Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 24.3.1

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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 24.3.1

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
Cloud Native BNG User Plane	
cnBNG User Plane and Control Plane Reachability over IPv6 Networks	You can now establish communication between the user and control plane cnBNG over IPv6 networks, allowing users to seamlessly migrate to an IPv6-only core.
Routing	

Feature	Description
Enhanced BGP BFD Strict-Mode Capabilities for Improved Interoperability	You now have the capability of upgrading your network with Cisco's "BGP BFD strict-mode negotiate" and "override" modes, which enhance stability and device cooperation between Cisco IOS XR and Cisco XE systems. These modes ensure BGP sessions initiate only if BFD sessions are active, with the override option enforcing this even if a peer device lacks strict-mode support. This feature resolves interoperability issues, secures route propagation, and adheres to IETF standards, leading to a more reliable network. This feature introduces these changes: **CLI:** • The **bfd-state** keyword is introduced in the **show bgp sessions** command. • The BFDmode and BFDState fields were added to **show bgp neighbors** command output. **YANG Data Models:** • New XPaths for `Cisco-IOS-XR-um-router-bgp-cfg.yang` (See GitHub, YANG Data Models Navigator)
LSP Fast-Flooding on IS-IS Networks	You can now accelerate the rate at which Link State Packets (LSPs) are distributed across an IS-IS network. Faster LSP distribution means faster network convergence. This faster convergence ensures that the most accurate topology information is quickly available across all routers on the network, reducing the chances of routing loops or misrouting. The feature introduces these changes: **CLI:** • **lsp-fast-flooding** • **max-lsp-tx** • **psnp-interval** • **remote-psnp-delay** **YANG Data Model:** • `Cisco-IOS-XR-um-router-isis-cfg` (see GitHub, YANG Data Models Navigator)
MPLS	
Route Convergence with Next-Hop ID Option for LDP in MPLS Networks	This release improves route convergence during routing changes and reduces downtime due to asynchronous Forwarding Information Base (FIB) updates by introducing Next-Hop ID (NHID) support for LDP via UDP sockets in MPLS networks. By synchronizing FIB updates across line cards and RPs, NHID ensures swift packet forwarding decisions without the need to reprogram all entries.
Segment Routing	

Feature	Description
BGP Signaling for co-existence of IP routes	SRv6 with BGP supports the coexistence of IP routes with or without SRv6 SID over an SRv6-enabled core network. This support enables integrating SRv6 capabilities into existing network infrastructures without replacing IP routing completely. This feature enables flexibility and scalability, transition to new technologies, and enhanced network efficiency, making it easier to migrate from MPLS to SRV6. The feature introduces these changes: CLI: • **encapsulation-type srv6 relax-sid**
Interface and Hardware Component	
1x10GbE Breakout Ports on Cisco ASR 9903 Router and Cisco A9K-20HG-FLEX-SE Line Cards	You can now configure 1x10GbE breakout mode on the Cisco ASR 9903 Router and Cisco A9K-20HG-FLEX-SE line card using SFP-10G-ER, SFP-10G-ZR, and SFP-10G-LR hot-pluggable transceiver modules. The feature introduces these changes: **CLI**: • The **1xTenGigE** keyword is introduced in the **hw-module location** command.
Modular QoS	
ICMP, ICMPv6 Fragment Packet and Message Type QoS Classification Enhancement	In this release, we have enhanced network congestion management and security against distributed denial-of-service (DDoS) fragment attacks by enabling more granular classification and policing of ICMP and ICMPv6 traffic. This is made possible by enabling support for QoS policies that can classify and police ICMP and ICMPv6 fragments and message types in both flat QoS and hierarchical QoS (HQoS). Prior to release 24.3.1, this capability was limited to classifying ICMP and ICMPv6 fragments in HQoS and message types in flat QoS only.
Application Hosting	
Cisco Secure DDoS Edge Protection	You can now block malicious traffic at peering edge routers, stopping distributed denial-of-service (DDoS) attacks at the network entry point and ensuring constant service availability and reliability in your network. A centralized controller manages DDoS mitigation capabilities using information from a collection of detectors deployed on the routers. These detectors analyze IPv4 and IPv6 traffic in real-time to identify DDoS attacks. Upon detection, the controller enforces deny ACLs to block malicious traffic while allowing legitimate traffic. This local inspection enhances visibility, speeds up response times, and optimizes the network without the need for additional hardware or attack traffic redirection.
General Administration	

Feature	Description
Concurrent Configuration Rebase during Commit	The router performs the commit and rebase operations simultaneously, ensuring that the commit operation remains unblocked during the rebase operation.
	This removes the need to use the **cfs check** command to increase the commit count and the commit file diff size.

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	
openconfig-macsec.yang Version 1.0.0	Cisco IOS-XR now supports the openconfig-keychain.yang data model, version 0.4.0. This model provides a standardized approach to key management on network devices by introducing a keychain container for managing cryptographic keys, each with specified lifetimes and algorithms.
	Key Identification - Keys are identified based on the key-id string:
	• MACsec Keys: Keys with a key-id string containing any characters from [a-fA-F].
	• NON-MACsec Keys: Keys with a key-id as an integer.
	• MACsec Key Requirements - For MACsec keys, the secret-key/key-string must adhere to the following requirements:
	• 32 Hex Characters: Automatically maps to the AES-128-CMAC cryptographic algorithm in the native model.
	• 64 Hex Characters: Automatically maps to the AES-256-CMAC cryptographic algorithm.
	This mapping is assumed because the openconfig-keychain model does not include AES-128-CMAC and AES-256-CMAC crypto-type enums.

Feature	Description
opencconfig-keychain.yang Version 0.4.0	Cisco IOS-XR now supports the opencconfig-keychain.yang data model, version 0.4.0, offering a standardized method for key management on network devices. This model introduces a keychain container for managing cryptographic keys, each with defined lifetimes and algorithms. Keys with a key-id string containing any characters from [a-fA-F] are considered MACsec keys and keys with a key-id as an integer are treated as NON-MACsec keys. The key-chains container from the previous version has been removed.
opencconfig-system.yang Version 0.17.1	The OpenConfig data model is revised from version 0.16.1 to 0.17.1, introducing two new leaves in the NTP container: • network-instance: The network instance used to locate this server. • source-address: The source address to use on outgoing NTP packets. In the current OpenConfig system hierarchy, the NTP server or peer's IP address is the container, with the network instance as its leaf. Therefore, this feature comes with the following restrictions: • The open-config model does not support multiple VRFs on the same NTP server or peer IP address. • The address and network-instance tags are mandatory for creating, updating, merging, or replacing an NTP server or peer with a non-default VRF. Replacing the NTP server or peer for a non-default network instance is not supported. • Users must clear NTP configurations with non-default VRFs before downgrading to another XR SW release due to the inverted OC hierarchy. Due to these limitations, we recommend using the corresponding CLI commands for the NTP functionalities.

Hardware Introduced

No new hardware introduced in this release.

Caveats

Table 1: Cisco ASR 9000 Series Router Specific Bugs

Bug ID	Headline
CSCwk73534	OC terminal-device target-output-power units/definition interpretation is wrong

Behavior Changes

- Two new MPLS OAM commands, **address-family ipv4 reply** and **address-family ipv6 reply**, are implemented in Cisco IOS XR Release 24.3.1. Use the keyword **ip-header-source** in either of these commands if an explicit source IP is required in the MPLS OAM reply packets when route policies block packets with non-routed source addresses. By default, the MPLS OAM packets use the local interface address as the source.

- Starting from Cisco IOS XR Release 24.3.1, the **reverse** keyword in **show reboot** command is deprecated and will not be supported in future releases. Hence the **show reboot history reverse location** command is also not supported.

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 24.3.1 Release supported on the Cisco ASR 9000 Series Aggregation Services Router.

Table 2: Cisco IOS XR 64 bit Software Release 24.3.1 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP and RP systems]	ASR9K-x64-iosxr-px-24.3.1.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
Cisco IOS XR IP/MPLS Core Software 3DES [for RSP and RP systems]	ASR9K-x64-iosxr-px-k9-24.3.1.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

Feature Set	Filename	Description
Cisco IOS XR IP Unicast Routing Core Bundle and Migration to IOS XR 64 bit tar image	asr9k-mini-x64-migrate_to_eXR.tar-24.3.1	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 24.2.1 and additional software for migration to 64 bit.

Table 3: Cisco IOS XR 64 bit Software Release 24.2.1 ISO and RPM Files

Composite Package		
Feature Set	**Filename**	**Description**
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-x64-24.3.1.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-r2431.x86_64.rpm	Includes EIGRP protocol support software
Cisco IOS XR BNG Package	asr9k-bng-x64-1.1.0.0-r2431.x86_64.rpm	Includes binaries to support BNG features.
Cisco IOS XR 64 bit ISIS package	asr9k-isis-x64-1.1.0.0-r2431.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-r2431.x86_64.rpm	Includes OSPF link state protocol support software
Cisco IOS XR Manageability Package	asr9k-mgbl-x64-3.0.0.0-r2431.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-r2431.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-r2431.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-r2431.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-r2431.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-r2431.x86_64.rpm	Includes LI software images.
Cisco IOS XR Security Package	asr9k-k9sec-x64-3.1.0.0-r2431.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-r2431.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-r2431.x86_64.rpm	Includes RPM to support Cisco IOS XR 64-bit inline MAP-T function

Memory

⚠️

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

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

- 32 GB memory on the A99-RP-F

- 16 GB memory on the RP2 transport optimised (TR) variant and 32 GB memory on the RP2 service edge (SE) variant

- 24 GB memory on the RP3 transport optimised (TR) variant and 40 GB memory on the RP3 service edge (SE) variant

- 24 GB memory on the RP3-X transport optimised (TR) variant and 48 GB memory on the RP3-X service edge (SE) variant

- 24 GB memory on the RSP5 transport optimised (TR) variant and 40 GB memory on the RSP5 service edge (SE) variant

- 24 GB memory on the RSP5-X transport optimised (TR) variant and 48 GB memory on the RSP5-X service edge (SE) variant

- 2 GB compact flash on route switch processors (RSPs)

- 8 GB memory on the line cards (LCs) running Cisco IOS XR 64-bit image

Software Compatibility

Cisco IOS XR Software Release 24.3.1 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 : 24.3.1-iso
    Active Packages: 18
        asr9k-xr-24.3.1 version=24.3.1 [Boot image]
        asr9k-m2m-x64-1.0.0.0-r2431
        asr9k-9000v-nV-x64-1.0.0.0-r2431
        asr9k-optic-x64-1.0.0.0-r2431
        asr9k-mgbl-x64-1.0.0.0-r2431
        asr9k-eigrp-x64-1.0.0.0-r2431
        asr9k-mpls-x64-1.0.0.0-r2431
```

```
asr9k-li-x64-1.0.0.0-r2431
asr9k-isis-x64-1.0.0.0-r2431
asr9k-ospf-x64-1.0.0.0-r2431
asr9k-bng-x64-1.0.0.0-r2431
asr9k-bng-ipoe-x64-1.0.0.0-r2431
asr9k-bng-supp-x64-1.0.0.0-r2431
asr9k-services-x64-1.0.0.0-r2431
asr9k-k9sec-x64-1.0.0.0-r2431
asr9k-bng-pppoe-x64-1.0.0.0-r2431
asr9k-mcast-x64-1.0.0.0-r2431
asr9k-mpls-te-rsvp-x64-1.0.0.0-r2431
```

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      25.31       25.31       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      25.31       25.31       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      25.31       25.31       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
```

```
------------------------------------------------------------------------------
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    25.31       25.31        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    25.31       25.31        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-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     25.31      25.31       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     25.31      25.31       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   25.31     25.31      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   25.31     25.31      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   25.31     25.31      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
```

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                        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-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    25.31     25.31      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    25.31     25.31      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    25.31     25.31      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
```

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--------------------------------------------------------------------------------
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
--------------------------------------------------------------------------------
```

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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     33.31     33.31     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     30.37     30.37     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     30.37     30.37     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     35.10     35.10     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   35.10    35.10    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
```

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-----------------------------------------------------------------------------
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    25.31       25.31       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    25.31       25.31       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    25.31       25.31       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
```

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                           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    25.31      25.31      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    25.31      25.31      0.0
```

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                       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-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     25.31     25.31      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     25.31     25.31      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
```

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                      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        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     25.31     25.31       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     25.31     25.31       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     25.31     25.31       0.0
                      Sunstreaker            YES      0.19      0.19       0.0
```

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                          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-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
```

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                         Meldun-1              YES    1.07      1.07       0.0
                         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    25.31     25.31      0.0
                         Skylynx-0             YES    0.12      0.12       0.0
```

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                       Sunstreaker           YES      0.19       0.19      0.0
                       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     25.31      25.31      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     25.31      25.31      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
```

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                        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-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      31.37       31.37       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      31.37       31.37       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      35.10       35.10       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      35.10       35.10       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    25.31      25.31      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
```

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                         Meldun-1              YES     1.07      1.07       0.0
                         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     23.24     23.24      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     22.29     22.29      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     34.31     34.31      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     34.31     34.31      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
```

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--------------------------------------------------------------------------------
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           PO-PriMCU            NO    1.03     1.03     0.0
                       QCS-PriMCU           NO    1.05     1.05     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      3.03       3.03      0.1
                         DT-Sec154vMCU            NO      3.03       3.03      0.1
                         DT-Sec5vMCU              NO      3.02       3.02      0.1
                         QCS-Pri0MCU              NO      1.04       1.04      0.1
                         QCS-Pri1MCU              NO      1.04       1.04      0.1
                         QCS-Sec054vMCU           NO      1.10       1.10      0.1
                         QCS-Sec154vMCU           NO      1.10       1.10      0.1
                         QCS-Sec5vMCU             NO      1.06       1.06      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
A9K-RSP880-SE	ASR9K Route Switch Processor with 880G/slot and 32 GB for Service Edge	Release 6.1.2
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 Aggregration 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-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

*This hardware is supported as Satellite Host and not as Standalone Router.

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 24.3.1	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.

- Starting Cisco IOS XR Software Release 24.1.1, ISSU upgrades and ISSU SMU are not supported 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