     16.08        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-RP2-TR                Can Bus Ctrl (CBC) MTRP    lc   cbc        35.12        0.00      0.1
                          MB CPUCtrl                 lc   fpga2       0.57        0.00      0.0
                          DBCtrl                     lc   fpga3       0.16        0.00      0.0
                          DBCtrl                     lc   fpga4       0.16        0.00      0.0
                          DBCtrl                     lc   fpga5       0.12        0.00      0.0
```

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                          PUNT FPGA                 lc   fpga6       0.06        0.00      0.0
                          Fsbl                      lc   fsbl        1.103       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RP2               lc   rommon     14.28        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-RP2-SE                Can Bus Ctrl (CBC) MTRP   lc   cbc        35.12        0.00      0.1
                          MB CPUCtrl                lc   fpga2       0.57        0.00      0.0
                          DBCtrl                    lc   fpga3       0.16        0.00      0.0
                          DBCtrl                    lc   fpga4       0.16        0.00      0.0
                          DBCtrl                    lc   fpga5       0.12        0.00      0.0
                          PUNT FPGA                 lc   fpga6       0.06        0.00      0.0
                          Fsbl                      lc   fsbl        1.103       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.103       0.00      0.0
                          ROMMONB RP2               lc   rommon     14.28        0.00      0.0
-----------------------------------------------------------------------------------------------
ASR9001-RP                Can Bus Ctrl (CBC) IMRP   lc   cbc        22.114       0.00      0.1
                          MB CPUCtrl                lc   fpga2       1.15        0.00      0.0
                          ROMMONB IM RP             lc   rommon      3.04        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-24x10GE-SE            Can Bus Ctrl (CBC) LC6    lc   cbc        19.112       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-2x100GE-SE            Can Bus Ctrl (CBC) LC4    lc   cbc        21.111       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       1.04        0.00      0.0
                          Emux                      lc   fpga5       1.04        0.00      0.0
                          100GIGMAC                 lc   fpga6      41.00        0.00      0.0
                          ROMMONB LC4               lc   rommon      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD80-SE              Can Bus Ctrl (CBC) LC4    lc   cbc        20.118       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      3.03        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-MOD160-SE             Can Bus Ctrl (CBC) LC4    lc   cbc        20.118       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      3.03        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-24x10GE-TR            Can Bus Ctrl (CBC) LC6    lc   cbc        19.112       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-2x100GE-TR            Can Bus Ctrl (CBC) LC4    lc   cbc        21.111       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       1.04        0.00      0.0
                          Emux                      lc   fpga5       1.04        0.00      0.0
                          100GIGMAC                 lc   fpga6      41.00        0.00      0.0
                          ROMMONB LC4               lc   rommon      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD80-TR              Can Bus Ctrl (CBC) LC4    lc   cbc        20.118       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      3.03        0.00      0.1
-----------------------------------------------------------------------------------------------
```

```
A9K-MOD160-TR             Can Bus Ctrl (CBC) LC4     lc   cbc        20.118       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      3.03        0.00      0.1
-----------------------------------------------------------------------------------------------
A9K-36x10GE-SE            Can Bus Ctrl (CBC) LC6     lc   cbc        15.104       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-36x10GE_SC7-SE        Can Bus Ctrl (CBC) LC6     lc   cbc        15.104       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-36x10GE-TR            Can Bus Ctrl (CBC) LC6     lc   cbc        15.104       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-36x10GE_SC7-TR        Can Bus Ctrl (CBC) LC6     lc   cbc        15.104       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      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-1x100GE-SE            Can Bus Ctrl (CBC) LC4     lc   cbc        21.111       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       1.04        0.00      0.0
                          Emux                       lc   fpga5       1.04        0.00      0.0
                          100GIGMAC                  lc   fpga6      41.00        0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-1x100GE-TR            Can Bus Ctrl (CBC) LC4     lc   cbc        21.111       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       1.04        0.00      0.0
                          Emux                       lc   fpga5       1.04        0.00      0.0
                          100GIGMAC                  lc   fpga6      41.00        0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-VSM-500               CPUCtrl Forge              lc   cbc        33.05        0.00      0.1
                          CPUCtrl Forge              lc   fpga1       1.26        0.00      0.1
                          CPUCtrl Forge              lc   ibmc        5.08        0.00      0.1
                          CPUCtrl Forge              lc   rommon      3.07        0.00      0.1
-----------------------------------------------------------------------------------------------
A99-8X100GE-SE            Can Bus Ctrl (CBC) LC4     lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          DBCtrl                     lc   fpga3       1.07        0.00      0.0
                          PortCtrl                   lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                   lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                  lc   fpga6       2.02        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-8X100GE-TR            Can Bus Ctrl (CBC) LC4     lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
```

```
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-4X100GE-SE           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-4X100GE-SE-TAA       Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-4X100GE-TR           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-4X100GE-TR-TAA       Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-4X100GE-TAA          Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                         Fsbl                      lc   fsbl        1.100       0.00      0.0
                         LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                         ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-SE           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                         MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                         DBCtrl                    lc   fpga3       1.07        0.00      0.0
                         PortCtrl                  lc   fpga4       1.09        0.00      0.0
                         CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                         CPAK SR10                 lc   fpga6       2.02        0.00      0.0
```

```
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-SE-TAA        Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-TR            Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-TR-TAA        Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-TAA           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-MOD200-SE            Can Bus Ctrl (CBC) LC4    lc   cbc        39.07        0.00      0.0
                          DBCtrl                    lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-200MOD-SE-TAA        Can Bus Ctrl (CBC) LC4    lc   cbc        39.07        0.00      0.0
                          DBCtrl                    lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-MOD200-TR            Can Bus Ctrl (CBC) LC4    lc   cbc        39.07        0.00      0.0
                          DBCtrl                    lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
```

```
-----------------------------------------------------------------------------------------------
A99K-MOD200-TR-TAA        Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD200-SE             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD200-SE-TAA         Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD200-TR             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD200-TR-TAA         Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD200-TAA            Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-MOD400-SE            Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-MOD400-SE-TAA        Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99K-MOD400-TR            Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
```

```
A99K-MOD400-TR-TAA        Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD400-SE             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD400-SE-TAA         Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD400-TR             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD400-TR-TAA         Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-MOD400-TAA            Can Bus Ctrl (CBC) LC4     lc   cbc        39.07        0.00      0.0
                          DBCtrl                     lc   fpga10      1.19        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-8X100GE-L-SE          Can Bus Ctrl (CBC) LC4     lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          DBCtrl                     lc   fpga3       1.07        0.00      0.0
                          PortCtrl                   lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                   lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                  lc   fpga6       2.02        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-8X100GE-L-TR          Can Bus Ctrl (CBC) LC4     lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
                          DBCtrl                     lc   fpga3       1.07        0.00      0.0
                          PortCtrl                   lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                   lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                  lc   fpga6       2.02        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-8X100GE-SE            Can Bus Ctrl (CBC) LC4     lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93        0.00      0.0
```

```
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-8X100GE-TR            Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99L-4X100GE-SE           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99L-4X100GE-TR           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9KL-4X100GE-SE           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9KL-4X100GE-TR           Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-400G-DWDM-TR          Can Bus Ctrl (CBC) LC4    lc   cbc        42.04        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.06        0.00      0.0
                          DBCtrl                    lc   fpga4       1.03        0.00      0.0
                          DBCtrl                    lc   fpga5       1.05        0.00      0.0
                          DBCtrl                    lc   fpga6       3.72        0.00      1.0
```

```
                          DBCtrl                    lc   fpga7      49.00        0.00      0.0
                          CFP2 V2                   lc   fpga8       5.23        0.00      2.0
                          CFP2 V1                   lc   fpga8       4.40        0.00      1.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-4X100GE-L             Can Bus Ctrl (CBC) LC4    lc   cbc        46.06        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.80        0.00      0.0
                          DBCtrl                    lc   fpga3       1.02        0.00      0.0
                          PortCtrl                  lc   fpga4       1.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.92        0.00      0.0
                          LinuxFW                   lc   lnxfw       1.92        0.00      0.0
                          ROMMONB LC1               lc   rommon      9.22        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-12X100GE              Can Bus Ctrl (CBC) LC4    lc   cbc        46.06        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.80        0.00      0.0
                          DBCtrl                    lc   fpga3       1.02        0.00      0.0
                          PortCtrl                  lc   fpga4       1.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.92        0.00      0.0
                          LinuxFW                   lc   lnxfw       1.92        0.00      0.0
                          ROMMONB LC1               lc   rommon      9.22        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-8X100GE-CM            Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-8X100GE-CM            Can Bus Ctrl (CBC) LC4    lc   cbc        38.23        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.93        0.00      0.0
                          DBCtrl                    lc   fpga3       1.07        0.00      0.0
                          PortCtrl                  lc   fpga4       1.09        0.00      0.0
                          CPAK LR4                  lc   fpga5       1.16        0.00      0.0
                          CPAK SR10                 lc   fpga6       2.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon      8.43        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-12X100GE-CM           Can Bus Ctrl (CBC) LC4    lc   cbc        46.06        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.80        0.00      0.0
                          DBCtrl                    lc   fpga3       1.02        0.00      0.0
                          PortCtrl                  lc   fpga4       1.02        0.00      0.0
                          Fsbl                      lc   fsbl        1.92        0.00      0.0
                          LinuxFW                   lc   lnxfw       1.92        0.00      0.0
                          ROMMONB LC1               lc   rommon      9.22        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-48X10GE-1G-SE         Can Bus Ctrl (CBC) LC4    lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.85        0.00      0.0
                          PortCtrl                  lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl            lc   fpga4       1.04        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
                          LinuxFW                   lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1               lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-48X10GE-1G-TR         Can Bus Ctrl (CBC) LC4    lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                lc   fpga2       1.85        0.00      0.0
                          PortCtrl                  lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl            lc   fpga4       1.04        0.00      0.0
                          Fsbl                      lc   fsbl        1.100       0.00      0.0
```

```
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-48X10GE-1G-CM         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          fpd_lc_fpga4_0x003d02ca    lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-24X10GE-1G-SE         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-24X10GE-1G-TR         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-24X10GE-1G-CM         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-48X10GE-1G-SE         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-48X10GE-1G-TR         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A9K-48X10GE-1G-CM         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100       0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16        0.00      0.0
-----------------------------------------------------------------------------------------------
A99-24X10GE-1G-SE         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02        0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85        0.00      0.0
                          PortCtrl                   lc   fpga3       1.00        0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04        0.00      0.0
                          Fsbl                       lc   fsbl        1.100       0.00      0.0
```

```
                          LinuxFW                    lc   lnxfw       1.100        0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16         0.00      0.0
-----------------------------------------------------------------------------------------------------
A99-24X10GE-1G-TR         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02         0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85         0.00      0.0
                          PortCtrl                   lc   fpga3       1.00         0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04         0.00      0.0
                          Fsbl                       lc   fsbl        1.100        0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100        0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16         0.00      0.0
-----------------------------------------------------------------------------------------------------
A99-24X10GE-1G-CM         Can Bus Ctrl (CBC) LC4     lc   cbc        47.02         0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.85         0.00      0.0
                          PortCtrl                   lc   fpga3       1.00         0.00      0.0
                          EOBCSwicthCtrl             lc   fpga4       1.04         0.00      0.0
                          Fsbl                       lc   fsbl        1.100        0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100        0.00      0.0
                          ROMMONB LC1                lc   rommon     18.16         0.00      0.0
-----------------------------------------------------------------------------------------------------
A9K-MOD400-CM             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07         0.00      0.0
                          DBCtrl                     lc   fpga10      1.19         0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93         0.00      0.0
                          Fsbl                       lc   fsbl        1.100        0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100        0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43         0.00      0.0
-----------------------------------------------------------------------------------------------------
A9K-MOD200-CM             Can Bus Ctrl (CBC) LC4     lc   cbc        39.07         0.00      0.0
                          DBCtrl                     lc   fpga10      1.17         0.00      0.0
                          MB CPUCtrl                 lc   fpga2       1.93         0.00      0.0
                          Fsbl                       lc   fsbl        1.100        0.00      0.0
                          LinuxFW                    lc   lnxfw       1.100        0.00      0.0
                          ROMMONB LC1                lc   rommon      8.43         0.00      0.0
-----------------------------------------------------------------------------------------------------
A9K-40GE-SE               Can Bus Ctrl (CBC) LC4     lc   cbc        41.104        0.00      0.1
                          PortCtrl                   lc   fpga2       0.08         0.00      0.0
                          PortCtrl                   lc   fpga3       0.08         0.00      0.0
                          MB CPUCtrl                 lc   fpga4       0.06         0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03         0.00      0.1
-----------------------------------------------------------------------------------------------------
A9K-4T16GE-SE             Can Bus Ctrl (CBC) LC4     lc   cbc        41.104        0.00      0.1
                          PortCtrl                   lc   fpga2       0.08         0.00      0.0
                          PortCtrl                   lc   fpga3       1.00         0.00      0.0
                          MB CPUCtrl                 lc   fpga4       0.06         0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03         0.00      0.1
-----------------------------------------------------------------------------------------------------
A9K-40GE-TR               Can Bus Ctrl (CBC) LC4     lc   cbc        41.104        0.00      0.1
                          PortCtrl                   lc   fpga2       0.08         0.00      0.0
                          PortCtrl                   lc   fpga3       0.08         0.00      0.0
                          MB CPUCtrl                 lc   fpga4       0.06         0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03         0.00      0.1
-----------------------------------------------------------------------------------------------------
A9K-4T16GE-TR             Can Bus Ctrl (CBC) LC4     lc   cbc        41.104        0.00      0.1
                          PortCtrl                   lc   fpga2       0.08         0.00      0.0
                          PortCtrl                   lc   fpga3       1.00         0.00      0.0
                          MB CPUCtrl                 lc   fpga4       0.06         0.00      0.0
                          ROMMONB LC4                lc   rommon      3.03         0.00      0.1
-----------------------------------------------------------------------------------------------------
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       1.01         0.00      0.0
                          MB CPUCtrl                 lc   fpga4       2.10         0.00      0.0
                          EP Rogue                   lc   fpga6       1.06         0.00      0.0
                          EP I/O FPGA                lc   fpga7       1.02         0.00      0.0
                          ROMMONB IM LC              lc   rommon      3.04         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	1.01	0.00	0.0
	MB CPUCtrl	lc	fpga4	2.10	0.00	0.0
	EP Rogue	lc	fpga6	1.06	0.00	0.0
	EP I/O FPGA	lc	fpga7	1.02	0.00	0.0
	ROMMONB IM LC	lc	rommon	3.04	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
PWR-3KW-AC-V2	Delta AC logic PM	pm	fpga11	6.04	0.00	0.1
	Delta AC primary PM	pm	fpga12	6.02	0.00	0.1
	Delta AC secondary PM	pm	fpga13	6.02	0.00	0.1
	Emerson AC logic PM	pm	fpga14	3.18	0.00	0.1
	Emerson AC primary PM	pm	fpga15	3.06	0.00	0.1
	Emerson AC secondary PM	pm	fpga16	3.12	0.00	0.1
PWR-2KW-DC-V2	Delta DC logic PM	pm	fpga11	6.03	0.00	0.1
	Delta DC primary PM	pm	fpga12	6.03	0.00	0.1
	Delta DC secondary PM	pm	fpga13	6.02	0.00	0.1
	Emerson DC logic PM	pm	fpga14	3.19	0.00	0.1
	Emerson DC primary PM	pm	fpga15	3.12	0.00	0.1
	Emerson DC secondary PM	pm	fpga16	3.19	0.00	0.1
PWR-6KW-AC-V3	Delta V3 AC logic PM	pm	fpga11	4.03	0.00	0.1
	Delta V3 AC primary PM	pm	fpga12	4.01	0.00	0.1
	Delta V3 AC secondary PM	pm	fpga13	4.02	0.00	0.1
	Acbel V3 AC logic PM MCU	pm	fpga14	2.05	0.00	0.1
	Acbel V3 AC primary PM	pm	fpga15	1.25	0.00	0.1
	Acbel V3 AC secondary PM	pm	fpga16	2.29	0.00	0.1
PWR-4.4KW-DC-V3	Delta V3 DC logic PM	pm	fpga11	3.00	0.00	0.1
	Delta V3 DC primary PM	pm	fpga12	3.00	0.00	0.1
	Delta V3 DC secondary PM	pm	fpga13	3.00	0.00	0.1
	Acbel V3 DC logic PM MCU	pm	fpga14	1.11	0.00	0.1
	Acbel V3 DC primary PM	pm	fpga15	1.03	0.00	0.1
	Acbel V3 DC secondary PM	pm	fpga16	2.13	0.00	0.1
PWR-3KW-HVDC	Delta HVDC logic PM	pm	fpga11	2.03	0.00	0.1
	Delta HVDC primary PM	pm	fpga12	2.02	0.00	0.1
	Delta HVDC secondary PM	pm	fpga13	2.02	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-1XOC48POS/RPR	SPA FPGA swv1.101 hwv3	spa	fpga2	1.101	0.00	3.0
	SPA FPGA swv1.2	spa	fpga1	1.02	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-1XOC3-ATM-V2	SPA FPGA swv2.104 hwv2	spa	fpga2	2.104	0.00	2.8
	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-3XOC3-ATM-V2	SPA FPGA swv2.104 hwv2	spa	fpga2	2.104	0.00	2.8
	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
SPA-1XOC12-ATM-V2	SPA FPGA swv2.104 hwv2	spa	fpga2	2.104	0.00	2.8
	SPA FPGA swv1.2	spa	fpga1	2.02	0.00	0.0
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	1.01	0.00	0.0
A9K-MPA-20X10GE	EP I/O FPGA	spa	fpga5	1.16	0.00	0.0
A9K-MPA20X10GE-CM	EP I/O FPGA	spa	fpga5	1.16	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 I/O FPGA	spa	fpga7	1.03	0.00	0.0
A9K-MPA-1X40GE	EP I/O FPGA	spa	fpga7	1.03	0.00	0.0
A9K-MPA-8X10GE	EP I/O FPGA	spa	fpga8	1.07	0.00	0.0
A9K-MPA-2X100GE	EP I/O FPGA	spa	fpga9	1.04	0.00	0.0
A9K-MPA-1X100GE	EP I/O FPGA	spa	fpga9	1.04	0.00	0.0
A9K-MPA2X100GE-CM	EP I/O FPGA	spa	fpga9	1.04	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-4XOC3-POS-V2          SPA FPGA swv1.0            spa  fpga1       1.00        0.00      0.5
-----------------------------------------------------------------------------------------------
SPA-2XOC3-ATM-V2          SPA FPGA swv1.2            spa  fpga1       2.02        0.00      0.0
-----------------------------------------------------------------------------------------------
SPA-8XCHT1/E1-V2          SPA I/O FPGA               spa  fpga1       1.02        0.00      1.0
                          SPA ROMMON                 spa  rommon      1.00        0.00      1.0
-----------------------------------------------------------------------------------------------
SPA-1CHSTM1/OC3V2         SPA I/O FPGA               spa  fpga1       1.00        0.00      0.1
                          SPA ROMMON                 spa  rommon      1.00        0.00      0.1
-----------------------------------------------------------------------------------------------
SPA-2XCT3/DS0-V2          SPA I/O FPGA               spa  fpga1       1.01        0.00      1.0
                          SPA ROMMON                 spa  rommon      1.00        0.00      1.0
-----------------------------------------------------------------------------------------------
SPA-4XCT3/DS0-V2          SPA I/O FPGA               spa  fpga1       1.01        0.00      1.0
                          SPA ROMMON                 spa  rommon      1.00        0.00      1.0
-----------------------------------------------------------------------------------------------
SPA-2XT3/E3-V2            SPA FPGA swv1.1 hwv3       spa  fpga1       1.01        0.00      1.0
                          SPA ROMMON                 spa  rommon      1.00        0.00      1.0
-----------------------------------------------------------------------------------------------
SPA-4XT3/E3-V2            SPA FPGA swv1.1 hwv3       spa  fpga1       1.01        0.00      1.0
                          SPA ROMMON                 spa  rommon      1.00        0.00      1.0
-----------------------------------------------------------------------------------------------
```

Firmware Support on Cisco IOS XR 64 bit

To check the firmware code running on the Cisco ASR 9000 Series Router, run the **show fpd package** command in admin mode:

```
RP/0/RSP0/CPU0:router(admin)#show fpd package

============================== ================================================\
                                        Field Programmable Device Package\
                                 ================================================\
                                            Req     SW      Min Req   Min Req\
Card Type            FPD Description        Reload  Ver     SW Ver  Board Ver\
=================== ========================== ====== ======= ======== =========\
A99-12X100GE         CBC                     NO     46.06     46.06      0.1  \
                     IPU-FPGA                YES     1.80      1.80      0.1  \
                     IPU-FSBL                YES     1.92      1.92      0.1  \
                     IPU-Linux               YES     1.92      1.92      0.1  \
                     Morra-0                 YES     1.02      1.02      0.1  \
                     Morra-1                 YES     1.02      1.02      0.1  \
                     Primary-BIOS            YES     9.22      9.22      0.1  \
                     Sideswipe-0             YES     1.02      1.02      0.1  \
                     Sideswipe-1             YES     1.02      1.02      0.1  \
-------------------------------------------------------------------------------\
A99-12X100GE-CM      CBC                     NO     46.06     46.06      0.1  \
                     IPU-FPGA                YES     1.80      1.80      0.1  \
                     IPU-FSBL                YES     1.92      1.92      0.1  \
                     IPU-Linux               YES     1.92      1.92      0.1  \
                     Morra-0                 YES     1.02      1.02      0.1  \
                     Morra-1                 YES     1.02      1.02      0.1  \
                     Primary-BIOS            YES     9.22      9.22      0.1  \
```

```
                    Sideswipe-0                YES     1.02      1.02      0.1  \
                    Sideswipe-1                YES     1.02      1.02      0.1  \
-------------------------------------------------------------------------------\
A99-30X100GE-TR     Aldrin-FPGA                YES     0.01      0.01      0.0  \
                    CBC                        NO     48.01     48.01      0.0  \
                    Grapple-0                  YES     0.03      0.03      0.0  \
                    Grapple-1                  YES     0.03      0.03      0.0  \
                    IPU-FPGA                   YES     1.100     1.100     0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Mixmaster-0                YES     0.03      0.03      0.0  \
                    Mixmaster-1                YES     0.03      0.03      0.0  \
                    Primary-BIOS               YES    21.03     21.03      0.0  \
                    Scamper                    YES     0.01      0.01      0.0  \
                    Skylynx-0                  YES     0.03      0.03      0.0  \
                    Skylynx-1                  YES     0.03      0.03      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-SE      CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-SE      CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-SE-TAA  CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-TAA     CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-TR      CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-4X100GE-TR      CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
```

```
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-4X100GE-TR-TAA   CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-CM       CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-SE       CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-SE       CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-SE-TAA   CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-TAA      CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
                     IPU-FSBL                   YES     1.100     1.100     0.0  \
                     IPU-Linux                  YES     1.100     1.100     0.0  \
                     Meldun-0                   YES     1.07      1.07      0.0  \
                     Meldun-1                   YES     1.07      1.07      0.0  \
                     Primary-BIOS               YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A99-8X100GE-TR       CBC                        NO     38.23     38.23      0.0  \
                     Dalla                      YES     1.09      1.09      0.0  \
                     IPU-FPGA                   YES     1.93      1.93      0.0  \
```

```
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-8X100GE-TR      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-8X100GE-TR-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99-RP2-SE          Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC-0                     NO     35.12     35.12      0.0  \
                    CBC-1                     NO     35.12     35.12      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    14.28     14.28      0.0  \
-------------------------------------------------------------------------------\
A99-RP2-TR          Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC-0                     NO     35.12     35.12      0.0  \
                    CBC-1                     NO     35.12     35.12      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    14.28     14.28      0.0  \
-------------------------------------------------------------------------------\
A99-RP3-SE          Beta-FPGA                 YES     0.01      0.01      0.0  \
                    CBC-0                     NO     51.02     51.02      0.0  \
                    CBC-1                     NO     51.02     51.02      0.0  \
                    IPU-FPGA                  YES     0.03      0.03      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Orion-FPGA                YES     0.03      0.03      0.0  \
                    Primary-BIOS              YES    30.10     30.10      0.0  \
                    Zenith-FPGA               YES     0.01      0.01      0.0  \
-------------------------------------------------------------------------------\
A99-RP3-TR          Beta-FPGA                 YES     0.01      0.01      0.0  \
                    CBC-0                     NO     51.02     51.02      0.0  \
                    CBC-1                     NO     51.02     51.02      0.0  \
                    IPU-FPGA                  YES     0.03      0.03      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Orion-FPGA                YES     0.03      0.03      0.0  \
                    Primary-BIOS              YES    30.10     30.10      0.0  \
```

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                    Zenith-FPGA                YES     0.01      0.01      0.0  \
-------------------------------------------------------------------------------\
A99-RSP-SE          Alpha-FPGA                 YES     0.16      0.16      0.0  \
                    CBC                        NO     43.02     43.02      0.0  \
                    Cha-FPGA                   YES     0.06      0.06      0.0  \
                    IPU-FPGA                   YES     0.57      0.57      0.0  \
                    IPU-FSBL                   YES     1.103     1.103     0.0  \
                    IPU-Linux                  YES     1.103     1.103     0.0  \
                    Omega-FPGA                 YES     0.16      0.16      0.0  \
                    Optimus-FPGA               YES     0.12      0.12      0.0  \
                    Primary-BIOS               YES    16.08     16.08      0.0  \
-------------------------------------------------------------------------------\
A99-RSP-TR          Alpha-FPGA                 YES     0.16      0.16      0.0  \
                    CBC                        NO     43.02     43.02      0.0  \
                    Cha-FPGA                   YES     0.06      0.06      0.0  \
                    IPU-FPGA                   YES     0.57      0.57      0.0  \
                    IPU-FSBL                   YES     1.103     1.103     0.0  \
                    IPU-Linux                  YES     1.103     1.103     0.0  \
                    Omega-FPGA                 YES     0.16      0.16      0.0  \
                    Optimus-FPGA               YES     0.12      0.12      0.0  \
                    Primary-BIOS               YES    16.08     16.08      0.0  \
-------------------------------------------------------------------------------\
A99-SFC-S           CBC                        NO     44.02     44.02      0.0  \
                    IPU-FPGA                   YES     0.37      0.37      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
-------------------------------------------------------------------------------\
A99-SFC-T           CBC                        NO     44.02     44.02      0.0  \
                    IPU-FPGA                   YES     0.37      0.37      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
-------------------------------------------------------------------------------\
A99-SFC2            CBC                        NO     37.20     37.20      0.0  \
                    IPU-FPGA                   YES     0.37      0.37      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
-------------------------------------------------------------------------------\
A99-SFC3            CBC                        NO     49.01     49.01      0.0  \
                    IPU-FPGA                   YES     0.01      0.01      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
-------------------------------------------------------------------------------\
A99L-4X100GE-SE-TAA CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99L-4X100GE-TAA    CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
                    IPU-Linux                  YES     1.100     1.100     0.0  \
                    Meldun-0                   YES     1.07      1.07      0.0  \
                    Meldun-1                   YES     1.07      1.07      0.0  \
                    Primary-BIOS               YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99L-4X100GE-TR-TAA CBC                        NO     38.23     38.23      0.0  \
                    Dalla                      YES     1.09      1.09      0.0  \
                    IPU-FPGA                   YES     1.93      1.93      0.0  \
                    IPU-FSBL                   YES     1.100     1.100     0.0  \
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                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99L-8X100GE-SE-TAA CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99L-8X100GE-TAA    CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A99L-8X100GE-TR-TAA CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-400G-DWDM-TR    CBC                       NO     42.04     42.04      0.0  \
                    Doran                     YES     1.05      1.05      0.0  \
                    Frenzy                    YES    49.00     49.00      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Martell                   YES     1.03      1.03      0.0  \
                    Meldun                    YES     1.06      1.06      0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-4X100GE         CBC                       NO     46.06     46.06      0.1  \
                    IPU-FPGA                  YES     1.80      1.80      0.1  \
                    IPU-FSBL                  YES     1.92      1.92      0.1  \
                    IPU-Linux                 YES     1.92      1.92      0.1  \
                    Morra-0                   YES     1.02      1.02      0.1  \
                    Morra-1                   YES     1.02      1.02      0.1  \
                    Primary-BIOS              YES     9.22      9.22      0.1  \
                    Sideswipe-0               YES     1.02      1.02      0.1  \
                    Sideswipe-1               YES     1.02      1.02      0.1  \
-------------------------------------------------------------------------------\
A9K-4X100GE-SE      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-SE      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
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                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-SE-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-TAA     CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-TR      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-TR      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-4X100GE-TR-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-CM      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-L-SE    CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
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                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-L-TAA   CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-L-TR    CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-SE      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-SE-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-TAA     CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-TR      CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GE-TR-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
```

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                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GELSE-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-8X100GELTR-TAA  CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
-------------------------------------------------------------------------------\
A9K-MOD200-SE       Blaster                   YES     1.19      1.19      0.1  \
                    CBC                       NO     39.07     39.07      0.1  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-MOD200-TR       Blaster                   YES     1.19      1.19      0.1  \
                    CBC                       NO     39.07     39.07      0.1  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-MOD400-CM       Blaster                   YES     1.19      1.19      0.1  \
                    CBC                       NO     39.07     39.07      0.1  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-MOD400-SE       Blaster                   YES     1.19      1.19      0.1  \
                    CBC                       NO     39.07     39.07      0.1  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-MOD400-TR       Blaster                   YES     1.19      1.19      0.1  \
                    CBC                       NO     39.07     39.07      0.1  \
                    IPU-FPGA                  YES     1.93      1.93      0.1  \
                    IPU-FSBL                  YES     1.100     1.100     0.1  \
                    IPU-Linux                 YES     1.100     1.100     0.1  \
                    Primary-BIOS              YES     8.43      8.43      0.1  \
-------------------------------------------------------------------------------\
A9K-RP2-64G         Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC-0                     NO     35.12     35.12      0.0  \
                    CBC-1                     NO     35.12     35.12      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
```

```
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    14.28     14.28      0.0  \
--------------------------------------------------------------------------------\
A9K-RP3-64G         Beta-FPGA                 YES     0.01      0.01      0.0  \
                    CBC-0                     NO     51.02     51.02      0.0  \
                    CBC-1                     NO     51.02     51.02      0.0  \
                    IPU-FPGA                  YES     0.03      0.03      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Orion-FPGA                YES     0.03      0.03      0.0  \
                    Primary-BIOS              YES    30.10     30.10      0.0  \
                    Zenith-FPGA               YES     0.01      0.01      0.0  \
--------------------------------------------------------------------------------\
A9K-RSP4-64G        Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC                       NO     34.38     34.38      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    10.58     10.58      0.0  \
--------------------------------------------------------------------------------\
A9K-RSP880-SE       Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC                       NO     34.38     34.38      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    10.58     10.58      0.0  \
--------------------------------------------------------------------------------\
A9K-RSP880-TR       Alpha-FPGA                YES     0.16      0.16      0.0  \
                    CBC                       NO     34.38     34.38      0.0  \
                    Cha-FPGA                  YES     0.06      0.06      0.0  \
                    IPU-FPGA                  YES     0.57      0.57      0.0  \
                    IPU-FSBL                  YES     1.103     1.103     0.0  \
                    IPU-Linux                 YES     1.103     1.103     0.0  \
                    Omega-FPGA                YES     0.16      0.16      0.0  \
                    Optimus-FPGA              YES     0.12      0.12      0.0  \
                    Primary-BIOS              YES    10.58     10.58      0.0  \
--------------------------------------------------------------------------------\
A9KL-4X100GE-SE-TAA CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A9KL-4X100GE-TAA    CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
A9KL-4X100GE-TR-TAA CBC                       NO     38.23     38.23      0.0  \
                    Dalla                     YES     1.09      1.09      0.0  \
```

```
                    IPU-FPGA                  YES     1.93      1.93      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
                    Meldun-0                  YES     1.07      1.07      0.0  \
                    Meldun-1                  YES     1.07      1.07      0.0  \
                    Primary-BIOS              YES     8.43      8.43      0.0  \
--------------------------------------------------------------------------------\
ASR-9006-AC         CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9006-AC-V2      CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9006-FAN        CBC                       NO      5.04      5.04      0.0  \
--------------------------------------------------------------------------------\
ASR-9006-FAN-V2     CBC                       NO      5.04      5.04      0.0  \
--------------------------------------------------------------------------------\
ASR-9010-AC         CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9010-AC-V2      CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9010-FAN        CBC                       NO      4.03      4.03      0.0  \
--------------------------------------------------------------------------------\
ASR-9010-FAN-V2     CBC                       NO     29.12     29.12      0.0  \
--------------------------------------------------------------------------------\
ASR-9904-AC         CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9904-FAN        CBC                       NO     31.05     31.05      0.0  \
--------------------------------------------------------------------------------\
ASR-9906-FAN        CBC                       NO     56.01     56.01      0.0  \
                    PSOC                      NO      2.06      2.06      0.0  \
--------------------------------------------------------------------------------\
ASR-9910            CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9910-FAN        CBC                       NO     45.02     45.02      0.0  \
                    PSOC                      NO      2.06      2.06      0.0  \
--------------------------------------------------------------------------------\
ASR-9912-AC         CBC                       NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9912-FAN        CBC                       NO     31.05     31.05      0.0  \
--------------------------------------------------------------------------------\
ASR-9912-SFC220     CBC                       NO     37.20     37.20      0.0  \
                    IPU-FPGA                  YES     0.37      0.37      0.0  \
                    IPU-FSBL                  YES     1.100     1.100     0.0  \
                    IPU-Linux                 YES     1.100     1.100     0.0  \
--------------------------------------------------------------------------------\
ASR-9922-AC         CBC-0                     NO      7.105     7.105     0.0  \
                    CBC-1                     NO      7.105     7.105     0.0  \
--------------------------------------------------------------------------------\
ASR-9922-FAN        CBC                       NO     29.12     29.12      0.0  \
--------------------------------------------------------------------------------\
ASR-9922-FAN-V2     CBC                       NO     40.07     40.07      0.0  \
                    PSOC                      NO      2.06      2.06      0.0  \
--------------------------------------------------------------------------------\
PWR-2KW-DC-V2       DT-PriMCU                 NO      6.03      6.03      0.12 \
                    DT-Sec54vMCU              NO      6.02      6.02      0.12 \
                    DT-Sec5vMCU               NO      6.03      6.03      0.12 \
                    EM-PriMCU                 NO      3.12      3.12      0.12 \
                    EM-Sec54vMCU              NO      3.19      3.19      0.12 \
                    EM-Sec5vMCU               NO      3.19      3.19      0.12 \
--------------------------------------------------------------------------------\
PWR-3KW-AC-V2       DT-PriMCU                 NO      6.02      6.02      1.0  \
                    DT-Sec54vMCU              NO      6.02      6.02      1.0  \
                    DT-Sec5vMCU               NO      6.04      6.04      1.0  \
                    EM-Sec54vMCU              NO      3.12      3.12      0.21 \
                    EM-Sec5vMCU               NO      3.18      3.18      0.21 \
```

```
-------------------------------------------------------------------------------\
PWR-4.4KW-DC-V3       DT-Pri0MCU                 NO      3.00      3.00      0.1  \
                      DT-Pri1MCU                 NO      3.00      3.00      0.1  \
                      DT-Sec054vMCU              NO      3.00      3.00      0.1  \
                      DT-Sec154vMCU              NO      3.00      3.00      0.1  \
                      DT-Sec5vMCU                NO      3.00      3.00      0.1  \
-------------------------------------------------------------------------------\
PWR-6KW-AC-V3         DT-Pri0MCU                 NO      4.01      4.01      0.1  \
                      DT-Pri1MCU                 NO      4.01      4.01      0.1  \
                      DT-Sec054vMCU              NO      4.02      4.02      0.1  \
                      DT-Sec154vMCU              NO      4.02      4.02      0.1  \
                      DT-Sec5vMCU                NO      4.03      4.03      0.1  \
-------------------------------------------------------------------------------\
```

Other Important Information

- Cisco IOS XR Release 5.3.0 and later does not support combination of Cisco ASR 9000 High Density 100GE Ethernet Line Card and Cisco ASR 9000 Ethernet Line Card in a single chassis.

  For the list of ASR 9000 Series line card types, see:
  http://www.cisco.com/c/en/us/support/docs/routers/asr-9000-series-aggregation-services-routers/116726-qanda-product-00.html#anc2

- From Release 6.0, A9K-RSP-4G, A9K-RSP-8G and the ASR 9000 Ethernet Line Cards also known as the first generation ASR 9000 LCs are not supported. For a detailed listing, see End-of-Life and End-of-Sale Notices

- From Release 6.0, the onePK toolkit is not supported.

- 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 brief`**command—The show ip interface brief command might display interfaces out of order if different types of serialization are used on the SPA cards.

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

  The ordering is based on:

  1. Slot
  2. SPA
  3. Type

4. T3
5. T3/T1
6. vt15-T1
7. multilink

This may be different from the usual order (as 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 Release and the Cisco ASR 9000 Series Aggregation Services Router platform.

Cisco IOS XR Caveats

There are no caveats specific to Cisco IOS XR Software Release.

There are no caveats specific to Cisco IOS XR Software Release.

Caveats Specific to the Cisco ASR 9000 Series Router

Caveats describe unexpected behavior in Cisco IOS XR Software releases.

Bug ID	Headline
CSCve96916	Traffic drop during ISSU load phase - low priority drops
CSCvf19512	Partitioned P2MP/MLDP traffic loss when RP is selected at Tail PE

Caveats Specific to the ASR 9001 Router

There are no caveats for ASR 9001 in this release.

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.

Caution Before upgrading to a new release, you must install all available bridge SMUs of the current release. For information on the bridge SMUs, refer the upgrade document.

Note The software upgrade to a release 6.7.x and later versions fails due to unresolved software API dependencies. The issue is seen on the ASR 9000 router series running Cisco IOS XR 32-bit release 6.4.1 or lower than release 6.3.3.

To resolve the issue, you should first upgrade to any of these versions:

- Release 6.6.3
- Release 6.6.2
- Release 6.5.3
- Release 6.5.2
- Release 6.4.2, or
- Release 6.5.1

Later, upgrade to a release 6.7.x.

Alternatively, you can directly upgrade by performing a turboboot to 6.7.x.

We recommend you to upgrade all FPGAs on a given node using the **upgrade hw-module fpd all location** command. Do not upgrade a card using the **upgrade hw-module fpd** *fpga-type* **location** command as this results in FPGA inconsistencies therefore causes card boot failure.

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.

Related Documentation

The most current Cisco ASR 9000 router hardware documentation is located at the following URL:

https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-installation-guides-list.html

The Cisco IOS XR Software documentation set includes the Cisco IOS XR software configuration guides and command references.

- The configuration guides are located at this URL:

  https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-installation-and-configuration-guides-list.html
- The command reference guides are located at this URL:

  https://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-command-reference-list.html

The document containing Cisco IOS XR System Error Messages (SEM) is located at this URL:

https://www.cisco.com/c/en/us/td/docs/ios_xr_sw/error/message/ios-xr-sem-guide.html

Production Software Maintenance Updates (SMUs)

A production SMU is a SMU that is formally requested, developed, tested, and released. Production SMUs are intended for use in a live network environment and are formally supported by the Cisco TAC and the relevant development teams. Software bugs identified through software recommendations or Bug Search Tools are not a basis for production SMU requests.

For information on production SMU types, refer the Production SMU Types section of the IOS XR Software Maintenance Updates (SMUs) guide.

Communications, Services, and Additional Information

- To receive timely, relevant information from Cisco, sign up at Cisco Profile Manager.
- To get the business impact you're looking for with the technologies that matter, visit Cisco Services.
- To submit a service request, visit Cisco Support.
- To discover and browse secure, validated enterprise-class apps, products, solutions and services, visit Cisco Marketplace.
- To obtain general networking, training, and certification titles, visit Cisco Press.
- To find warranty information for a specific product or product family, access Cisco Warranty Finder.

Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.

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