Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 24.1.1

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

References

For more information about Cisco ASR 9000 Series, see:

- Cisco ASR 9000 Data Sheet listing page
- Migration Guide for Cisco ASR 9000 Series Routers

What's New in Cisco IOS XR Release 24.1.1

For more details on the Cisco IOS XR release model and associated support, see Software Lifecycle Support Statement - IOS XR.

New in Documentation

Feature	Description
Cisco IOS XR Feature Finder	We have launched this interactive tool that assists you in locating features introduced across Cisco IOS XR releases and platforms. This tool empowers you to explore, discover, and utilize the full potential of our platforms. As we continue to enhance the tool, we would love to hear your feedback. You are welcome to drop us a note here.

Software Features Enhanced and Introduced

Feature	Description
Licensing	
Smart Licensing Using Policy	Cisco Smart Licensing Using Policy (SLP) is an enhancement to the existing Cisco Smart Licensing model. It streamlines the licensing process for Cisco IOS XR products by introducing a more flexible and automated approach. With SLP, you no longer need to register your device during installation, and there is no evaluation license state or period. This simplifies the licensing process and reduces complexity. To use SLP, your devices must establish trust and send the initial license usage report within 90 days.
	Starting with this release, **cslu** is the default communication transport mode.
	The feature introduces these changes:
	YANG Data Models:
	- `Cisco-IOS-XR-smart-license-cfg.yang` (see GitHub, YANG Data Models Navigator)

Feature	Description
Application Hosting	
Support for Docker Run Options via AppMgr Commands	This feature enables you to configure Docker runtime options during the launch of the container. This allows you to overwrite default configurations for parameters such as CPU usage, security settings, health checks, and more. Multiple Docker runtime options are supported, providing users with the flexibility to customize container behavior based on specific requirements.
Support for MPLS Explicit Null for IPv6 Data packets	To monitor Quality of Service (QoS) actions executed by the penultimate router before reaching the egress router, we have introduced support for explicit null. This enables MPLS labeled packets destined for Linux TPA to be processed and forwarded to the respective TPAs without removing the MPLS labels. Prior to this release, the MPLS labeled packets intended for Linux TPA were not processed.
Telemetry Data Export from Line Card Port via User Defined VRF	In this release, you now have the capability to export telemetry data from the router to your specified destination address through line card data ports using user-defined or default VRFs. This helps in improving network segmentation, enabling you to direct telemetry data through distinct VRFs, enhancing network isolation and security. Prior to this update, telemetry data export was limited to the default VRF.
Programmability	
Certificate Common-Name For Dial-in Using gRPC Protocol	You can now specify a common-name for the certificate generated by the router while using gRPC dial-in and avoid failure during certificate verification. Earlier, the common-name in the certificate was fixed. The feature introduces these changes: **CLI:** • New **gRPC certificate common-name** command. **YANG Data Model:** • `Cisco-IOS-XR-um-grpc-cfg.yang` • `Cisco-IOS-XR-man-ems-cfg` (see GitHub, YANG Data Models Navigator)
Common Authentication For all gRPC Services	Enhances the security of device-based gRPC services by implementing a unified authentication mechanism. This feature introduces the following change: **CLI:** • The keyword **certificate-authentication** is introduced in the **grpc**
View Inconsistent OpenConfig Configuration	OpenConfig infrastructure now provides an operational data YANG model, `Cisco-IOS-XR-yiny-oper`, which can be queried to view the inconsistent OpenConfig configuration caused due to activities such as interface breakout operations, installation activities or insertion of a new line card. See GitHub, YANG Data Models Navigator
MPLS	

Feature	Description
Set Global RSVP Message Retransmission Interval	During Fast Reroute (FRR), an RSVP router sends multiple messages to neighbors. If a neighbor fails to acknowledge the messages due to an overload of RSVP message processing or a high frequency of failures, RSVP retransmits the messages, which can result in network congestion. You can now set a longer RSVP message retransmission interval to provide sufficient processing time for neighbors, reduce signaling overhead, and prevent network congestion.
	You can set this interval for all directly connected neighbors at once or remote neighbors connected through backup tunnels. Previously, you could only enable this option per interface.
	The feature introduces these changes:
	CLI: signalling refresh reduction reliable retransmit-time
	YANG Data Model: `Cisco-IOS-XR-ip-rsvp-cfg.yang` (see GitHub, YANG Data Models Navigator)
Segment Routing	
Delay Measurement for IP Endpoint over SR6 Network	In Segment Routing over an IPv6 network (SRv6), you can measure packet delay from the source to a specific IP endpoint. You can use this information for troubleshooting, network maintenance, and optimizing network performance.
	Additionally, you can use flow labels to verify the delay of each subsequent hop path towards the IP endpoint of that path. So that, when network traffic is distributed across multiple available paths towards an IP endpoint, delay measurement tracks the delay of each of these paths towards the IP endpoint.
	The feature introduces these changes:
	CLI:
	• The **source-address ipv6** keyword is introduced in the **performance-measurement endpoint** command.
	• The **segment-list name** keyword is introduced in the **segment-routing traffic-eng explicit** command.
	• The **flow-label** keyword is introduced in the **performance-measurement delay-profile name** command.
	YANG Data Model:
	• `Cisco-IOS-XR-um-performance-measurement-cfg`
	• `Cisco-IOS-XR-perf-meas-oper.yang`
	(See GitHub, YANG Data Models Navigator)

Feature	Description
ISIS Flex-Algo UCMP Support	Unequal-Cost Multiple Path (UCMP) support, present in ISIS for algorithm 0, permits the use of non-optimal paths to carry a part of the traffic. This is particularly beneficial in networks with redundancy where redundant links are not part of the Equal-Cost Multi-Path (ECMP) set and are not fully utilized. UCMP allows complete usage of these redundant network resources. When applied to Flex-Algo, UCMP provides similar functionality for algorithm-specific paths, ensuring compliance with the specific constraints of each algorithm. When UCMP is enabled at ISIS-AF level using the existing UCMP configuration, it is enabled for all the Flex-algos. You can use **ucmp disable** command under ISIS Flex-Algo sub-mode to disable UCMP for a specific Flex-Algo. This feature introduces the **ucmp disable** command.
Identical Route Distinguisher (RD) for Interworking Gateways between MPLS and SRv6 Domains	You can now configure the same Route Distinguisher (RD) for interworking gateways catering to both MPLS and SRv6 domains that help conserve hardware resources, reduce the BGP table scale and minimize the processing load on routers. At the same time, it ensures seamless connectivity across SRv6 and MPLS L3 EVPN domains, thus promoting interoperability and efficiency in modern network environments. Previously, a unique RD was required to extend L3 services between MPLS and SRv6 domains resulting in higher router load and resource consumption, which could have affected performance.
Liveness Monitoring for IP Endpoint over SRv6 Network	In Segment Routing over an IPv6 network (SRv6), you can keep track of the operational status of both the forward and reverse paths of a particular node or IP endpoint. You can use this information for troubleshooting, network maintenance, and optimizing network performance. Additionally, you can use flow labels to verify the liveness of each subsequent hop path toward the IP endpoint of that path. So that, when network traffic is distributed across multiple available paths towards an IP endpoint, liveness detection tracks the operational status of each of these paths towards the IP endpoint. The feature introduces these changes: **CLI:** • The **reverse-path** and **segment-list name** keywords are introduced in the **segment-routing traffic-eng explicit** command. • The **source-address ipv6** is introduced in the **performance-measurement endpoint** command. **YANG Data Model:** • `Cisco-IOS-XR-um-performance-measurement-cfg` • `Cisco-IOS-XR-perf-meas-oper.yang` (see GitHub, YANG Data Models Navigator)

Feature	Description
Path Tracing Source and Sink Nodes	You can now measure the Hop-by-Hop delay, trace the path in the network, collect egress interface load information and interface ID, and store them for both Source and Sink nodes. You can now gain visibility into the Path Tracing Source and Sink nodes, which handle IPv6 transit in Path Tracing and full characterization of the packet delivery path. This characterization includes real-time information and checking the network's current status, such as if packets are diverted because of a breach, pinpointing the exact location of problems between routers, and checking that traffic flows per specified priority for Quality of Service (QoS) enforcement. This feature introduces a new behavior keyword **utef** under the **router static** command.
Reporting of SR-TE Policies Using BGP-Link State for SRv6	You can gather the Traffic Engineering Policy information that is locally available in a node and advertise it in BGP-LS for SRv6. Previous versions only supported SR-MPLS. There are no changes to the configuration procedures from previous releases and works on the same configuration as the SR-MPLS feature.
SR-MPLSv6 Traffic Engineering	We have introduced the capability for SR Policy to support segment lists with IPv6 addresses, which can be either dynamically computed or explicitly set at the SRTE headend.
Synthetic Loss Measurement	You can now proactively monitor and address potential network issues before they impact users by measuring key parameters everywhere, packet loss, and jitter. Using this information, you can plan network capacity optimally and ensure quality of service. Such proactive action is possible because this feature reports synthetic Two-Way Active Measurement Protocol (TWAMP) test packets deployed in delay-profile or delay measurement sessions. It also enables you to set the upper and lower limits and notifies when the synthetic packet loss metric is out of the set limit. The feature introduces these changes: **CLI:** • The optional **anomaly-loss** keyword is introduced in the **performance-measurement delay-profile** command. • **show performance-measurement history** **YANG Data Model** • New XPaths for `Cisco-IOS-XR-um-performance-measurement-cfg` • New operations for `Cisco-IOS-XR-perf-meas-oper.yang` (see GitHub, YANG Data Models Navigator)
L2VPN and Ethernet Services	

Feature	Description
EVPN Non-Revertive Designated Forwarder Election	In a preference-based Designated Forwarder (DF) election, non-revertive mode prevents the traffic disruption that occurs during the recovery of a node in a port-active multihoming network.
	While recovering from a link failure, an EVPN ethernet-segment (ES) performs DF re-election and re-carves the services among the multihomed nodes, which causes traffic interruption and interface flapping, leading to traffic loss. In the non-revertive mode, the EVPN ES does not re-carve the services after the recovery, thus avoiding the traffic disruption.
	The feature introduces these changes:
	CLI:
	• **non-revertive**
	• **revert**
	• The **ethernet-segment interface** *interface-name* **revert** keyword is introduced in the **l2vpn evpn** command.
	YANG Data Model:
	• `Cisco-IOS-XR-evpn-oper.yang`
	• `Cisco-IOS-XR-l2vpn-cfg.yang`
	(see GitHub, YANG Data Models Navigator)
System Security	
Interaction with MASA through gRPC	From this release, you can use the gRPC protocol to interact with MASA APIs in addition to the current HTTP protocols. Through structured serialization of data with gRPC's Protocol Buffers, the communication between services is made more efficient, type-safe, and consistent.
Multi-Factor Authentication for SSH	You can now deploy robust authentication mechanisms for SSH connections to your routers and reduce security risks due to compromised or weak passwords. We now support multi-factor authentication (MFA)—a secure access management solution that verifies the identity of a user using multiple verification factors—for SSH login on Cisco IOS XR routers. These verification factors include a combination of login credentials such as username and password and a token, a cryptographic device, or a mobile phone with MFA application installed.
	No new commands or data models were introduced or modified as part of this feature.
Pre-upload Pinned-Domain Certificate	You can now pre-upload your Pinned-Domain Certificate (PDC) credentials before requesting OVs Ownership Vouchers (OVs) from the MASA server, thus making the voucher request process easier.

YANG Data Models Introduced and Enhanced

This release introduces or enhances the following data models. For detailed information about the supported and unsupported sensor paths of all the data models, see the Github repository. To get a comprehensive list of the data models supported in a release, navigate to the Available-Content.md file for the release in the Github repository. The unsupported sensor paths are documented as deviations. For example, openconfig-acl.yang provides details about the supported sensor paths, whereas cisco-xr-openconfig-acl-deviations.yang provides the unsupported sensor paths for openconfig-acl.yang on Cisco IOS XR routers.

You can also view the data model definitions using the YANG Data Models Navigator tool. This GUI-based and easy-to-use tool helps you explore the nuances of the data model and view the dependencies between various containers in the model. You can view the list of models supported across Cisco IOS XR releases and platforms, locate a specific model, view the containers and their respective lists, leaves, and leaf lists presentedvisually in a tree structure.

Feature	Description
Programmability	
opencivfig-mpls-ldp.yang Version 3.1.0	This OpenConfig data model introduces the following changes: • Enable and authenticate LDP signalling messages using **enable** and **authentication-key** leaves globally for all interfaces or for LDP neighbors. • Configure the global and neighbor label switch identifier for the router using **lsr-id** leaf • Define the time for which a neighbor adjacency will be kept by the router while it waits for a new "hello" message using **hello-holdtime** leaf • Define the interval for sending these "hello" messages on each link LDP adjacency using **hello-interval** leaf • Enable and configure the address family name for IPv4 and IPv6 interfaces using **enabled** and **afi-name** leaves • Configure the list of LDP configurations for each interface using **interface-id** leaf where the interface referenced is based on the interface and subinterface leaves within the **interface-ref** container • Define the list of LDP neighbors and their attributes using **label-space-id** leaf • Configure the list for attributes related to address families for targeted LDP using **afi-name** leaf • Specify the neighbor address of the targeted LDP session using **remote-address** leaf • Enable or disable the acceptance of targeted LDP "hello" messages using **hello-accept** leaf • Enable and configure the interval for which the remote LDP peers wait for the local node to reconnect gracefully after a failure using **enable** and **reconnect-time** leaves • Configure the time interval to gracefully restart a Label Switch Router's (LSR) forwarding when in recovery mode using **forwarding-holdtime** leaf
Cisco-IOS-XR-evpn-oper.yang	This YANG model is modified to enable non-revertive mode on preference based EVPN DF election.

Feature	Description
Cisco-IOS-XR-l2vpn-cfg.yang	This YANG model is modified to enable non-revertive mode on preference based EVPN DF election.
Cisco-IOS-XR-infra-xtc-agent-oper.yang	This native data model is enhanced with a new container, *excluded-resources* to display associated resource lists for policies.
Cisco-IOS-XR-infra-xtc-oper.yang	This native data model is enhanced with a new container, *constraints-information*, to exclude IP constraints for candidate paths and includes the shortest-path flag in the disjoint constraints.
Cisco-IOS-XR-infra-xtc-agent-cfg.yang	This native data model is enhanced with a new container, *resources*, and a new leaf, *exclude-resource-rule* in the *resources-rule-table* container to configure and associate resource lists as constraints to policies. Additionally, new leaves such as *shortest-path* and *fallback-disable* are added in the *disjoint-path* container to extend the disjoint constraint configuration.
opencconfig-ospfv2.yang Version 0.4.0	The OpenConfig data model is part of the opencconfig-network-instance.yang data model and configures OSPF functionalities, such as multiple processes, areas, and interfaces. In this release, the OpenConfig data model supports streaming Model-driven telemetry (MDT)—both Cadence driven and Event-driven telemetry (EDT). EDT and MDT for all state leafs under the Link state database (LSDB) container are not supported.
opencconfig-network-instance.yang	This OpenConfig data model augments the **Cisco-IOS-XR-opencconfig-bgp-ext.yang** and supports streaming Model-driven telemetry (MDT) for all the leaves. However, only the following leaves support both Event-driven telemetry (EDT) and Model-driven telemetry (MDT): • **max-prefix-discard-extra-paths** • **max-prefix-exceed-paths-discard** • **route-policy-prefix-orf** • **dmz-link-bandwidth** • **previous-connection-state**

Feature	Description
Cisco-IOS-XR-ip-rsvp-cfg.yang	The Cisco-IOS-XR-ip-rsvp-cfg.yang data model's global-refresh-reduction container is updated with the following: The global-retransmit-timer container and its two leaves are added to hold the global RSVP message retransmission interval parameters. The retransmit-time leaf holds the RSVP message retransmission interval. The global-retransmit-timer-option leaf either holds the all-option (if the interval is enabled for all RSVP interfaces) or the backup-option (if the interval is enabled only for backup tunnels).
Cisco-IOS-XR-um-grpc-cfg.yang	This YANG model is modified to specify a common-name for the certificate generated by the router while using gRPC dial-in.
Cisco-IOS-XR-man-ems-cfg.yang	This YANG model is modified to specify a common-name for the certificate generated by the router while using gRPC dial-in and to specify a limit on the number of concurrent streams per gRPC connection.
Cisco-IOS-XR-man-ems-oper.yang	This YANG model is modified to specify a limit on the number of concurrent streams per gRPC connection.

Hardware Introduced

No new hardware introduced in this release.

Caveats

Table 1: Cisco ASR 9000 Series Router Specific Bugs

Bug ID	Headline
CSCwj07339	The call-home configurations displayed in the show run call-home command are missing in the show running-config command output.

Behavior Changes

- From this release, the default order of authentication methods for SSH clients on Cisco IOS XR routers running Cisco IOS XR SSH is changed to: **public-key**, **keyboard-interactive**, and **password**.

  Prior to this release, the default order was: **public-key**, **password**, and **keyboard-interactive**.

Supported Packages and System Requirements

Feature Set (Software Images)

Visit the Cisco Software Download page to download the Cisco IOS XR software.

Cisco IOS XR 64 bit

This table lists the feature set matrix (ISO and RPM files) and associated filenames available for the Cisco IOS XR 64 bit 24.1.1 Release supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 2: Cisco IOS XR 64 bit Software Release 24.1.1 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP and RP systems]	ASR9K-x64-iosxr-px-24.1.1.tar	• Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR MPLS -TE and RSVP Package • Cisco IOS XR Multicast Package • Cisco IOS XR Optics Package • Cisco IOS XR BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Satellite Package • Cisco IOS XR EIGRP Package • Cisco IOS XR ISIS Package • Cisco IOS XR OSPF Package • Cisco IOS XR Service Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software 3DES [for RSP and RP systems]	ASR9K-x64-iosxr-px-k9-24.1.1.tar	• Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR MPLS -TE and RSVP Package • Cisco IOS XR Multicast Package • Cisco IOS XR Optics Package • Cisco IOS XR BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Satellite Package • Cisco IOS XR Security Package • Cisco IOS XR EIGRP Package • Cisco IOS XR ISIS Package • Cisco IOS XR OSPF Package • Cisco IOS XR Service Package
Cisco IOS XR IP Unicast Routing Core Bundle and Migration to IOS XR 64 bit tar image	asr9k-mini-x64-migrate_to_eXR.tar-24.1.1	Contains the required core packages, including OS, Admin, Base,Forwarding, Modular Services Card, Routing, FPD, SNMP Agent, and Alarm Correlation. Contains mini.iso file for XR 64 bit 24.1.1 and additional software for migration to 64 bit.

Table 3: Cisco IOS XR 64 bit Software Release 24.1.1 ISO and RPM Files

Composite Package		
Feature Set	**Filename**	**Description**
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-x64-24.1.1.iso	Contains the required core packages, including OS, Admin, Base,Forwarding, Modular Services Card, Routing, FPD, 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-r2411.x86_64.rpm	Includes EIGRP protocol support software
Cisco IOS XR BNG Package	asr9k-bng-x64-1.1.0.0-r2411.x86_64.rpm	Includes binaries to support BNG features.
Cisco IOS XR 64 bit ISIS package	asr9k-isis-x64-1.1.0.0-r711.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-r711.x86_64.rpm	Includes OSPF link state protocol support software
Cisco IOS XR Manageability Package	asr9k-mgbl-x64-3.0.0.0-r2411.x86_64.rpm	CORBA2 agent, XML3 Parser, and HTTP server packages. This RPM 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-r2411.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-r2411.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-r2411.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-r2411.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-r2411.x86_64.rpm	Includes LI software images.
Cisco IOS XR Security Package	asr9k-k9sec-x64-3.1.0.0-r2411.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-r2411.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
Cisco IOS XR 64 bit Services Package	asr9k-services-x64-1.0.0.0-r2411.x86_64.rpm	Includes RPM to support Cisco IOS XR 64-bit inline MAP-T function

Software Compatibility

Cisco IOS XR Software Release 24.1.1 is compatible with the following Cisco ASR 9000 Series Aggregation Services Router systems.

- Cisco ASR 9900 Series Chassis

    - Cisco ASR 9922 Chassis

    - Cisco ASR 9912 Chassis

    - Cisco ASR 9910 Chassis

    - Cisco ASR 9906 Chassis

    - Cisco ASR 9904 Chassis

    - Cisco ASR 9903 Chassis

    - Cisco ASR 9902 Chassis

    - Cisco ASR 9901 Chassis

- Cisco ASR 9000 Series Chassis

    - Cisco ASR 9010 Chassis

    - Cisco ASR 9006 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 active summary** command:

Cisco IOS XR 64 bit

```
Router# show install active summary
Label : 24.1.1

    Active Packages: 16
        asr9k-xr-24.1.1 version=24.1.1 [Boot image]
        asr9k-9000v-nV-x64-1.0.0.0-r2411
        asr9k-bng-supp-x64-1.0.0.0-r2411
        asr9k-bng-x64-1.0.0.0-r2411
        asr9k-eigrp-x64-1.0.0.0-r2411
        asr9k-isis-x64-1.0.0.0-r2411
        asr9k-k9sec-x64-1.0.0.0-r2411
```

```
asr9k-li-x64-1.0.0.0-r2411
asr9k-m2m-x64-1.0.0.0-r2411
asr9k-mcast-x64-1.0.0.0-r2411
asr9k-mgbl-x64-1.0.0.0-r2411
asr9k-mpls-x64-1.0.0.0-r2411
asr9k-mpls-te-rsvp-x64-1.0.0.0-r2411
asr9k-optic-x64-1.0.0.0-r2411
asr9k-ospf-x64-1.0.0.0-r2411
asr9k-services-x64-1.0.0.0-r2411
```

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:

Note

The show command output lists supported and EOL hardware PIDs. To know the PIDs that are supported in this release, see the Supported Hardware section in this Release Notes.

```
(sysadmin-vm)#show fpd package
=====================================================================================
                        Field Programmable Device Package
                    =================================================
                                            Req    SW        Min Req    Min Req
Card Type           FPD Description         Reload Ver       SW Ver     Board Ver
================== ========================= ====== =======  ========== =========
A99-10X400GE-X-CM   Aldrin-FPGA             YES    1.05       1.05        0.0
                    Beachcomber-0           YES    0.01       0.01        0.0
                    Beachcomber-1           YES    0.01       0.01        0.0
                    CBC                     NO     62.05      62.05       0.0
                    IPU-DDR4                YES    1.06       1.06        0.0
                    Primary-BIOS            YES    25.30      25.30       0.0
                    Sunstreaker             YES    0.19       0.19        0.0
                    TAMFW-Sunstreaker       YES    2.72       2.72        0.0
                    Trailbreaker-0          YES    0.24       0.24        0.0
                    Trailbreaker-1          YES    0.24       0.24        0.0
------------------------------------------------------------------------------------
A99-10X400GE-X-SE   Aldrin-FPGA             YES    1.05       1.05        0.0
                    Beachcomber-0           YES    0.01       0.01        0.0
                    Beachcomber-1           YES    0.01       0.01        0.0
                    CBC                     NO     62.05      62.05       0.0
                    IPU-DDR4                YES    1.06       1.06        0.0
                    Primary-BIOS            YES    25.30      25.30       0.0
                    Sunstreaker             YES    0.19       0.19        0.0
                    TAMFW-Sunstreaker       YES    2.72       2.72        0.0
                    Trailbreaker-0          YES    0.24       0.24        0.0
                    Trailbreaker-1          YES    0.24       0.24        0.0
------------------------------------------------------------------------------------
A99-10X400GE-X-TR   Aldrin-FPGA             YES    1.05       1.05        0.0
                    Beachcomber-0           YES    0.01       0.01        0.0
                    Beachcomber-1           YES    0.01       0.01        0.0
                    CBC                     NO     62.05      62.05       0.0
                    IPU-DDR4                YES    1.06       1.06        0.0
                    Primary-BIOS            YES    25.30      25.30       0.0
                    Sunstreaker             YES    0.19       0.19        0.0
                    TAMFW-Sunstreaker       YES    2.72       2.72        0.0
                    Trailbreaker-0          YES    0.24       0.24        0.0
                    Trailbreaker-1          YES    0.24       0.24        0.0
------------------------------------------------------------------------------------
A99-12X100GE        CBC                     NO     46.06      46.06       0.1
                    IPU-FPGA                YES    1.90       1.90        0.1
                    IPU-FSBL                YES    1.113      1.113       0.1
                    IPU-Linux               YES    1.113      1.113       0.1
                    Morra-0                 YES    1.05       1.05        0.1
                    Morra-1                 YES    1.05       1.05        0.1
                    Primary-BIOS            YES    9.33       9.33        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    1.90       1.90        0.1
                    IPU-FSBL                YES    1.113      1.113       0.1
                    IPU-Linux               YES    1.113      1.113       0.1
                    Morra-0                 YES    1.05       1.05        0.1
                    Morra-1                 YES    1.05       1.05        0.1
                    Primary-BIOS            YES    9.33       9.33        0.1
                    Sideswipe-0             YES    1.02       1.02        0.1
                    Sideswipe-1             YES    1.02       1.02        0.1
------------------------------------------------------------------------------------
```

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A99-16X100GE-CM      Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     48.09      48.09       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.09       1.09       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    21.43      21.43       0.0
                     Scamper              YES     0.23       0.23       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
-------------------------------------------------------------------------------
A99-16X100GE-SE      Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     48.09      48.09       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.09       1.09       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    21.43      21.43       0.0
                     Scamper              YES     0.23       0.23       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
-------------------------------------------------------------------------------
A99-16X100GE-TR      Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     48.09      48.09       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.09       1.09       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    21.43      21.43       0.0
                     Scamper              YES     0.23       0.23       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
-------------------------------------------------------------------------------
A99-16X100GE-X-SE    Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     48.09      48.09       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     Grapple-1            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.09       1.09       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Mixmaster-1          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    21.43      21.43       0.0
                     Scamper              YES     0.23       0.23       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
                     Skylynx-1            YES     0.12       0.12       0.0
-------------------------------------------------------------------------------
A99-24HG-FLEX-CM     Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     57.04      57.04       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     Grapple-1            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.18       1.18       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Mixmaster-1          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    25.30      25.30       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
                     Skylynx-1            YES     0.12       0.12       0.0
                     Sunstreaker          YES     0.19       0.19       0.0
                     TAMFW-Sunstreaker    YES     2.72       2.72       0.0
-------------------------------------------------------------------------------
A99-24HG-FLEX-SE     Aldrin-FPGA          YES     1.05       1.05       0.0
                     CBC                  NO     57.04      57.04       0.0
                     Grapple-0            YES     0.15       0.15       0.0
                     Grapple-1            YES     0.15       0.15       0.0
                     IPU-DDR4             YES     1.18       1.18       0.0
                     Mixmaster-0          YES     0.13       0.13       0.0
                     Mixmaster-1          YES     0.13       0.13       0.0
                     Primary-BIOS         YES    25.30      25.30       0.0
                     Skylynx-0            YES     0.12       0.12       0.0
                     Skylynx-1            YES     0.12       0.12       0.0
                     Sunstreaker          YES     0.19       0.19       0.0
                     TAMFW-Sunstreaker    YES     2.72       2.72       0.0
```

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--------------------------------------------------------------------------------
A99-24HG-FLEX-TR    Aldrin-FPGA             YES    1.05       1.05      0.0
                    CBC                     NO    57.04      57.04      0.0
                    Grapple-0               YES    0.15       0.15      0.0
                    Grapple-1               YES    0.15       0.15      0.0
                    IPU-DDR4                YES    1.18       1.18      0.0
                    Mixmaster-0             YES    0.13       0.13      0.0
                    Mixmaster-1             YES    0.13       0.13      0.0
                    Primary-BIOS            YES   25.30      25.30      0.0
                    Skylynx-0               YES    0.12       0.12      0.0
                    Skylynx-1               YES    0.12       0.12      0.0
                    Sunstreaker             YES    0.19       0.19      0.0
                    TAMFW-Sunstreaker       YES    2.72       2.72      0.0
--------------------------------------------------------------------------------
A99-24X10GE-1G-CM   CBC                     NO    47.03      47.03      0.1
                    IPU-FPGA                YES    1.90       1.90      0.1
                    IPU-FSBL                YES    1.113      1.113     0.1
                    IPU-Linux               YES    1.113      1.113     0.1
                    Leadfoot-0              YES    1.00       1.00      0.1
                    Lewis                   YES    1.11       1.11      0.1
                    Primary-BIOS            YES   18.33      18.33      0.1
--------------------------------------------------------------------------------
A99-24X10GE-1G-SE   CBC                     NO    47.03      47.03      0.1
                    IPU-FPGA                YES    1.90       1.90      0.1
                    IPU-FSBL                YES    1.113      1.113     0.1
                    IPU-Linux               YES    1.113      1.113     0.1
                    Leadfoot-0              YES    1.00       1.00      0.1
                    Lewis                   YES    1.11       1.11      0.1
                    Primary-BIOS            YES   18.33      18.33      0.1
--------------------------------------------------------------------------------
A99-24X10GE-1G-TR   CBC                     NO    47.03      47.03      0.1
                    IPU-FPGA                YES    1.90       1.90      0.1
                    IPU-FSBL                YES    1.113      1.113     0.1
                    IPU-Linux               YES    1.113      1.113     0.1
                    Leadfoot-0              YES    1.00       1.00      0.1
                    Lewis                   YES    1.11       1.11      0.1
                    Primary-BIOS            YES   18.33      18.33      0.1
--------------------------------------------------------------------------------
A99-32X100GE-CM     Aldrin-FPGA             YES    1.05       1.05      0.0
                    CBC                     NO    48.09      48.09      0.0
                    Grapple-0               YES    0.15       0.15      0.0
                    Grapple-1               YES    0.15       0.15      0.0
                    IPU-DDR4                YES    1.09       1.09      0.0
                    Mixmaster-0             YES    0.13       0.13      0.0
                    Mixmaster-1             YES    0.13       0.13      0.0
                    Primary-BIOS            YES   21.43      21.43      0.0
                    Scamper                 YES    0.23       0.23      0.0
                    Skylynx-0               YES    0.12       0.12      0.0
                    Skylynx-1               YES    0.12       0.12      0.0
--------------------------------------------------------------------------------
A99-32X100GE-DENS   Aldrin-FPGA             YES    1.05       1.05      0.0
                    CBC                     NO    57.04      57.04      0.0
                    Grapple-0               YES    0.12       0.12      0.0
                    Grapple-1               YES    0.12       0.12      0.0
                    IPU-DDR4                YES    1.08       1.08      0.0
                    Mixmaster-0             YES    0.13       0.13      0.0
                    Mixmaster-1             YES    0.13       0.13      0.0
                    Primary-BIOS            YES   25.30      25.30      0.0
                    Skylynx-0               YES    0.08       0.08      0.0
                    Skylynx-1               YES    0.08       0.08      0.0
                    Sunstreaker             YES    0.19       0.19      0.0
                    TAMFW-Sunstreaker       YES    2.72       2.72      0.0
--------------------------------------------------------------------------------
A99-32X100GE-SE     Aldrin-FPGA             YES    1.05       1.05      0.0
```

```
                        CBC                    NO    48.09      48.09      0.0
                        Grapple-0              YES    0.15       0.15      0.0
                        Grapple-1              YES    0.15       0.15      0.0
                        IPU-DDR4               YES    1.09       1.09      0.0
                        Mixmaster-0            YES    0.13       0.13      0.0
                        Mixmaster-1            YES    0.13       0.13      0.0
                        Primary-BIOS           YES   21.43      21.43      0.0
                        Scamper                YES    0.23       0.23      0.0
                        Skylynx-0              YES    0.12       0.12      0.0
                        Skylynx-1              YES    0.12       0.12      0.0
-------------------------------------------------------------------------------
A99-32X100GE-TR         Aldrin-FPGA            YES    1.05       1.05      0.0
                        CBC                    NO    48.09      48.09      0.0
                        Grapple-0              YES    0.15       0.15      0.0
                        Grapple-1              YES    0.15       0.15      0.0
                        IPU-DDR4               YES    1.09       1.09      0.0
                        Mixmaster-0            YES    0.13       0.13      0.0
                        Mixmaster-1            YES    0.13       0.13      0.0
                        Primary-BIOS           YES   21.43      21.43      0.0
                        Scamper                YES    0.23       0.23      0.0
                        Skylynx-0              YES    0.12       0.12      0.0
                        Skylynx-1              YES    0.12       0.12      0.0
-------------------------------------------------------------------------------
A99-32X100GE-X-CM       Aldrin-FPGA            YES    1.05       1.05      0.0
                        CBC                    NO    57.04      57.04      0.0
                        Grapple-0              YES    0.15       0.15      0.0
                        Grapple-1              YES    0.15       0.15      0.0
                        IPU-DDR4               YES    1.18       1.18      0.0
                        Mixmaster-0            YES    0.13       0.13      0.0
                        Mixmaster-1            YES    0.13       0.13      0.0
                        Primary-BIOS           YES   25.30      25.30      0.0
                        Skylynx-0              YES    0.12       0.12      0.0
                        Skylynx-1              YES    0.12       0.12      0.0
                        Sunstreaker            YES    0.19       0.19      0.0
                        TAMFW-Sunstreaker      YES    2.72       2.72      0.0
-------------------------------------------------------------------------------
A99-32X100GE-X-SE       Aldrin-FPGA            YES    1.05       1.05      0.0
                        CBC                    NO    57.04      57.04      0.0
                        Grapple-0              YES    0.15       0.15      0.0
                        Grapple-1              YES    0.15       0.15      0.0
                        IPU-DDR4               YES    1.18       1.18      0.0
                        Mixmaster-0            YES    0.13       0.13      0.0
                        Mixmaster-1            YES    0.13       0.13      0.0
                        Primary-BIOS           YES   25.30      25.30      0.0
                        Skylynx-0              YES    0.12       0.12      0.0
                        Skylynx-1              YES    0.12       0.12      0.0
                        Sunstreaker            YES    0.19       0.19      0.0
                        TAMFW-Sunstreaker      YES    2.72       2.72      0.0
-------------------------------------------------------------------------------
A99-32X100GE-X-TR       Aldrin-FPGA            YES    1.05       1.05      0.0
                        CBC                    NO    57.04      57.04      0.0
                        Grapple-0              YES    0.15       0.15      0.0
                        Grapple-1              YES    0.15       0.15      0.0
                        IPU-DDR4               YES    1.18       1.18      0.0
                        Mixmaster-0            YES    0.13       0.13      0.0
                        Mixmaster-1            YES    0.13       0.13      0.0
                        Primary-BIOS           YES   25.30      25.30      0.0
                        Skylynx-0              YES    0.12       0.12      0.0
                        Skylynx-1              YES    0.12       0.12      0.0
                        Sunstreaker            YES    0.19       0.19      0.0
                        TAMFW-Sunstreaker      YES    2.72       2.72      0.0
-------------------------------------------------------------------------------
A99-48X10GE-1G-CM       CBC                    NO    47.03      47.03      0.1
                        IPU-FPGA               YES    1.90       1.90      0.1
```

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                      IPU-FSBL                YES    1.113    1.113    0.1
                      IPU-Linux               YES    1.113    1.113    0.1
                      Leadfoot-0              YES    1.00     1.00     0.1
                      Leadfoot-1              YES    1.00     1.00     0.1
                      Lewis                   YES    1.11     1.11     0.1
                      Primary-BIOS            YES    18.33    18.33    0.1
--------------------------------------------------------------------------------
A99-48X10GE-1G-SE     CBC                     NO     47.03    47.03    0.1
                      IPU-FPGA                YES    1.90     1.90     0.1
                      IPU-FSBL                YES    1.113    1.113    0.1
                      IPU-Linux               YES    1.113    1.113    0.1
                      Leadfoot-0              YES    1.00     1.00     0.1
                      Leadfoot-1              YES    1.00     1.00     0.1
                      Lewis                   YES    1.11     1.11     0.1
                      Primary-BIOS            YES    18.33    18.33    0.1
--------------------------------------------------------------------------------
A99-48X10GE-1G-TR     CBC                     NO     47.03    47.03    0.1
                      IPU-FPGA                YES    1.90     1.90     0.1
                      IPU-FSBL                YES    1.113    1.113    0.1
                      IPU-Linux               YES    1.113    1.113    0.1
                      Leadfoot-0              YES    1.00     1.00     0.1
                      Leadfoot-1              YES    1.00     1.00     0.1
                      Lewis                   YES    1.11     1.11     0.1
                      Primary-BIOS            YES    18.33    18.33    0.1
--------------------------------------------------------------------------------
A99-4HG-FLEX-FC       Aldrin-FPGA             YES    1.05     1.05     0.0
                      CBC                     NO     63.03    63.03    0.0
                      IPU-DDR4                YES    1.05     1.05     0.0
                      Moonracer               YES    0.14     0.14     0.0
                      Primary-BIOS            YES    25.30    25.30    0.0
                      Skywarp-0               YES    0.11     0.11     0.0
                      Skywarp-1               YES    0.11     0.11     0.0
                      Sunstreaker             YES    0.19     0.19     0.0
                      TAMFW-Sunstreaker       YES    2.72     2.72     0.0
--------------------------------------------------------------------------------
A99-4HG-FLEX-SE       Aldrin-FPGA             YES    1.05     1.05     0.0
                      CBC                     NO     63.03    63.03    0.0
                      IPU-DDR4                YES    1.05     1.05     0.0
                      Moonracer               YES    0.14     0.14     0.0
                      Primary-BIOS            YES    25.30    25.30    0.0
                      Skywarp-0               YES    0.11     0.11     0.0
                      Skywarp-1               YES    0.11     0.11     0.0
                      Sunstreaker             YES    0.19     0.19     0.0
                      TAMFW-Sunstreaker       YES    2.72     2.72     0.0
--------------------------------------------------------------------------------
A99-4HG-FLEX-TR       Aldrin-FPGA             YES    1.05     1.05     0.0
                      CBC                     NO     63.03    63.03    0.0
                      IPU-DDR4                YES    1.05     1.05     0.0
                      Moonracer               YES    0.14     0.14     0.0
                      Primary-BIOS            YES    25.30    25.30    0.0
                      Skywarp-0               YES    0.11     0.11     0.0
                      Skywarp-1               YES    0.11     0.11     0.0
                      Sunstreaker             YES    0.19     0.19     0.0
                      TAMFW-Sunstreaker       YES    2.72     2.72     0.0
--------------------------------------------------------------------------------
A99-4X100GE-SE        CBC                     NO     38.23    38.23    0.0
                      Dalla                   YES    1.09     1.09     0.0
                      IPU-FPGA                YES    1.99     1.99     0.0
                      IPU-FSBL                YES    1.113    1.113    0.0
                      IPU-Linux               YES    1.113    1.113    0.0
                      Meldun-0                YES    1.07     1.07     0.0
                      Meldun-1                YES    1.07     1.07     0.0
                      Primary-BIOS            YES    8.51     8.51     0.0
--------------------------------------------------------------------------------
```

```
A99-4X100GE-SE          CBC               NO    38.23    38.23    0.0
                        Dalla             YES    1.09     1.09    0.0
                        IPU-FPGA          YES    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    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    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    0.0
-------------------------------------------------------------------------------
A99-4X100GE-TAA         CBC               NO    38.23    38.23    0.0
                        Dalla             YES    1.09     1.09    0.0
                        IPU-FPGA          YES    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    0.0
-------------------------------------------------------------------------------
A99-4X100GE-TR          CBC               NO    38.23    38.23    0.0
                        Dalla             YES    1.09     1.09    0.0
                        IPU-FPGA          YES    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    0.0
-------------------------------------------------------------------------------
A99-4X100GE-TR          CBC               NO    38.23    38.23    0.0
                        Dalla             YES    1.09     1.09    0.0
                        IPU-FPGA          YES    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    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    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    0.0
-------------------------------------------------------------------------------
A99-8X100GE-CM          CBC               NO    38.23    38.23    0.0
                        Dalla             YES    1.09     1.09    0.0
                        IPU-FPGA          YES    1.99     1.99    0.0
                        IPU-FSBL          YES   1.113    1.113    0.0
                        IPU-Linux         YES   1.113    1.113    0.0
                        Meldun-0          YES    1.07     1.07    0.0
                        Meldun-1          YES    1.07     1.07    0.0
                        Primary-BIOS      YES    8.51     8.51    0.0
-------------------------------------------------------------------------------
A99-8X100GE-SE          CBC               NO    38.23    38.23    0.0
```

```
                      Dalla                 YES    1.09       1.09        0.0
                      IPU-FPGA              YES    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        0.0
--------------------------------------------------------------------------------
A99-8X100GE-SE        CBC                   NO    38.23      38.23        0.0
                      Dalla                 YES    1.09       1.09        0.0
                      IPU-FPGA              YES    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        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    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        0.0
--------------------------------------------------------------------------------
A99-8X100GE-TAA       CBC                   NO    38.23      38.23        0.0
                      Dalla                 YES    1.09       1.09        0.0
                      IPU-FPGA              YES    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        0.0
--------------------------------------------------------------------------------
A99-8X100GE-TR        CBC                   NO    38.23      38.23        0.0
                      Dalla                 YES    1.09       1.09        0.0
                      IPU-FPGA              YES    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        0.0
--------------------------------------------------------------------------------
A99-8X100GE-TR        CBC                   NO    38.23      38.23        0.0
                      Dalla                 YES    1.09       1.09        0.0
                      IPU-FPGA              YES    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        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    1.99       1.99        0.0
                      IPU-FSBL              YES    1.113      1.113       0.0
                      IPU-Linux             YES    1.113      1.113       0.0
                      Meldun-0              YES    1.07       1.07        0.0
                      Meldun-1              YES    1.07       1.07        0.0
                      Primary-BIOS          YES    8.51       8.51        0.0
--------------------------------------------------------------------------------
A99-RP-F              Aldrin-0-FPGA         YES    1.06       1.06        0.0
                      CBC                   NO    59.13      59.13        0.0
```

```
                        Lionheart-FPGA          YES       0.30        0.30      0.0
                        Longshot                YES       2.16        2.16      0.0
                        Primary-BIOS            YES      33.30       33.30      0.0
                        TamFW-Longshot          YES       2.65        2.65      0.0
                        Wolfpack-FPGA           YES       0.19        0.19      0.0
-------------------------------------------------------------------------------------
A99-RP2-SE              Alpha-FPGA              YES       0.16        0.16      0.0
                        CBC-0                   NO       35.14       35.14      0.0
                        CBC-1                   NO       35.14       35.14      0.0
                        Cha-FPGA                YES       0.09        0.09      0.0
                        IPU-FPGA                YES       0.72        0.72      0.0
                        IPU-FSBL                YES       1.113       1.113     0.0
                        IPU-Linux               YES       1.113       1.113     0.0
                        Omega-FPGA              YES       0.20        0.20      0.0
                        Optimus-FPGA            YES       0.12        0.12      0.0
                        Primary-BIOS            YES      14.39       14.39      0.0
-------------------------------------------------------------------------------------
A99-RP2-TR              Alpha-FPGA              YES       0.16        0.16      0.0
                        CBC-0                   NO       35.14       35.14      0.0
                        CBC-1                   NO       35.14       35.14      0.0
                        Cha-FPGA                YES       0.09        0.09      0.0
                        IPU-FPGA                YES       0.72        0.72      0.0
                        IPU-FSBL                YES       1.113       1.113     0.0
                        IPU-Linux               YES       1.113       1.113     0.0
                        Omega-FPGA              YES       0.20        0.20      0.0
                        Optimus-FPGA            YES       0.12        0.12      0.0
                        Primary-BIOS            YES      14.39       14.39      0.0
-------------------------------------------------------------------------------------
A99-RP3-SE              Aldrin-0-FPGA           YES       1.03        1.03      0.0
                        Aldrin-1-FPGA           YES       1.00        1.00      0.0
                        Beta-FPGA               YES       0.07        0.07      0.0
                        CBC-0                   NO       51.12       51.12      0.0
                        CBC-1                   NO       51.12       51.12      0.0
                        IPU-DDR4                YES       0.20        0.20      0.0
                        Orion-FPGA              YES       0.23        0.23      0.0
                        Primary-BIOS            YES      30.36       30.36      0.0
                        Zenith-FPGA             YES       0.12        0.12      0.0
-------------------------------------------------------------------------------------
A99-RP3-TR              Aldrin-0-FPGA           YES       1.03        1.03      0.0
                        Aldrin-1-FPGA           YES       1.00        1.00      0.0
                        Beta-FPGA               YES       0.07        0.07      0.0
                        CBC-0                   NO       51.12       51.12      0.0
                        CBC-1                   NO       51.12       51.12      0.0
                        IPU-DDR4                YES       0.20        0.20      0.0
                        Orion-FPGA              YES       0.23        0.23      0.0
                        Primary-BIOS            YES      30.36       30.36      0.0
                        Zenith-FPGA             YES       0.12        0.12      0.0
-------------------------------------------------------------------------------------
A99-RP3-X-SE            Aldrin-0-FPGA           YES       1.00        1.00      0.0
                        Aldrin-1-FPGA           YES      32.00       32.00      0.0
                        Beta-FPGA               YES       2.02        2.02      0.0
                        CBC-0                   NO       12.04       12.04      0.0
                        CBC-1                   NO       51.12       51.12      0.0
                        IPU-DDR4                YES       3.04        3.04      0.0
                        Orion-FPGA              YES       2.03        2.03      0.0
                        Primary-BIOS            YES      35.09       35.09      0.0
                        Sigma                   YES       3.34        3.34      0.0
                        TamFW-Sigma             YES       2.07        2.07      0.0
                        Zenith-FPGA             YES       2.08        2.08      0.0
-------------------------------------------------------------------------------------
A99-RP3-X-TR            Aldrin-0-FPGA           YES       1.00        1.00      0.0
                        Aldrin-1-FPGA           YES      32.00       32.00      0.0
                        Beta-FPGA               YES       2.02        2.02      0.0
                        CBC-0                   NO       12.04       12.04      0.0
```

```
                         CBC-1              NO    51.12    51.12    0.0
                         IPU-DDR4           YES    3.04     3.04    0.0
                         Orion-FPGA         YES    2.03     2.03    0.0
                         Primary-BIOS       YES   35.09    35.09    0.0
                         Sigma              YES    3.34     3.34    0.0
                         TamFW-Sigma        YES    2.07     2.07    0.0
                         Zenith-FPGA        YES    2.08     2.08    0.0
------------------------------------------------------------------------------
A99-RSP-SE               Alpha-FPGA         YES    0.16     0.16    0.0
                         CBC                NO    43.03    43.03    0.0
                         Cha-FPGA           YES    0.09     0.09    0.0
                         IPU-FPGA           YES    0.72     0.72    0.0
                         IPU-FSBL           YES    1.113    1.113   0.0
                         IPU-Linux          YES    1.113    1.113   0.0
                         Omega-FPGA         YES    0.20     0.20    0.0
                         Optimus-FPGA       YES    0.12     0.12    0.0
                         Primary-BIOS       YES   16.18    16.18    0.0
------------------------------------------------------------------------------
A99-RSP-TR               Alpha-FPGA         YES    0.16     0.16    0.0
                         CBC                NO    43.03    43.03    0.0
                         Cha-FPGA           YES    0.09     0.09    0.0
                         IPU-FPGA           YES    0.72     0.72    0.0
                         IPU-FSBL           YES    1.113    1.113   0.0
                         IPU-Linux          YES    1.113    1.113   0.0
                         Omega-FPGA         YES    0.20     0.20    0.0
                         Optimus-FPGA       YES    0.12     0.12    0.0
                         Primary-BIOS       YES   16.18    16.18    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    49.03    49.03    0.0
                         IPU-DDR4           YES    0.25     0.25    0.0
------------------------------------------------------------------------------
A99-SFC3-S               CBC                NO    44.02    44.02    0.0
                         IPU-DDR4           YES    0.25     0.25    0.0
------------------------------------------------------------------------------
A99-SFC3-T               CBC                NO    44.02    44.02    0.0
                         IPU-DDR4           YES    0.25     0.25    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    1.99     1.99    0.0
                         IPU-FSBL           YES    1.113    1.113   0.0
                         IPU-Linux          YES    1.113    1.113   0.0
                         Meldun-0           YES    1.07     1.07    0.0
                         Meldun-1           YES    1.07     1.07    0.0
                         Primary-BIOS       YES    8.51     8.51    0.0
------------------------------------------------------------------------------
A99L-4X100GE-TAA         CBC                NO    38.23    38.23    0.0
                         Dalla              YES    1.09     1.09    0.0
                         IPU-FPGA           YES    1.99     1.99    0.0
```

```
                        IPU-FSBL              YES      1.113      1.113     0.0
                        IPU-Linux             YES      1.113      1.113     0.0
                        Meldun-0              YES      1.07       1.07      0.0
                        Meldun-1              YES      1.07       1.07      0.0
                        Primary-BIOS          YES      8.51       8.51      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      1.99       1.99      0.0
                        IPU-FSBL              YES      1.113      1.113     0.0
                        IPU-Linux             YES      1.113      1.113     0.0
                        Meldun-0              YES      1.07       1.07      0.0
                        Meldun-1              YES      1.07       1.07      0.0
                        Primary-BIOS          YES      8.51       8.51      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      1.99       1.99      0.0
                        IPU-FSBL              YES      1.113      1.113     0.0
                        IPU-Linux             YES      1.113      1.113     0.0
                        Meldun-0              YES      1.07       1.07      0.0
                        Meldun-1              YES      1.07       1.07      0.0
                        Primary-BIOS          YES      8.51       8.51      0.0
--------------------------------------------------------------------------------
A99L-8X100GE-TAA        CBC                   NO       38.23      38.23     0.0
                        Dalla                 YES      1.09       1.09      0.0
                        IPU-FPGA              YES      1.99       1.99      0.0
                        IPU-FSBL              YES      1.113      1.113     0.0
                        IPU-Linux             YES      1.113      1.113     0.0
                        Meldun-0              YES      1.07       1.07      0.0
                        Meldun-1              YES      1.07       1.07      0.0
                        Primary-BIOS          YES      8.51       8.51      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      1.99       1.99      0.0
                        IPU-FSBL              YES      1.113      1.113     0.0
                        IPU-Linux             YES      1.113      1.113     0.0
                        Meldun-0              YES      1.07       1.07      0.0
                        Meldun-1              YES      1.07       1.07      0.0
                        Primary-BIOS          YES      8.51       8.51      0.0
--------------------------------------------------------------------------------
A9K-1600W-AC            PO-PriMCU             NO       17.137     17.137    0.0
--------------------------------------------------------------------------------
A9K-1600W-DC            PO-PriMCU             NO       1.09       1.09      0.0
--------------------------------------------------------------------------------
A9K-16X100GE-CM         Aldrin-FPGA           YES      1.05       1.05      0.0
                        CBC                   NO       48.09      48.09     0.0
                        Grapple-0             YES      0.15       0.15      0.0
                        IPU-DDR4              YES      1.09       1.09      0.0
                        Mixmaster-0           YES      0.13       0.13      0.0
                        Primary-BIOS          YES      21.43      21.43     0.0
                        Scamper               YES      0.23       0.23      0.0
                        Skylynx-0             YES      0.12       0.12      0.0
--------------------------------------------------------------------------------
A9K-16X100GE-SE         Aldrin-FPGA           YES      1.05       1.05      0.0
                        CBC                   NO       48.09      48.09     0.0
                        Grapple-0             YES      0.15       0.15      0.0
                        IPU-DDR4              YES      1.09       1.09      0.0
                        Mixmaster-0           YES      0.13       0.13      0.0
                        Primary-BIOS          YES      21.43      21.43     0.0
                        Scamper               YES      0.23       0.23      0.0
                        Skylynx-0             YES      0.12       0.12      0.0
--------------------------------------------------------------------------------
```

```
A9K-16X100GE-TR      Aldrin-FPGA          YES    1.05      1.05     0.0
                     CBC                  NO    48.09     48.09     0.0
                     Grapple-0            YES    0.15      0.15     0.0
                     IPU-DDR4             YES    1.09      1.09     0.0
                     Mixmaster-0          YES    0.13      0.13     0.0
                     Primary-BIOS         YES   21.43     21.43     0.0
                     Scamper              YES    0.23      0.23     0.0
                     Skylynx-0            YES    0.12      0.12     0.0
----------------------------------------------------------------------------------
A9K-16X100GE-TR      Aldrin-FPGA          YES    1.05      1.05     0.0
                     CBC                  NO    48.09     48.09     0.0
                     Grapple-0            YES    0.15      0.15     0.0
                     IPU-DDR4             YES    1.09      1.09     0.0
                     Mixmaster-0          YES    0.13      0.13     0.0
                     Primary-BIOS         YES   21.43     21.43     0.0
                     Scamper              YES    0.23      0.23     0.0
                     Skylynx-0            YES    0.12      0.12     0.0
----------------------------------------------------------------------------------
A9K-20HG-FLEX-CM     Aldrin-FPGA          YES    1.05      1.05     0.0
                     CBC                  NO    58.09     58.09     0.0
                     IPU-DDR4             YES    1.18      1.18     0.0
                     Primary-BIOS         YES   25.30     25.30     0.0
                     Sunstreaker          YES    0.19      0.19     0.0
                     TAMFW-Sunstreaker    YES    2.72      2.72     0.0
                     Trailbreaker-0       YES    0.24      0.24     0.0
                     Trailbreaker-1       YES    0.24      0.24     0.0
                     Windcharger-0        YES    0.08      0.08     0.0
                     Windcharger-1        YES    0.08      0.08     0.0
----------------------------------------------------------------------------------
A9K-20HG-FLEX-SE     Aldrin-FPGA          YES    1.05      1.05     0.0
                     CBC                  NO    58.09     58.09     0.0
                     IPU-DDR4             YES    1.18      1.18     0.0
                     Primary-BIOS         YES   25.30     25.30     0.0
                     Sunstreaker          YES    0.19      0.19     0.0
                     TAMFW-Sunstreaker    YES    2.72      2.72     0.0
                     Trailbreaker-0       YES    0.24      0.24     0.0
                     Trailbreaker-1       YES    0.24      0.24     0.0
                     Windcharger-0        YES    0.08      0.08     0.0
                     Windcharger-1        YES    0.08      0.08     0.0
----------------------------------------------------------------------------------
A9K-20HG-FLEX-TR     Aldrin-FPGA          YES    1.05      1.05     0.0
                     CBC                  NO    58.09     58.09     0.0
                     IPU-DDR4             YES    1.18      1.18     0.0
                     Primary-BIOS         YES   25.30     25.30     0.0
                     Sunstreaker          YES    0.19      0.19     0.0
                     TAMFW-Sunstreaker    YES    2.72      2.72     0.0
                     Trailbreaker-0       YES    0.24      0.24     0.0
                     Trailbreaker-1       YES    0.24      0.24     0.0
                     Windcharger-0        YES    0.08      0.08     0.0
                     Windcharger-1        YES    0.08      0.08     0.0
----------------------------------------------------------------------------------
A9K-24X10GE-1G-CM    CBC                  NO    47.03     47.03     0.1
                     IPU-FPGA             YES    1.90      1.90     0.1
                     IPU-FSBL             YES    1.113     1.113    0.1
                     IPU-Linux            YES    1.113     1.113    0.1
                     Leadfoot-0           YES    1.00      1.00     0.1
                     Lewis                YES    1.11      1.11     0.1
                     Primary-BIOS         YES   18.33     18.33     0.1
----------------------------------------------------------------------------------
A9K-24X10GE-1G-SE    CBC                  NO    47.03     47.03     0.1
                     IPU-FPGA             YES    1.90      1.90     0.1
                     IPU-FSBL             YES    1.113     1.113    0.1
                     IPU-Linux            YES    1.113     1.113    0.1
                     Leadfoot-0           YES    1.00      1.00     0.1
```

```
                        Lewis                      YES      1.11        1.11      0.1
                        Primary-BIOS               YES     18.33       18.33      0.1
--------------------------------------------------------------------------------------
A9K-24X10GE-1G-TR       CBC                        NO      47.03       47.03      0.1
                        IPU-FPGA                   YES      1.90        1.90      0.1
                        IPU-FSBL                   YES      1.113       1.113     0.1
                        IPU-Linux                  YES      1.113       1.113     0.1
                        Leadfoot-0                 YES      1.00        1.00      0.1
                        Lewis                      YES      1.11        1.11      0.1
                        Primary-BIOS               YES     18.33       18.33      0.1
--------------------------------------------------------------------------------------
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      1.97        1.97      0.1
                        IPU-FSBL                   YES      1.103       1.103     0.1
                        IPU-Linux                  YES      1.103       1.103     0.1
                        Martell                    YES      1.03        1.03      0.0
                        Meldun                     YES      1.07        1.07      0.1
                        Primary-BIOS               YES      8.51        8.51      0.1
--------------------------------------------------------------------------------------
A9K-400GE-LSP           Aldrin-FPGA                YES      1.05        1.05      0.0
                        CBC                        NO      63.03       63.03      0.0
                        IPU-DDR4                   YES      1.05        1.05      0.0
                        Moonracer                  YES      0.14        0.14      0.0
                        Primary-BIOS               YES     25.30       25.30      0.0
                        Skywarp-0                  YES      0.11        0.11      0.0
                        Skywarp-1                  YES      0.11        0.11      0.0
                        Sunstreaker                YES      0.19        0.19      0.0
                        TAMFW-Sunstreaker          YES      2.72        2.72      0.0
--------------------------------------------------------------------------------------
A9K-48X10GE-1G-CM       CBC                        NO      47.03       47.03      0.1
                        IPU-FPGA                   YES      1.90        1.90      0.1
                        IPU-FSBL                   YES      1.113       1.113     0.1
                        IPU-Linux                  YES      1.113       1.113     0.1
                        Leadfoot-0                 YES      1.00        1.00      0.1
                        Leadfoot-1                 YES      1.00        1.00      0.1
                        Lewis                      YES      1.11        1.11      0.1
                        Primary-BIOS               YES     18.33       18.33      0.1
--------------------------------------------------------------------------------------
A9K-48X10GE-1G-SE       CBC                        NO      47.03       47.03      0.1
                        IPU-FPGA                   YES      1.90        1.90      0.1
                        IPU-FSBL                   YES      1.113       1.113     0.1
                        IPU-Linux                  YES      1.113       1.113     0.1
                        Leadfoot-0                 YES      1.00        1.00      0.1
                        Leadfoot-1                 YES      1.00        1.00      0.1
                        Lewis                      YES      1.11        1.11      0.1
                        Primary-BIOS               YES     18.33       18.33      0.1
--------------------------------------------------------------------------------------
A9K-48X10GE-1G-TR       CBC                        NO      47.03       47.03      0.1
                        IPU-FPGA                   YES      1.90        1.90      0.1
                        IPU-FSBL                   YES      1.113       1.113     0.1
                        IPU-Linux                  YES      1.113       1.113     0.1
                        Leadfoot-0                 YES      1.00        1.00      0.1
                        Leadfoot-1                 YES      1.00        1.00      0.1
                        Lewis                      YES      1.11        1.11      0.1
                        Primary-BIOS               YES     18.33       18.33      0.1
--------------------------------------------------------------------------------------
A9K-4HG-FLEX-FC         Aldrin-FPGA                YES      1.05        1.05      0.0
                        CBC                        NO      63.03       63.03      0.0
                        IPU-DDR4                   YES      1.05        1.05      0.0
                        Moonracer                  YES      0.14        0.14      0.0
                        Primary-BIOS               YES     25.30       25.30      0.0
                        Skywarp-0                  YES      0.11        0.11      0.0
```

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                          Skywarp-1             YES     0.11     0.11     0.0
                          Sunstreaker           YES     0.19     0.19     0.0
                          TAMFW-Sunstreaker     YES     2.72     2.72     0.0
------------------------------------------------------------------------------
A9K-4HG-FLEX-SE           Aldrin-FPGA           YES     1.05     1.05     0.0
                          CBC                   NO     63.03    63.03     0.0
                          IPU-DDR4              YES     1.05     1.05     0.0
                          Moonracer             YES     0.14     0.14     0.0
                          Primary-BIOS          YES    25.30    25.30     0.0
                          Skywarp-0             YES     0.11     0.11     0.0
                          Skywarp-1             YES     0.11     0.11     0.0
                          Sunstreaker           YES     0.19     0.19     0.0
                          TAMFW-Sunstreaker     YES     2.72     2.72     0.0
------------------------------------------------------------------------------
A9K-4HG-FLEX-TR           Aldrin-FPGA           YES     1.05     1.05     0.0
                          CBC                   NO     63.03    63.03     0.0
                          IPU-DDR4              YES     1.05     1.05     0.0
                          Moonracer             YES     0.14     0.14     0.0
                          Primary-BIOS          YES    25.30    25.30     0.0
                          Skywarp-0             YES     0.11     0.11     0.0
                          Skywarp-1             YES     0.11     0.11     0.0
                          Sunstreaker           YES     0.19     0.19     0.0
                          TAMFW-Sunstreaker     YES     2.72     2.72     0.0
------------------------------------------------------------------------------
A9K-4X100GE               CBC                   NO     46.06    46.06     0.1
                          IPU-FPGA              YES     1.90     1.90     0.1
                          IPU-FSBL              YES     1.113    1.113    0.1
                          IPU-Linux             YES     1.113    1.113    0.1
                          Morra-0               YES     1.05     1.05     0.1
                          Primary-BIOS          YES     9.33     9.33     0.1
                          Sideswipe-0           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     1.99     1.99     0.0
                          IPU-FSBL              YES     1.113    1.113    0.0
                          IPU-Linux             YES     1.113    1.113    0.0
                          Meldun-0              YES     1.07     1.07     0.0
                          Meldun-1              YES     1.07     1.07     0.0
                          Primary-BIOS          YES     8.51     8.51     0.0
------------------------------------------------------------------------------
A9K-4X100GE-SE            CBC                   NO     38.23    38.23     0.0
                          Dalla                 YES     1.09     1.09     0.0
                          IPU-FPGA              YES     1.99     1.99     0.0
                          IPU-FSBL              YES     1.113    1.113    0.0
                          IPU-Linux             YES     1.113    1.113    0.0
                          Meldun-0              YES     1.07     1.07     0.0
                          Meldun-1              YES     1.07     1.07     0.0
                          Primary-BIOS          YES     8.51     8.51     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     1.99     1.99     0.0
                          IPU-FSBL              YES     1.113    1.113    0.0
                          IPU-Linux             YES     1.113    1.113    0.0
                          Meldun-0              YES     1.07     1.07     0.0
                          Meldun-1              YES     1.07     1.07     0.0
                          Primary-BIOS          YES     8.51     8.51     0.0
------------------------------------------------------------------------------
A9K-4X100GE-TAA           CBC                   NO     38.23    38.23     0.0
                          Dalla                 YES     1.09     1.09     0.0
                          IPU-FPGA              YES     1.99     1.99     0.0
                          IPU-FSBL              YES     1.113    1.113    0.0
                          IPU-Linux             YES     1.113    1.113    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     8.51      8.51      0.0
-------------------------------------------------------------------------------
A9K-4X100GE-TR          CBC                     NO     38.23     38.23      0.0
                        Dalla                   YES     1.09      1.09      0.0
                        IPU-FPGA                YES     1.99      1.99      0.0
                        IPU-FSBL                YES     1.113     1.113     0.0
                        IPU-Linux               YES     1.113     1.113     0.0
                        Meldun-0                YES     1.07      1.07      0.0
                        Meldun-1                YES     1.07      1.07      0.0
                        Primary-BIOS            YES     8.51      8.51      0.0
-------------------------------------------------------------------------------
A9K-4X100GE-TR          CBC                     NO     38.23     38.23      0.0
                        Dalla                   YES     1.09      1.09      0.0
                        IPU-FPGA                YES     1.99      1.99      0.0
                        IPU-FSBL                YES     1.113     1.113     0.0
                        IPU-Linux               YES     1.113     1.113     0.0
                        Meldun-0                YES     1.07      1.07      0.0
                        Meldun-1                YES     1.07      1.07      0.0
                        Primary-BIOS            YES     8.51      8.51      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     1.99      1.99      0.0
                        IPU-FSBL                YES     1.113     1.113     0.0
                        IPU-Linux               YES     1.113     1.113     0.0
                        Meldun-0                YES     1.07      1.07      0.0
                        Meldun-1                YES     1.07      1.07      0.0
                        Primary-BIOS            YES     8.51      8.51      0.0
-------------------------------------------------------------------------------
A9K-4X100GE-TR-V2       Aldrin-FPGA             YES     1.05      1.05      0.0
                        CBC                     NO     48.09     48.09      0.0
                        Grapple-0               YES     0.15      0.15      0.0
                        IPU-DDR4                YES     1.09      1.09      0.0
                        Mixmaster-0             YES     0.13      0.13      0.0
                        Primary-BIOS            YES    21.43     21.43      0.0
                        Scamper                 YES     0.23      0.23      0.0
                        Skylynx-0               YES     0.12      0.12      0.0
-------------------------------------------------------------------------------
A9K-8HG-FLEX-CM         Aldrin-FPGA             YES     1.05      1.05      0.0
                        CBC                     NO     58.09     58.09      0.0
                        IPU-DDR4                YES     1.18      1.18      0.0
                        Primary-BIOS            YES    25.30     25.30      0.0
                        Sunstreaker             YES     0.19      0.19      0.0
                        TAMFW-Sunstreaker       YES     2.72      2.72      0.0
                        Trailbreaker-0          YES     0.24      0.24      0.0
                        Windcharger-0           YES     0.08      0.08      0.0
-------------------------------------------------------------------------------
A9K-8HG-FLEX-SE         Aldrin-FPGA             YES     1.05      1.05      0.0
                        CBC                     NO     58.09     58.09      0.0
                        IPU-DDR4                YES     1.18      1.18      0.0
                        Primary-BIOS            YES    25.30     25.30      0.0
                        Sunstreaker             YES     0.19      0.19      0.0
                        TAMFW-Sunstreaker       YES     2.72      2.72      0.0
                        Trailbreaker-0          YES     0.24      0.24      0.0
                        Windcharger-0           YES     0.08      0.08      0.0
-------------------------------------------------------------------------------
A9K-8HG-FLEX-TR         Aldrin-FPGA             YES     1.05      1.05      0.0
                        CBC                     NO     58.09     58.09      0.0
                        IPU-DDR4                YES     1.18      1.18      0.0
                        Primary-BIOS            YES    25.30     25.30      0.0
                        Sunstreaker             YES     0.19      0.19      0.0
                        TAMFW-Sunstreaker       YES     2.72      2.72      0.0
```

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                        Trailbreaker-0          YES     0.24       0.24        0.0
                        Windcharger-0           YES     0.08       0.08        0.0
-------------------------------------------------------------------------------------
A9K-8X100GE-CM          CBC                     NO      38.23      38.23       0.0
                        Dalla                   YES     1.09       1.09        0.0
                        IPU-FPGA                YES     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        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     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        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     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        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     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        0.0
-------------------------------------------------------------------------------------
A9K-8X100GE-SE          CBC                     NO      38.23      38.23       0.0
                        Dalla                   YES     1.09       1.09        0.0
                        IPU-FPGA                YES     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        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     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
                        Primary-BIOS            YES     8.51       8.51        0.0
-------------------------------------------------------------------------------------
A9K-8X100GE-TAA         CBC                     NO      38.23      38.23       0.0
                        Dalla                   YES     1.09       1.09        0.0
                        IPU-FPGA                YES     1.99       1.99        0.0
                        IPU-FSBL                YES     1.113      1.113       0.0
                        IPU-Linux               YES     1.113      1.113       0.0
                        Meldun-0                YES     1.07       1.07        0.0
                        Meldun-1                YES     1.07       1.07        0.0
```

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                        Primary-BIOS           YES      8.51      8.51      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-TR          CBC                    NO      38.23     38.23      0.0
                        Dalla                  YES      1.09      1.09      0.0
                        IPU-FPGA               YES      1.99      1.99      0.0
                        IPU-FSBL               YES      1.113     1.113     0.0
                        IPU-Linux              YES      1.113     1.113     0.0
                        Meldun-0               YES      1.07      1.07      0.0
                        Meldun-1               YES      1.07      1.07      0.0
                        Primary-BIOS           YES      8.51      8.51      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      1.99      1.99      0.0
                        IPU-FSBL               YES      1.113     1.113     0.0
                        IPU-Linux              YES      1.113     1.113     0.0
                        Meldun-0               YES      1.07      1.07      0.0
                        Meldun-1               YES      1.07      1.07      0.0
                        Primary-BIOS           YES      8.51      8.51      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-X-CM        Aldrin-FPGA            YES      1.05      1.05      0.0
                        CBC                    NO      48.09     48.09      0.0
                        Grapple-0              YES      0.15      0.15      0.0
                        IPU-DDR4               YES      1.09      1.09      0.0
                        Mixmaster-0            YES      0.13      0.13      0.0
                        Primary-BIOS           YES     21.43     21.43      0.0
                        Scamper                YES      0.23      0.23      0.0
                        Skylynx-0              YES      0.12      0.12      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-X-SE        Aldrin-FPGA            YES      1.05      1.05      0.0
                        CBC                    NO      48.09     48.09      0.0
                        Grapple-0              YES      0.15      0.15      0.0
                        IPU-DDR4               YES      1.09      1.09      0.0
                        Mixmaster-0            YES      0.13      0.13      0.0
                        Primary-BIOS           YES     21.43     21.43      0.0
                        Scamper                YES      0.23      0.23      0.0
                        Skylynx-0              YES      0.12      0.12      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-X-TR        Aldrin-FPGA            YES      1.05      1.05      0.0
                        CBC                    NO      48.09     48.09      0.0
                        Grapple-0              YES      0.15      0.15      0.0
                        IPU-DDR4               YES      1.09      1.09      0.0
                        Mixmaster-0            YES      0.13      0.13      0.0
                        Primary-BIOS           YES     21.43     21.43      0.0
                        Scamper                YES      0.23      0.23      0.0
                        Skylynx-0              YES      0.12      0.12      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-X-TR        Aldrin-FPGA            YES      1.05      1.05      0.0
                        CBC                    NO      48.09     48.09      0.0
                        Grapple-0              YES      0.15      0.15      0.0
                        IPU-DDR4               YES      1.09      1.09      0.0
                        Mixmaster-0            YES      0.13      0.13      0.0
                        Primary-BIOS           YES     21.43     21.43      0.0
                        Scamper                YES      0.23      0.23      0.0
                        Skylynx-0              YES      0.12      0.12      0.0
-------------------------------------------------------------------------------
A9K-8X100GE-X2-CM       Aldrin-FPGA            YES      1.05      1.05      0.0
                        CBC                    NO      58.09     58.09      0.0
                        Grapple-0              YES      0.15      0.15      0.0
                        IPU-DDR4               YES      1.18      1.18      0.0
                        Mixmaster-0            YES      0.13      0.13      0.0
                        Primary-BIOS           YES     25.30     25.30      0.0
                        Skylynx-0              YES      0.12      0.12      0.0
                        Sunstreaker            YES      0.19      0.19      0.0
```

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                    TAMFW-Sunstreaker       YES    2.72      2.72     0.0
--------------------------------------------------------------------------------
A9K-8X100GE-X2-SE   Aldrin-FPGA             YES    1.05      1.05     0.0
                    CBC                     NO    58.09     58.09     0.0
                    Grapple-0               YES    0.15      0.15     0.0
                    IPU-DDR4                YES    1.18      1.18     0.0
                    Mixmaster-0             YES    0.13      0.13     0.0
                    Primary-BIOS            YES   25.30     25.30     0.0
                    Skylynx-0               YES    0.12      0.12     0.0
                    Sunstreaker             YES    0.19      0.19     0.0
                    TAMFW-Sunstreaker       YES    2.72      2.72     0.0
--------------------------------------------------------------------------------
A9K-8X100GE-X2-TR   Aldrin-FPGA             YES    1.05      1.05     0.0
                    CBC                     NO    58.09     58.09     0.0
                    Grapple-0               YES    0.15      0.15     0.0
                    IPU-DDR4                YES    1.18      1.18     0.0
                    Mixmaster-0             YES    0.13      0.13     0.0
                    Primary-BIOS            YES   25.30     25.30     0.0
                    Skylynx-0               YES    0.12      0.12     0.0
                    Sunstreaker             YES    0.19      0.19     0.0
                    TAMFW-Sunstreaker       YES    2.72      2.72     0.0
--------------------------------------------------------------------------------
A9K-8X100GELSE-TAA  CBC                     NO    38.23     38.23     0.0
                    Dalla                   YES    1.09      1.09     0.0
                    IPU-FPGA                YES    1.99      1.99     0.0
                    IPU-FSBL                YES    1.113     1.113    0.0
                    IPU-Linux               YES    1.113     1.113    0.0
                    Meldun-0                YES    1.07      1.07     0.0
                    Meldun-1                YES    1.07      1.07     0.0
                    Primary-BIOS            YES    8.51      8.51     0.0
--------------------------------------------------------------------------------
A9K-8X100GELTR-TAA  CBC                     NO    38.23     38.23     0.0
                    Dalla                   YES    1.09      1.09     0.0
                    IPU-FPGA                YES    1.99      1.99     0.0
                    IPU-FSBL                YES    1.113     1.113    0.0
                    IPU-Linux               YES    1.113     1.113    0.0
                    Meldun-0                YES    1.07      1.07     0.0
                    Meldun-1                YES    1.07      1.07     0.0
                    Primary-BIOS            YES    8.51      8.51     0.0
--------------------------------------------------------------------------------
A9K-MOD200-CM       Blaster                 YES    1.27      1.27     0.1
                    CBC                     NO    39.09     39.09     0.1
                    IPU-FPGA                YES    1.97      1.97     0.1
                    IPU-FSBL                YES    1.103     1.103    0.1
                    IPU-Linux               YES    1.103     1.103    0.1
                    Primary-BIOS            YES    8.51      8.51     0.1
--------------------------------------------------------------------------------
A9K-MOD200-SE       Blaster                 YES    1.27      1.27     0.1
                    CBC                     NO    39.09     39.09     0.1
                    IPU-FPGA                YES    1.97      1.97     0.1
                    IPU-FSBL                YES    1.103     1.103    0.1
                    IPU-Linux               YES    1.103     1.103    0.1
                    Primary-BIOS            YES    8.51      8.51     0.1
--------------------------------------------------------------------------------
A9K-MOD200-TR       Blaster                 YES    1.27      1.27     0.1
                    CBC                     NO    39.09     39.09     0.1
                    IPU-FPGA                YES    1.97      1.97     0.1
                    IPU-FSBL                YES    1.103     1.103    0.1
                    IPU-Linux               YES    1.103     1.103    0.1
                    Primary-BIOS            YES    8.51      8.51     0.1
--------------------------------------------------------------------------------
A9K-MOD400-CM       Blaster                 YES    1.27      1.27     0.1
                    CBC                     NO    39.09     39.09     0.1
                    IPU-FPGA                YES    1.97      1.97     0.1
```

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                         IPU-FSBL            YES    1.103    1.103    0.1
                         IPU-Linux           YES    1.103    1.103    0.1
                         Primary-BIOS        YES    8.51     8.51     0.1
--------------------------------------------------------------------------------
A9K-MOD400-SE            Blaster             YES    1.27     1.27     0.1
                         CBC                 NO     39.09    39.09    0.1
                         IPU-FPGA            YES    1.97     1.97     0.1
                         IPU-FSBL            YES    1.103    1.103    0.1
                         IPU-Linux           YES    1.103    1.103    0.1
                         Primary-BIOS        YES    8.51     8.51     0.1
--------------------------------------------------------------------------------
A9K-MOD400-TR            Blaster             YES    1.27     1.27     0.1
                         CBC                 NO     39.09    39.09    0.1
                         IPU-FPGA            YES    1.97     1.97     0.1
                         IPU-FSBL            YES    1.103    1.103    0.1
                         IPU-Linux           YES    1.103    1.103    0.1
                         Primary-BIOS        YES    8.51     8.51     0.1
--------------------------------------------------------------------------------
A9K-RSP5-SE             Aldrin-0-FPGA       YES    1.06     1.06     0.0
                         Beta-FPGA           YES    0.07     0.07     0.0
                         CBC                 NO     53.10    53.10    0.0
                         IPU-DDR4            YES    0.20     0.20     0.0
                         Orion-FPGA          YES    0.23     0.23     0.0
                         Primary-BIOS        YES    31.36    31.36    0.0
                         Zenith-FPGA         YES    0.12     0.12     0.0
--------------------------------------------------------------------------------
A9K-RSP5-TR             Aldrin-0-FPGA       YES    1.06     1.06     0.0
                         Beta-FPGA           YES    0.07     0.07     0.0
                         CBC                 NO     53.10    53.10    0.0
                         IPU-DDR4            YES    0.20     0.20     0.0
                         Orion-FPGA          YES    0.23     0.23     0.0
                         Primary-BIOS        YES    31.36    31.36    0.0
                         Zenith-FPGA         YES    0.12     0.12     0.0
--------------------------------------------------------------------------------
A9K-RSP5-X-SE           Aldrin-0-FPGA       YES    51.00    51.00    0.0
                         Beta-FPGA           YES    2.02     2.02     0.0
                         CBC                 NO     14.04    14.04    0.0
                         IPU-DDR4            YES    3.04     3.04     0.0
                         Orion-FPGA          YES    2.03     2.03     0.0
                         Primary-BIOS        YES    35.09    35.09    0.0
                         Sigma               YES    3.34     3.34     0.0
                         TamFW-Sigma         YES    2.07     2.07     0.0
                         Zenith-FPGA         YES    2.08     2.08     0.0
--------------------------------------------------------------------------------
A9K-RSP5-X-TR           Aldrin-0-FPGA       YES    51.00    51.00    0.0
                         Beta-FPGA           YES    2.02     2.02     0.0
                         CBC                 NO     14.04    14.04    0.0
                         IPU-DDR4            YES    3.04     3.04     0.0
                         Orion-FPGA          YES    2.03     2.03     0.0
                         Primary-BIOS        YES    35.09    35.09    0.0
                         Sigma               YES    3.34     3.34     0.0
                         TamFW-Sigma         YES    2.07     2.07     0.0
                         Zenith-FPGA         YES    2.08     2.08     0.0
--------------------------------------------------------------------------------
A9K-RSP880-LT-SE        Aldrin-FPGA         YES    1.11     1.11     0.0
                         Alpha-FPGA          YES    0.05     0.05     0.0
                         CBC                 NO     50.03    50.03    0.0
                         IPU-FPGA            YES    0.20     0.20     0.0
                         IPU-FSBL            YES    1.113    1.113    0.0
                         IPU-Linux           YES    1.113    1.113    0.0
                         Omega-FPGA          YES    0.07     0.07     0.0
                         Optimus-FPGA        YES    0.05     0.05     0.0
                         Primary-BIOS        YES    17.40    17.40    0.0
--------------------------------------------------------------------------------
```

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A9K-RSP880-LT-TR      Aldrin-FPGA          YES    1.11      1.11      0.0
                      Alpha-FPGA           YES    0.05      0.05      0.0
                      CBC                  NO     50.03     50.03     0.0
                      IPU-FPGA             YES    0.20      0.20      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Omega-FPGA           YES    0.07      0.07      0.0
                      Optimus-FPGA         YES    0.05      0.05      0.0
                      Primary-BIOS         YES    17.40     17.40     0.0
----------------------------------------------------------------------------------
A9K-RSP880-SE         Alpha-FPGA           YES    0.16      0.16      0.0
                      CBC                  NO     34.40     34.40     0.0
                      Cha-FPGA             YES    0.09      0.09      0.0
                      IPU-FPGA             YES    0.72      0.72      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Omega-FPGA           YES    0.20      0.20      0.0
                      Optimus-FPGA         YES    0.12      0.12      0.0
                      Primary-BIOS         YES    10.69     10.69     0.0
----------------------------------------------------------------------------------
A9K-RSP880-TR         Alpha-FPGA           YES    0.16      0.16      0.0
                      CBC                  NO     34.40     34.40     0.0
                      Cha-FPGA             YES    0.09      0.09      0.0
                      IPU-FPGA             YES    0.72      0.72      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Omega-FPGA           YES    0.20      0.20      0.0
                      Optimus-FPGA         YES    0.12      0.12      0.0
                      Primary-BIOS         YES    10.69     10.69     0.0
----------------------------------------------------------------------------------
A9K-TEST_LSQ_DX1      Aldrin-FPGA          YES    1.05      1.05      0.0
                      CBC                  NO     58.09     58.09     0.0
                      IPU-DDR4             YES    1.18      1.18      0.0
                      Primary-BIOS         YES    25.30     25.30     0.0
                      Sunstreaker          YES    0.19      0.19      0.0
                      TAMFW-Sunstreaker    YES    2.72      2.72      0.0
                      Trailbreaker-0       YES    0.24      0.24      0.0
                      Windcharger-0        YES    0.08      0.08      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    1.99      1.99      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Meldun-0             YES    1.07      1.07      0.0
                      Meldun-1             YES    1.07      1.07      0.0
                      Primary-BIOS         YES    8.51      8.51      0.0
----------------------------------------------------------------------------------
A9KL-4X100GE-TAA      CBC                  NO     38.23     38.23     0.0
                      Dalla                YES    1.09      1.09      0.0
                      IPU-FPGA             YES    1.99      1.99      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Meldun-0             YES    1.07      1.07      0.0
                      Meldun-1             YES    1.07      1.07      0.0
                      Primary-BIOS         YES    8.51      8.51      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    1.99      1.99      0.0
                      IPU-FSBL             YES    1.113     1.113     0.0
                      IPU-Linux            YES    1.113     1.113     0.0
                      Meldun-0             YES    1.07      1.07      0.0
                      Meldun-1             YES    1.07      1.07      0.0
```

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                         Primary-BIOS          YES     8.51      8.51     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      5.05      5.05     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-9901-LC              CBC                   NO      55.07     55.07    0.1
                         Gamora-FPGA           YES     0.36      0.36     0.1
                         IPU-FPGA              YES     1.10      1.10     0.1
                         IPU-FSBL              YES     1.104     1.104    0.1
                         IPU-Linux             YES     1.104     1.104    0.1
                         Primary-BIOS          YES     23.22     23.22    0.1
--------------------------------------------------------------------------------
ASR-9901-RP              CBC                   NO      54.11     54.11    0.1
                         Drax-FPGA             YES     0.38      0.38     0.1
                         IPU-FPGA              YES     2.05      2.05     0.1
                         IPU-FSBL              YES     1.104     1.104    0.1
                         IPU-Linux             YES     1.104     1.104    0.1
                         Primary-BIOS          YES     22.28     22.28    0.1
--------------------------------------------------------------------------------
ASR-9902                 FAN-CBC               NO      61.25     61.25    0.0
--------------------------------------------------------------------------------
ASR-9902-LC              Aldrin-FPGA           YES     1.05      1.05     0.0
                         CBC                   NO      17.03     17.03    0.0
                         Chromia               YES     0.14      0.14     0.0
                         IPU-DDR4              YES     1.17      1.17     0.0
                         Primary-BIOS          YES     34.30     34.30    0.0
                         Skywarp-0             YES     0.11      0.11     0.0
                         Skywarp-1             YES     0.11      0.11     0.0
                         Sunstreaker           YES     0.19      0.19     0.0
                         TAMFW-Sunstreaker     YES     2.72      2.72     0.0
--------------------------------------------------------------------------------
ASR-9903                 FAN-CBC               NO      61.25     61.25    0.0
--------------------------------------------------------------------------------
ASR-9903-LC              Aldrin-0-FPGA         YES     1.05      1.05     0.0
                         CBC                   NO      60.12     60.12    0.0
                         Harpoon-0             YES     0.11      0.11     0.0
                         Harpoon-1             YES     0.11      0.11     0.0
                         IPU-DDR4              YES     1.25      1.25     0.0
                         Metalmaster-0         YES     0.02      0.02     0.0
                         Metalmaster-1         YES     0.02      0.02     0.0
                         Primary-BIOS          YES     34.30     34.30    0.0
                         Scattershot           YES     0.14      0.14     0.0
                         Sunstreaker           YES     0.19      0.19     0.0
                         Supernaut             YES     0.14      0.14     0.0
                         TAMFW-Sunstreaker     YES     2.72      2.72     0.0
                         Warstar-0             YES     0.02      0.02     0.0
                         Warstar-1             YES     0.02      0.02     0.0
--------------------------------------------------------------------------------
ASR-9903-PXC800G-LC      Harpoon-0             YES     0.11      0.11     0.0
                         Harpoon-1             YES     0.11      0.11     0.0
--------------------------------------------------------------------------------
```

```
ASR-9904-AC        CBC              NO    7.105    7.105    0.0
------------------------------------------------------------------
ASR-9904-FAN       CBC              NO    31.06    31.06    0.0
------------------------------------------------------------------
ASR-9906           CBC              NO    7.105    7.105    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    31.06    31.06    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
------------------------------------------------------------------
ASR-9922-FAN-V3    CBC              NO    40.07    40.07    0.0
                   PSOC             NO    2.06     2.06     0.0
------------------------------------------------------------------
PWR-1.6KW-AC       PO-PriMCU        NO    17.20    17.20    0.0
                   QCS-PriMCU       NO    3.02     3.02     0.1
                   QCS-SecMCU       NO    4.04     4.04     0.1
------------------------------------------------------------------
PWR-1.6KW-DC       PriMCU           NO    1.03     1.03     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    3.13     3.13     0.12
                   EM-Sec54vMCU     NO    3.21     3.21     0.12
                   EM-Sec5vMCU      NO    3.20     3.20     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-3KW-HVDC       DT-PriMCU        NO    2.02     2.02     1.0
                   DT-Sec54vMCU     NO    2.02     2.02     1.0
                   DT-Sec5vMCU      NO    2.03     2.03     1.0
------------------------------------------------------------------
PWR-4.4KW-DC-V3    AB-Pri0MCU       NO    3.02     3.02     0.1
                   AB-Pri1MCU       NO    3.02     3.02     0.1
                   AB-Sec054vMCU    NO    3.04     3.04     0.1
                   AB-Sec154vMCU    NO    3.04     3.04     0.1
                   AB-Sec5vMCU      NO    3.06     3.06     0.1
                   DT-Pri0MCU       NO    3.01     3.01     0.1
                   DT-Pri1MCU       NO    3.01     3.01     0.1
```

```
                     DT-Sec054vMCU            NO     3.02      3.02     0.1
                     DT-Sec154vMCU            NO     3.02      3.02     0.1
                     DT-Sec5vMCU              NO     9.03      9.03     0.1
                     QCS-Pri0MCU              NO     1.02      1.02     0.1
                     QCS-Pri1MCU              NO     1.02      1.02     0.1
                     QCS-Sec054vMCU           NO     1.08      1.08     0.1
                     QCS-Sec154vMCU           NO     1.08      1.08     0.1
                     QCS-Sec5vMCU             NO     1.03      1.03     0.1
        ---------------------------------------------------------------------------
        PWR-6KW-AC-V3 AB-Pri0MCU              NO     3.02      3.02     0.1
                     AB-Pri1MCU               NO     3.02      3.02     0.1
                     AB-Sec054vMCU            NO     3.02      3.02     0.1
                     AB-Sec154vMCU            NO     3.02      3.02     0.1
                     AB-Sec5vMCU              NO     3.05      3.05     0.1
                     DT-Pri0MCU               NO     4.02      4.02     0.1
                     DT-Pri1MCU               NO     4.02      4.02     0.1
                     DT-Sec054vMCU            NO     4.03      4.03     0.1
                     DT-Sec154vMCU            NO     4.03      4.03     0.1
                     DT-Sec5vMCU              NO     4.04      4.04     0.1
        ---------------------------------------------------------------------------
```

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 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		
Part Number	**Description**	**Support Initially Provided in IOS XR 64 bit Release**
A9K-RSP5-X-SE	ASR 9000 Series Route Switch Processor 5 for Service Edge, Premium	Release 7.6.2
A9K-RSP5-X-TR	ASR 9000 Series Route Switch Processor 5 for Packet Transport, Premium	Release 7.6.2
A9K-RSP5-SE	ASR 9000 Route Switch Processor 5 for Service Edge	Release 6.5.15
A9K-RSP5-TR	ASR 9000 Route Switch Processor 5 for Packet Transport	Release 6.5.15
Cisco ASR 9000 Series Aggregation Services Router - Route Processor Cards		
Part Number	**Description**	**Support Initially Provided in IOS XR 64 bit Release**
A99-RP3-X-SE	ASR 9900 Route Processor 3 for Service Edge, Premium	Release 7.6.2
A99-RP3-X-TR	ASR 9900 Route Processor 3 for Packet Transport, Premium	Release 7.6.2
A99-RP3-SE	ASR 9900 Route Processor 3 for Service Edge	Release 6.5.15

A99-RP3-TR	ASR 9900 Route Processor 3 for Packet Transport	Release 6.5.15

Cisco ASR 9901 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9901	Cisco ASR 9000 Series Aggregation Services Router 2-RU Fixed Port	Release 6.4.1
ASR-9901-FAN	Cisco ASR 9000 Series Aggregation Services Router 2-RU Fixed Port Fan Tray	Release 6.4.1
A9K-1600W-AC	Cisco ASR 9000 Series Aggregation Services Router 2-RU 1600W AC Power Module	Release 6.4.1
A9K-1600W-DC	Cisco ASR 9000 Series Aggregation Services Router 2-RU 1600W DC Power Module	Release 6.4.1

Cisco ASR 9902 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9902	Cisco ASR 9902 2RU Chassis with fixed ports	Release 7.4.1
A99-RP-F	Cisco ASR 9900 Fixed Chassis Route Processor	Release 7.1.3
ASR-9902-4P-KIT	Cisco ASR 9902 4-Post Mounting Kit for 19-Inch and 23-Inch Rack	Release 7.4.1
ASR-9902-4P-KIT-L	ASR 9902 4-Post Mounting Kit for 19 & 23 inch Rack – Long	Release 7.4.1
ASR-9902-2P-KIT	Cisco ASR 9902 2-Post Mounting Kit for 19-Inch and 23-Inch Rack	Release 7.4.1
ASR-9902-CAB-MGMT	Cisco ASR 9902 Cable Management	Release 7.4.1
ASR-9902-FILTER	Cisco ASR 9902 Air Filter	Release 7.4.1
ASR-9902-FAN	Cisco ASR 9902 Fan Tray	Release 7.4.1

Cisco ASR 9903 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9903	Cisco ASR 9903 Compact High-Performance Router with fixed ports and PEC (Port Expansion Card) slot.	Release 7.1.3
A99-RP-F	Cisco ASR 9900 Fixed Chassis Route Processor	Release 7.1.3
ASR-9903-FAN	Cisco ASR 9903 Router Fan Tray	Release 7.1.3
ASR-9903-4P-KIT	ASR 9903 4-Post Mounting Kit for 19-inch Rack	Release 7.1.3
ASR-9903-CAB-MGMT	ASR 9903 Cable Management Brackets	Release 7.1.3
ASR-9903-FILTER	ASR 9903 Air Filter	Release 7.1.3

Cisco ASR 9904 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9904	Cisco ASR 9000 Series Aggregation Services Router 4-Slot 2 Line Card Slot Chassis, 6 RU	Release 6.1.2
ASR-9904-AC	Cisco ASR 9000 Series Aggregation Services Router 4-Slot 2 Line Card Slot AC Chassis w/ PEM V2	Release 6.1.2
ASR-9904-DC	Cisco ASR 9000 Series Aggregation Services Router 4-Slot 2 Line Card Slot DC Chassis w/ PEM V2	Release 6.1.2
ASR-9904-FAN	Cisco ASR 9000 Series Aggregation Services Router 4-Slot Fan Tray	Release 6.1.2
ASR-9904-FILTER	Cisco ASR 9000 Series Aggregation Services Router 4-Slot Filter	Release 6.1.2
ASR-9904-BAFFLE	Cisco ASR 9000 Series Aggregation Services Router 4-Slot Baffle	Release 6.1.2

Cisco ASR 9912 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9912	Cisco ASR 9000 Series Aggregation Services Router 12-Slot 10 Line Card Slot Chassis	Release 6.1.2
ASR-9912-AC	Cisco ASR 9000 Series Aggregation Services Router 12-Slot 10 Line Card Slot AC Chassis w/ PEM V2	Release 6.1.2
ASR-9912-DC	Cisco ASR 9000 Series Aggregation Services Router 12-Slot 10 Line Card Slot DC Chassis w/ PEM V2	Release 6.1.2
A99-SFC3	Cisco ASR 9900 Switch Fabric Card 3	Release 6.5.15
ASR-9912-FAN	Cisco ASR 9000 Series Aggregation Services Router 12-Slot Fan Tray	Release 6.1.2

Cisco ASR 9922 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9922	Cisco ASR 9922 20 Line Card Slot Chassis, 44 RU	Release 6.1.2
ASR-9922-AC	Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot AC Chassis w/ PEM V2	Release 6.1.2
ASR-9922-DC	Cisco ASR 9000 Series Aggregation Services Router 22-Slot 20 Line Card Slot DC Chassis w/ PEM V2	Release 6.1.2
A99-SFC3	Cisco ASR 9900 Switch Fabric Card 3	Release 6.5.15
ASR-9922-FAN-V3	Cisco ASR 9000 Series Aggregation Services Router 22-Slot Fan Tray version 3	Release 6.5.15

ASR-9922-FLTR-CV2	Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Center	Release 6.1.2
ASR-9922-FLTR-LR	Cisco ASR 9000 Series Aggregation Services Router 22-Slot Air Filter with Media, Left & Right	Release 6.1.2
ASR-9922-RP-FILR	Cisco ASR 9000 Series Aggregation Services Router 22-Slot Route Processor Filler	Release 6.1.2
ASR-9922-FAN-V2	Cisco ASR 9000 Series Aggregation Services Router 22-Slot Version 2 Fan Tray	Release 6.1.2

Cisco ASR 9006 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9006-SYS	Cisco ASR 9000 Series Aggregation Services Router 6-Slot System	Release 6.1.2
ASR-9006-AC-V2	Cisco ASR 9000 Series Aggregation Services Router 6-Slot AC Chassis Version 2	Release 6.1.2
ASR-9006-DC-V2	Cisco ASR 9000 Series Aggregation Services Router 6-Slot DC Chassis Version 2	Release 6.1.2
ASR-9006-FAN	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	Release 6.1.2
ASR-9006-DOOR	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Door Kit	Release 6.1.2
ASR-9006-FILTER	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air Filter	Release 6.1.2

Cisco ASR 9906 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9906	Cisco ASR 9000 Series Aggregation Services Router 6-Slot chassis	Release 6.3.1
ASR-9906-FAN	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray	Release 6.3.1
ASR-9906-FILTER	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Filter	Release 6.3.1
A99-SFC3-T	ASR 9906 Switch Fabric Card	Release 6.5.15

Cisco ASR 9010 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9010-SYS	Cisco ASR 9000 Series Aggregation Services Router 10-Slot System	Release 6.1.2
ASR-9010-AC-V2	Cisco ASR 9000 Series Aggregation Services Router 10-Slot AC Chassis Version 2	Release 6.1.2
ASR-9010-DC-V2	Cisco ASR 9000 Series Aggregation Services Router 10-Slot DC Chassis Version 2	Release 6.1.2

ASR-9010-FAN	Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray	Release 6.1.2
ASR-9010-DOOR	Cisco ASR 9000 Series Aggregation Services Router 10-Slot Door Kit	Release 6.1.2
ASR-9010-2P-KIT	Cisco ASR 9000 Series Aggregation Services Router 2 Post Mounting Kit	Release 6.1.2
ASR-9010-2P-KIT	Cisco ASR 9000 Series Aggregation Services Router 4 Post Mounting Kit	Release 6.1.2
ASR-9010-FILTER	Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Filter	Release 6.1.2

Cisco ASR 9910 Router

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
ASR-9910	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) System	Release 6.2.1
ASR-9910-FAN	Cisco ASR 9000 Series Aggregation Services Router 10-Slot(9910) Fan Tray	Release 6.2.1
ASR-9910-ACC-KIT	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Accessory Kit	Release 6.2.1
ASR-9910-4P-KIT	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) 4 Post Rack Mounting Kit	Release 6.2.1
ASR-9910-2P-KIT	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) 2 Post Rack Mounting Kit	Release 6.2.1
ASR-9910-AIRREF	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Air Reflector	Release 6.2.1
ASR-9910-FILTER	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Air Filter	Release 6.2.1
A99-SFC3-S	ASR 9910 Switch Fabric Card 3	Release 6.5.15

Cisco ASR 9000 Series Aggregation Services Router - Power Modules

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
PWR-2KW-DC-V2	Cisco ASR 9000 Series Aggregation Services Router 2KW DC Power Module, version 2	Release 6.1.2
PWR-3KW-AC-V2	Cisco ASR 9000 Series Aggregation Services Router 3KW AC Power Module, version 2	Release 6.1.2
A9K-AC-PEM-V2	Cisco ASR 9000 Series Aggregation Services Router AC Power Entry Module Version 2	Release 6.1.2

A9K-DC-PEM-V2	Cisco ASR 9000 Series Aggregation Services Router DC Power Entry Module Version 2	Release 6.1.2
A9K-PEM-V2-FILR	Cisco ASR 9000 Series Aggregation Services Router Power Entry Module Version 2 Filler	Release 6.1.2
A9K-AC-PEM-V3	Cisco ASR 9000 Series Aggregation Services Router AC Power Enclosure Module Version 3	Release 6.1.2
A9K-DC-PEM-V3	Cisco ASR 9000 Series Aggregation Services Router DC Power Enclosure Module Version 3	Release 6.1.2
PWR-6KW-AC-V3	Cisco ASR 9000 Series Aggregation Services Router 6kW AC Power Module Version 3	Release 6.1.2
PWR-4.4KW-DC-V3	Cisco ASR 9000 Series Aggregation Services Router 4.4kW DC Power Module Version 3	Release 6.1.2
PWR-1.6KW-AC	ASR 9900 Fixed Chassis AC Power Supply	Release 7.1.25
PWR-1.6KW-DC	ASR 9900 Fixed Chassis DC Power Supply	Release 7.1.25

Cisco ASR 9000 Series Aggregation Services Router - Line Cards

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
A9K-4HG-FLEX-SE	ASR 9000 400GE Combo Service Edge Line Card - 5th Generation	Release 7.4.1
A9K-4HG-FLEX-TR	ASR 9000 400GE Combo Packet Transport Line Card - 5th Generation	Release 7.4.1
A99-4HG-FLEX-SE	ASR 9900 400GE Combo Service Edge Line Card - 5th Generation	Release 7.4.1
A99-4HG-FLEX-TR	ASR 9900 400GE Combo Packet Transport Line Card - 5th Generation	Release 7.4.1
A9903-8HG-PEC	ASR 9903 800G Multi-rate Port Expansion Card	Release 7.4.1
A99-10X400GE-X-SE	ASR 9900 4T Service Edge Line Card - 5th Generation	Release 7.3.1
A99-10X400GE-X-TR	ASR 9900 4T Packet Transport Line Card - 5th Generation	Release 7.3.1
A9903-20HG-PEC	ASR 9903 2T Multi-rate Port Expansion Card	Release 7.1.3
A99-32X100GE-X-SE	ASR 9000 32-Port 100GE QSFP28/QSFP+ Service Edge optimized Line Card - 5th Generation	Release 7.1.15
A99-32X100GE-X-TR	ASR 9000 32-Port 100GE QSFP28/QSFP+ Packet Transport optimized Line Card - 5th Generation	Release 7.1.15
A9K-20HG-FLEX-SE A9K-20HG-FLEX-TR	ASR 9000 2T Combo Line Card - 5th Generation	Release 7.1.15
A9K-8HG-FLEX-SE A9K-8HG-FLEX-TR	ASR 9000 800G Combo Line Card - 5th Generation	Release 7.1.15

A9K-16X100GE-TR	ASR 9000 16-port 100GE QSFP TR line card	Release 6.5.15
A99-32X100GE-TR	ASR 9900 32-port 100GE QSFP TR line card	Release 6.5.15
A99-48X10GE-1G-SE	ASR 9000 48 port dual rate 10G/1G Service Edge line card	Release 6.5.2
A99-48X10GE-1G-TR	ASR 9000 48 port dual rate 10G/1G Transport Optimised line card	Release 6.5.2
A99-16X100GE-X-SE	ASR 9900 16-port 100GE QSFP SE	Release 6.5.3
A9K-48X10GE-1G-CM	ASR 9000 48-port dual-rate 10G/1G Consumption Model line card	Release 6.4.1
A9K-24X10GE-1G-CM	ASR 9000 24-port dual-rate 10G/1G Consumption Model line card	Release 6.4.1
A9K-48X10GE-1G-SE	ASR9000 48-port dual-rate 10G/1G service edge–optimized line card	Release 6.3.2
A9K-48X10GE-1G-TR	ASR9000 48-port dual-rate 10G/1G packet transport–optimized line card	Release 6.3.2
A9K-24X10GE-1G-SE	ASR9000 24-port dual-rate 10G/1G service edge–optimized line card	Release 6.3.2
A9K-24X10GE-1G-TR	ASR9000 24-port dual-rate 10G/1G packet transport–optimized line card	Release 6.3.2

Cisco ASR 9000 Series Aggregation Services Router - Modular Line Cards

Part Number	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	Support Initially Provided in IOS XR 64 bit Release
A9K-MOD400-CM	Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Service Edge Optimized	Release 6.2.1
A9K-MOD400-SE	Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Packet Transport Optimized	Release 6.2.1
A9K-MOD400-TR	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	Release 6.2.1

Cisco ASR 9000 Series Aggregation Services Router - Modular Port Adapters (MPAs)

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
A9K-MPA-1X200GE	Cisco ASR 9000 1-port 200-Gigabit Ethernet MPA, requires CFP2-DCO optics	Release 6.6.2
A9K-MPA-32X1GE	Cisco ASR 9000 32-port 1-Gigabit Ethernet MPA with MACSec	Release 6.6.2
A9K-MPA20X10GE-CM	Cisco ASR 9000 20x10GE Consumption Model MPA	Release 6.5.1

A9K-MPA2X100GE-CM	Cisco ASR 9000 2x100GE Consumption Model MPA	Release 6.5.1
A9K-MPA-1X100GE	Cisco ASR 9000 Series Aggregation Services Router 1-port 100-Gigabit Modular Port Adapter	Release 6.3.1
A9K-MPA-2X100GE	Cisco ASR 9000 Series Aggregation Services Router 2-port 100-Gigabit Modular Port Adapter	Release 6.2.2
A9K-MPA-20x10GE	20-Port 10-Gigabit Ethernet Modular Port Adapter with SFP+	Release 6.2.1
A9K-MPA-8X10GE	Cisco ASR 9000 Series Aggregation Services Router 8-port 10GE Modular Port Adapter	Release 6.3.2
A9K-MPA-4X10GE	Cisco ASR 9000 Series Aggregation Services Router 4-port 10GE Modular Port Adapter	Release 6.2.1
A9K-MPA-20X1GE	Cisco ASR 9000 Series Aggregation Services Router 20-port 1GE Modular Port Adapter	Release 6.2.1
A9K-MPA-2X40GE	Cisco ASR 9000 Series Aggregation Services Router 2-port 40GE Modular Port Adapter	Release 6.3.1

Cisco ASR 9000v Satellite Shelf

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
A9KV-V2-DC-A=	Cisco ASR 9000v Satellite Shelf Version 2 DC power ANSI chassis	Release 6.2.1
A9KV-V2-DC-E=	Cisco ASR 9000v Satellite Shelf Version 2 DC power chassis	Release 6.2.1
A9KV-V2-AC=	Cisco ASR 9000v Satellite Shelf AC power chassis	Release 6.2.1
A9KV-V2-FAN=	Cisco ASR 9000v Satellite Shelf Version 2 Fan Tray	Release 6.2.1

Cisco NCS 5000 Satellite Shelf

Part Number	Description	Support Initially Provided in IOS XR 64 bit Release
NCS-5001	Cisco NCS 5001 Series Router	Release 6.2.1
NCS-5002	Cisco NCS 5002 Series Router	Release 6.2.1
NCS-5001-ACSR	Cisco NCS 5001 Router Accessory Kit	Release 6.2.1
NCS-5002-ACSR	Cisco NCS 5002 Router Accessory Kit	Release 6.2.1
NCS-5001-FN-BK	Cisco NCS 5001 Router Fan Back to Front AirFlow	Release 6.2.1
NCS-5002-FN-BK	Cisco NCS 5002 Router Fan Back to Front AirFlow	Release 6.2.1
NCS-5001-FLT-BK	Cisco NCS 5001 Air Filter Back to Front Airflow	Release 6.2.1
NCS-5002-FLT-BK	Cisco NCS 5002 Air Filter Back to Front Airflow	Release 6.2.1

NCS-5001-FN-FR	Cisco NCS 5001 Fan Front to Back Airflow	Release 6.2.1
NCS-5002-FN-FR	Cisco NCS 5002 Fan Front to Back Airflow	Release 6.2.1
NCS-5001-FLT-FR	Cisco NCS 5001 Air Filter Front to Back Airflow	Release 6.2.1
NCS-5002-FLT-FR	Cisco NCS 5002 Air Filter Front to Back Airflow	Release 6.2.1

Compatibility Matrix for EPNM and Crosswork with Cisco IOS XR Software

The compatibility matrix lists the version of EPNM and Crosswork that are supported with Cisco IOS XR Release in this release.

Table 5: Compatibility Matrix

Cisco IOS XR	Crosswork	EPNM
Release 24.1.1	Crosswork Optimization Engine 6.0	Evolved Programmable Network Manager 7.1.1

Important Notes

- Repetitive Smart Licensing evaluation expired warning messages are displayed on the console every hour, but no functionality impact is observed on the device. To stop these repetitive messages, you should register the device again with a new registration token.

- From IOS XR Release 7.0, 1st and 2nd generation of Ethernet ASR 9000 line cards are 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.

- Exceeding Cisco testing—If you intend to test beyond the combined maximum configuration tested and published by Cisco, contact your Cisco Account Team or Technical Support representative to discuss how to engineer a large-scale configuration for your purpose.

- The ISSU SMU for ASR 9000 third-generation line cards will be supported until the Cisco IOS XR Release 7.11.2 only. The ISSU SMU will not be supported in the future releases for ASR 9000 third-generation line cards.

- Installing a Line Card—For a fully populated 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*.

- For ZTP, In Cisco IOS XR Release 7.3.1 and earlier, the system accepts the device sending **user-class = "exr-config"**; however starting Cisco IOS XR Release 7.3.2 and later, you must use only **user-class = "xr-config"**.

In Cisco IOS XR Release 7.3.2 and later, use:

```
host cisco-rp0 {
   hardware ethernet e4:c7:22:be:10:ba;
   fixed-address 172.30.12.54;
   if exists user-class and option user-class = "iPXE" {
      filename = "http://172.30.0.22/boot.ipxe";
```

```
      } elsif exists user-class and option user-class = "xr-config" {
         filename = "http://172.30.0.22/scripts/cisco-rp0_ztp.sh";
      }
   }
```

- The auto FPD upgrade may result in certain intentional exceptions, which may need manual upgrades or reloading for a few FPDs. We recommend you use the **show hw-module fpd** command to check the hardware module status immediately after the FPD auto upgrade is complete and take necessary action in both admin and XR VM mode. That is, if any FPD displays a **NEED UPGD** status, then upgrade those FPDs individually by the manual upgrade and follow it with a reload in admin mode, and if any FPDs show a **RLOAD REQ** status, perform a hardware module reload from admin mode.

Licensing

Starting with Cisco IOS XR Release 24.1.1, Smart Licensing Using Policy (SLP) is the default Licensing model. When you upgrade to the Cisco IOS XR Release 24.1.1 release or later, the Smart Licensing Using Policy is enabled by default.

You can migrate your devices to Smart Licensing with Policy model, see *Migrating from Smart Licensing to Smart Licensing Using Policy*, Smart Licensing Using Policy on Cisco IOS XR Routers.

We recommend that you update to the latest version of SSM On-Prem or Cisco Smart Licensing Utility.

✎

Note   SSM On-Prem and CSSM both support SLP devices and SL devices. SLP devices and SL devices can coexist in a network. The Smart Licensing (SL) model is available in releases Cisco IOS XR Release 7.11.1 and earlier.

Supported Transceiver Modules

To determine the transceivers that Cisco hardware device supports, refer to the Transceiver Module Group (TMG) Compatibility Matrix tool.

Supported Modular Port Adapters

For the compatibility details of Modular Port Adapters (MPAs) on the line cards, see the datasheet of that specific line card.

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.

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 Route Processor Module (RPM) files that contain one or more software components.

The upgrade document is available along with the software images.

Note   If you have mLACP/ICCP Redundancy Model setup, ensure that you upgrade the active and standby nodes to the same IOS XR version while upgrading to a newer version of the ASR 9000 router.

Cisco IOS XR Error messages

To view, search, compare, and download Cisco IOS XR Error Messages, refer to the Cisco IOS XR Error messages tool.

Cisco IOS XR MIBs

To determine the MIBs supported by platform and release, refer to the Cisco IOS XR MIBs tool.

Related Documentation

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

https://www.cisco.com/c/en/us/td/docs/iosxr/asr-9000-series-routers.html