Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 7.10.1

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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 7.10.1

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

Software Features Enhanced and Introduced

To learn about features introduced in other Cisco IOS XR releases, select the release from the Documentation Landing Page.

Feature	Description
Programmability	
Improved YANG Input Validator and Get Requests	The OpenConfig data models provide a structure for managing networks via YANG protocols. With this release, enhancements to the configuration architecture improve input validations and ensure that the Get requests made through gNMI or NETCONF protocols return only explicitly configured OpenConfig leaves.
Prevent Partial Pseudo-Atomic Committed Configurations	You can now prevent the partially-committed configurations on the router and thus ensure the system database and OpenConfig datastore stay in sync. This feature changes how the internal rollback error is handled when a pseudo-atomic commit fails. In such cases, the system database always rolls back the configuration in its datastore thereby ensuring that there is no partially-committed configuration. If there is still inconsistency, the system displays error messages to notify you of various internal rollback failure scenarios based on which you must take rectification action to re-synchronize the data.
Cloud Native BNG User Plane	

Feature	Description
IPv6 Neighbor Discovery	You can now configure IPv6 Neighbor Discovery (ND) parameters on the access interface that facilitates address resolution, router discovery, and duplicate address detection. The IPv6 ND protocol discovers and establishes communication with neighboring IPv6 nodes within a local network. This feature introduces the following changes: • **CLI**: **cnbng ipv6 nd** commands. • **YANG** `Cisco-IOS-XR-um-asr9k-cnbng-nal-cfg` (see GitHub, YANG Data Models Navigator):
Routing	
Autonomous System Boundary Router Isolation and Adjacency Control for LSA Overflows	In a network employing an Autonomous System Boundary Router (ASBR) and other routers, you are now assured of uninterrupted traffic flow even if the ASBR generates LSAs that exceed the limit you configured. This is made possible as you can now isolate ASBRs and also control the duration of adjacency in the EXCHANGE or LOADING phase. By isolating the ASBR from its immediate neighbors, the remaining network topology can continue to function without disruption, effectively preventing any adverse impact on traffic flow. This approach also simplifies the recovery process, as manual intervention is only necessary for the immediate neighbors of the ASBR routers. This feature introduces these changes: **CLI:** • **max-external-lsa** • **exchange-timer** **YANG Data Model:** • `Cisco-IOS-XR-ipv4-ospf-cfg.yang` • `Cisco-IOS-XR-ipv4-ospf-oper.yang` • `Cisco-IOS-XR-um-router-ospf-cfg.yang` (see GitHub, YANG Data Models Navigator)

Feature	Description
EIBGP Policy-Based Multipath with Equal Cost Multipath and Default VRF	Now, with the inclusion of the default VRF in policy-based multipath selection, you gain control over traffic distribution and load-balancing capabilities across various BGP variations, including iBGP, eBGP, and eiBGP. This is achieved through the utilization of BGP communities, nexthops, and path types. Additionally, by employing the equal cost multipath (ECMP) option in eiBGP, this feature provides the capability to select ECMP across the iBGP paths chosen for eiBGP. The feature introduces these changes: **CLI:** The keywords **route-policy** and **equal-cost** are added to the command: **maximum-paths** **YANG Data Model:** • `Cisco-IOS-XR-um-router-bgp-cfg` (see GitHub, YANG Data Models Navigator)
Exclusion of Label Allocation for Non-Advertised Routes	We have enabled better label space management and hardware resource utilization by making MPLS label allocation more flexible. This flexibility means you can now assign these labels to only those routes that are advertised to their peer routes, ensuring better label space management and hardware resource utilization. Prior to this release, label allocation was done regardless of whether the routes being advertised. This resulted in inefficient use of label space.
Protection of Directly connected eBGP neighbors through Interface-based LPTS Identifier	We have enhanced the network security for directly connected eBGP neighbors by ensuring that only packets originating from designated eBGP neighbors can traverse through a single interface, thus preventing IP spoofing. This is made possible because we've now added an interface identifier for Local Packet Transport Services (LPTS). LPTS filters and polices the packets based on the type of flow rate you configure. The feature introduces these changes: **CLI:** • **bgp lpts-secure-binding** **YANG Data Model:** • `Cisco-IOS-XR-um-router-bgp-cfg` (see GitHub, YANG Data Models Navigator)
Segment Routing	
Configurable Filters for IS-IS Advertisements to BGP-Link State	This feature allows you to configure a route map to filter IS-IS route advertisements to BGP-Link State (LS). It also provides a per-area configuration knob to disable IS-IS advertisements for external and propagated prefixes. This configuration of filters hence reduces the amount of redundant data for external and interarea prefixes sent to the BGP - LS clients. The feature introduces **exclude-external** , **exclude-interarea** , and **route-policy** *name* optional keywords in the **distribute link-state** command.

Feature	Description
Multicast VPN: Dynamic Tree-SID Multicast VPN IPv6	This feature allows Dynamic Tree Segment Identifier (Tree-SID) deployment where IPv6 Multicast payload is used for optimally transporting IP VPN multicast traffic over the provider network, using SR-PCE as a controller. This implementation supports IPv6 only for the Dynamic Tree-SID. Currently, the Static Tree-SID supports IPV4 payloads only, not the IPv6 payloads.
Multicast: Cisco Nonstop Forwarding for Tree-SID	Starting from this release, Multicast Nonstop Forwarding supports Tree-SID (Tree Segment Identifier). This ensures that traffic forwarding continues without interruptions whenever the active RSP fails over to the standby RSP. This feature prevents hardware or software failures on the control plane from disrupting the forwarding of existing packet flows through the router for Tree-SID. Thus, ensuring improved network availability, network stability, preventing routing flaps, and no loss of user sessions while the routing protocol information is being restored. The feature modifies the **show mrib nsf private** command.
Reporting of SR-TE Policies Using BGP-Link State	BGP- Link State (LS) is a mechanism by which LS and Traffic Engineering (TE) information can be collected from networks and shared with external components (such as, Segment Routing Path Computation Element (SR-PCE) or Crossword Optimization Engine (COE)) using the BGP routing protocol. The feature gathers the Traffic Engineering Policy information that is locally available in a node and advertises it into BGP-LS updates. The operators can now take informed decisions based on the information that is gathered on their network's path computation, reoptimization, service placement, network visualization, and so on. The feature introduces these changes: **CLI:** • **distribute link-state** **YANG Data Model:** • New XPaths for `module Cisco-IOS-XR-infra-xtc-agent-cfg.yang` (see GitHub, YANG Data Models Navigator)
SR-Multicast: Tree-SID Label Range Validation in North-Bound API	The SR-PCE provides a north-bound HTTP-based API to establish communication between the SR-PCE and the Cisco Crosswork Optimization Engine. This release adds support for the following: • This feature allows the router to allocate the SR-Multicast Tree Segment Identifier (Tree-SID) Label automatically from the label range the operator configures. The operators can hence provision without passing the Label via North Bound API. Note that the label range configuration is mandatory for this feature to work. • If the label is not valid, an error message is returned to the application. • If the label is valid, the PCE computes, then program the Tree-SID multicast on the network nodes. For more information, refer to the Cisco Crosswork Optimization Engine User Guides.

Feature	Description
SRv6 Traffic Accounting	You can now enable the router to record the number of bytes transmitted on a specific egress interface for IPv6 traffic using the SRv6 locator counter. You can use this data to create deterministic data tools to anticipate and plan for future capacity planning solutions. This feature introduces or modifies the following changes: **CLI**: • **accounting prefixes ipv6 mode per-prefix per-nexthop srv6-locators** **YANG Data Models:** • `Cisco-IOS-XR-accounting-cfg` • `Cisco-IOS-XR-fib-common-oper.yang` (see GitHub, YANG Data Models Navigator)
MPLS	
Enable Per-Prefix Statistics Collection	You can now enable the router to collect only the per-prefix statistics, that is, the aggregate statistics for all paths available for a destination prefix. This helps conserve the hardware resources of the router. In earlier releases, there was no option to disable per-path statistics collection. The router collected both per-prefix statistics and per-path statistics for each destination prefix. When there were multiple paths for a destination prefix, the router required much more hardware resources to store the per-path statistics. This feature introduces these changes: **CLI:** • **hw-module l3 feature per-prefix-egress-stats enable** **YANG Data Model:** • New XPaths for `Cisco-IOS-XR-um-hw-module-l3-cfg.yang` (see GitHub, YANG Data Models Navigator)
Automatic Bandwidth Bundle TE++ for Numbered Tunnels	We have optimized network performance and enabled efficient utilization of resources for numbered tunnels based on real-time traffic by automatically adding or removing tunnels between two endpoints. This is made possible because this release introduces support for auto-bandwidth TE++ for numbered tunnels, expanding upon the previous support for only named tunnels, letting you define explicit paths and allocate the bandwidth to each tunnel. The feature introduces these changes: • **CLI:** The **auto-capacity** keyword is added to the **interface tunnel-te** command. • **YANG Data Model:** New XPaths for `Cisco-IOS-XR-mpls-te-cfg.yang` (see GitHub, YANG Data Models Navigator)
Broadband Network Gateway	

Feature	Description
Recursive DNS Server Information for IPv6 Neighbor Discovery Router Advertisement for PPPoE Subscribers	We've now made the resolution of DNS queries faster by including the DNS server information in the IPv6 Neighbor Discovery (nd) Router Advertisement (RA) for PPPoE subscribers. We've enabled the transmission of DNS information to devices that don't support DHCP thus expanding the scope of address resolution beyond DHCP-broadcasting. This feature introduces the following changes: • **CLI**: **ipv6 nd ra dns server** • **Radius Attribute**: `Cisco-avpair += "ipv6-nd-dns-servers-addr=2122::100"` • **YANG**: `Cisco-IOS-XR-subscriber-infra-tmplmgr-cfg` (see GitHub, YANG Data Models Navigator)
Interface and Hardware Component	
Cyclic Redundancy Check based Bit Error Ratio on A9K-20HG-FLEX, A9K-8HG-FLEX, and A9K-4HG-FLEX Line cards	Cyclic Redundancy Check (CRC) based Bit Error Ratio (BER) measures the error rate in a received message by dividing the number of errors by the total number of bits transmitted. This metric allows you to evaluate the performance of the communication system and ensure the integrity of transmitted data. A high BER indicates a higher rate of errors and potential issues with the communication system, whereas a low BER indicates a high-quality system with minimal errors. This release extends CRC-based BER support for the following line cards: • A9K-20HG-FLEX • A9K-8HG-FLEX • A9K-4HG-FLEX
Disable Laser Squelching	This release introduces the support to disable the laser squelching. By disabling laser squelch, you can detect weak signals embedded within the laser source noise and simultaneously reduce processing overhead in systems with stable laser sources and minimal noise. When laser squelch is enabled, the system shuts down the laser in case of an Optical Transport Network (OTN) failure. The feature introduces these changes: **CLI:** • The **controller optics** command is modified to support a new optional keyword, **host auto-squelch disable** **YANG DATA models:** • New XPaths for `Cisco-IOS-XR-controller-optics-cfg` (see Github, YANG Data Models Navigator)

Feature	Description
Small Frame Padding	Small frame padding prevents packet drops caused by network congestion. If the minimum frame size requirement isn't met, the frames drop, this enhancement ensures that your hardware ASIC adds extra bytes to the payload, thereby fulfilling the 68-byte minimum frame size requirement. By doing so, small frame padding significantly enhances network reliability and minimizes the risk of dropped frames due to congestion-related issues. Previously, this feature was supported on the second and third generations of the ASR 9000 Series Ethernet line cards. Starting from this release, we extend this feature support to the fourth and fifth generations of the ASR 9000 Series Ethernet line cards.
Support for DP04QSDD-HE0 Optical Module	With this release, the support for DP04QSDD-HE0 optical module is extended to the following hardware: • A99-10X400GE-X-SE/TR • A9903-20HG-PEC • A9903-20HG-PEC-FC • ASR9902 (100G) • ASR9902-FC (100G)
Multicast	
Dynamic Source-Specific Multicast Translation	With Dynamic Source-Specific Multicast (SSM) Translation, the router with BGP C-multicast routing, will now be able to avoid or prevent sending duplicate packets from the RP-PE (Rendezvous Point–Provider Edge) to all receiver PE nodes. This feature reduces the consumption of hardware resources by not programming (*, G) entries in the forwarding tables, and also avoids sending duplicate packets on PE nodes and eases debugging. The feature introduces these changes: **CLI:** • **dynamic-ssm translation** • **shared-tree-prune** **YANG Data Model:** New XPath for: • `Cisco-IOS-XR-um-multicast-routing-cfg` • `Cisco-IOS-XR-um-router-pim-cfg` (see Github, YANG Data Models Navigator)
Netflow	

Feature	Description
IPFIX Enablement for SRv6 and Services over SRv6 Core	During the transition from conventional IP/MPLS networks to SRv6-based networks, the necessity for monitoring SRv6 traffic flow becomes crucial. This feature enables IPFIX to effectively monitor SRv6 IP traffic flow from network devices. The feature introduces these changes: **CLI:** • The **srv6** keyword is introduced in the**record ipv6** command. The **srv6** keyword is supported on fourth generation and later ASR 9000 Series High Density Ethernet line cards.
Simultaneous L2 and L3 Flow Monitoring using IPFIX	This feature introduces support for simultaneous L2 and L3 flow monitoring. Now, you can configure IP Flow Information Export (IPFIX) to actively monitor and record end-to-end L2 and L3 flow information elements from network devices. Previously, only L2 or L3 flow could be monitored at a time. The feature introduces these changes: **CLI:** • The **l2-l3** keyword is introduced in the **record ipv4** command. • The **l2-l3** keyword is introduced in the **record ipv6** command. **YANG DATA models:** • New XPaths for `Cisco-IOS-XR-UM-flow-cfg` (see Github, YANG Data Models Navigator) The **l2-l3** keyword is supported on fourth generation and later ASR 9000 Series High Density Ethernet line cards.
sFlow Agent Address Assignment	You can now monitor traffic from a specific source by configuring the sFlow agent ID with the specific IPv4 or IPv6 address. Upon configuration, you can determine the source of the sFlow data. Earlier, by default, the sFlow agent ID had the source address of the sFlow export packet. The feature introduces these changes: **CLI** New Command: • **router-id** Modified Command: • The **show flow exporter-map** command is modified to display flow exporter map with router-id information. **YANG Data Model** • New XPaths for `openconfig-sampling-sflow.yang` (see GitHub, YANG Data Models Navigator)
L2VPN and Ethernet Services	

Feature	Description
EVPN Port-Active Hot Standby on Bundle Interfaces	The EVPN port-active mode configuration is now modified to support hot standby. In a hot standby bundle interface, the main and subinterfaces remain up. This functionality ensures fast convergence of standby to active transition. Previously, the interfaces in a standby node would be down. During the failure and recovery of active node, the standby node transitions through the Out-of-Service (OOS) state to the Up state. If you still want the nodes to transition through the OOS state, use the **access-signal out-of-service** command to revert to the previous behavior. The feature introduces these changes: **CLI**: • **access-signal out-of-service** **YANG Data Model**: • New XPaths for `Cisco-IOS-XR-l2vpn-cfg.yang` (see GitHub, YANG Data Models Navigator)
Increased Ethernet Flow Point Support per Bundle Interface	The maximum number of Ethernet Flow Points (EFPs) that can be added to a bundle interface is now enhanced to 40960 (40K). This greatly improves the flexibility to manage the traffic with different EFP filters. **Note** • Each bundle interface can support up to 40K L2 or L3 sub interfaces, or a combination totaling 40K. • Only per bundle capacity is increased to 40K. There is no change in overall system scale, which remains 128K. • The A99-12x100GE and A9K-4x100GE line cards do not support the enhanced limit.
Set EVPN Gateway IP Address in EVPN Route Type 5 NLRI	You can now facilitate optimal traffic load balancing across the Virtual Network Forwarders (VNFs) and minimize control plane updates when the VNFs or virtual machines (VMs) are moved across Top of Racks (ToR) by setting the EVPN gateway IP address in the EVPN route type 5 network layer reachability information (NLRI) that advertises IPv4 and IPv6 addresses. With this functionality, only one IP prefix route is withdrawn ensuring fast traffic switchover and reduced convergence time in the event of failure. Previously, the gateway IP address field in the EVPN route type 5 NLRI was not used. By default, the NLRI advertisement included the EVPN gateway IP address of zero, which was represented as 0.0.0.0 for IPv4 and :: for IPv6. This resulted in the withdrawal of all prefixes one by one in the event of a failure, leading to traffic loss. The feature introduces these changes: **CLI:** • **set advertise-evpn-gw-ip** • **advertise gateway-ip-disable**
System Security	

Feature	Description
Display Username for Failed Authentication for Telnet Protocols	With this feature, we have enhanced the security of the routers and introduced better tracking functionality to the router. The failed authentication sys log now displays the details of users who tried to log in but failed due to authentication failure. With this feature provisioned, the router can now display the user ID of both SSH and Telnet protocols. In earlier releases, this feature was available only for SSH protocol. This feature introduces the following change: **CLI: aaa display-login-failed-users** . **YANG DATA Model**: New XPaths for `Cisco-IOS-XR-um-aaa-task-user-cfg` (see Github, YANG Data Models Navigator)
Multi-Tier Certificate Authority for Trustpoint Authentication	Apart from the root certificate authority (CA), you can now use a subordinate CA to issue certificates and authenticate your network devices. This feature is beneficial when you have an existing CA hierarchy where it is not the root CA but the subordinate CA that issues the leaf or router certificates. In earlier releases, you could associate only a single CA, not a multi-tier CA, to a trustpoint. And, you could use only the root CA certificate to enroll the router certificates. This feature modifies the **show crypto ca certificates** command to display the **Trusted Certificate Chain** field.

Public Key-Based Authentication of SSH Clients on Cisco IOS XR Routers	You are now assured of cryptographic strength even as you avail of automated password-less login while establishing SSH connections with the server. With the password and keyboard-interactive authentication, Cisco IOS XR routers configured as SSH clients now support public key-based authentication. In this authentication method, passwords need not be sent over the network; hence, it provides an additional layer of security and aids in automation processes. This feature is available only for users locally configured on the router; not those configured on remote servers.
	
	Previous releases supported SSH public key-based authentication only for Cisco IOS XR routers configured as SSH servers.
	
	The feature introduces these changes:
	
	• **CLI**:
	  • **crypto key generate authentication-ssh rsa**
	  • **crypto key zeroize authentication-ssh rsa**
	  • **show crypto key mypubkey authentication-ssh rsa**
	
	• **Yang Data Models**:
	  New Xpaths for:
	  • `Cisco-IOS-XR-crypto-act.yang`
	  • `Cisco-IOS-XR-crypto-cepki-new-oper.yang`
	  (see GitHub, YANG Data Models Navigator)

Feature	Description

Secure Key Integration Protocol for Cisco IOS XR Routers	We have now enabled Secure Key Integration Protocol (SKIP), a key-exchange protocol, on your routers to ensure a long-term secure MACsec. This is made possible because the SKIP protocol facilitates communication with external quantum devices, thereby enabling your routers to use Quantum Key Distribution (QKD) to create and transmit secure MACsec keys. Using QKD overcomes a critical problem in a post-quantum world where the current cryptographic systems are no longer secure due to the advent of quantum computers.
	This feature introduces these changes:
	• **CLI:**
	  • **crypto-sks-kme**
	  • **show crypto sks profile**
	• **Yang Data Model**: Cisco-IOS-XR-um-sks-server-cfg.yang (see GitHub, YANG Data Models Navigator)

System Management	
Enhanced Object Tracking for Loopback Interfaces	You can now track an object (for example, an interface) and configure to error-disable a loopback interface when the tracked object state changes. This is beneficial when the loopback interface is the source of multiple tunnels and all tunnels need to be brought down simultaneously. Earlier, you couldn't error-disable loopback interface.
PTP Class B support on A99-400GE-SE/TR and A99-10X400GE-XSE/TR	Based on the IEEE 1588-2008 standard, Precision Time Protocol (PTP) is a protocol that defines a method to synchronize clocks in a network for networked measurement and control systems. With this release, PTP Class B performance is now supported on the following platforms: • A99-400GE-SE/TR • A99-10X400GE-XSE/TR
General Administration	
Auto-Save and Copy Router Configuration Using Public Key Authentication	You can now experience passwordless authentication while automatically saving running configurations and securely copying them on the router. The feature uses public key-based authentication, a secure logging method using a secure shell (SSH), which provides increased data security. This feature offers automatic authentication and single sign-on benefits, which also aids in a secure automation process. This feature modifies **configuration commit auto-save** and **copy** command to support password-less authentication.
System Monitoring	

Feature	Description
System Log Facility and Source-address per Remote Server	You can now assign a facility number per remote syslog server, which the system inherits to calculate the priority value of the syslog messages sent. You can also configure the source address to choose the interface to send remote syslog packets per remote server. The feature introduces these changes: **CLI:** • The keywords **facility** and **source-address** per remote syslog server are introduced in the **logging** command. **YANG Data Models:** • New XPaths for `openconfig-system-logging.yang` (see GitHub, YANG Data Models Navigator)

Feature	Description
General Administration on Cisco ASR 9000 Series Routers, Cisco IOS XR Releases	
Auto-Save and Copy Router Configuration Using Public Key Authentication	You can now experience passwordless authentication while automatically saving running configurations and securely copying them on the router. The feature uses public key-based authentication, a secure logging method using a secure shell (SSH), which provides increased data security. This feature offers automatic authentication and single sign-on benefits, which also aids in a secure automation process. This feature modifies **configuration commit auto-save** and **copy** command to support password-less authentication.

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.

To get started with using data models, see the *Programmability Configuration Guide for ASR 9000 Series Routers*.

Feature	Description
Programmability	
Cisco-IOS-XR-accounting-cfg	We have introduced this Cisco native data model to enable the router to record the amount of data transmitted between every pair of network routers using the SRv6 locator counter.
Cisco-IOS-XR-fib-common-oper	We have modified this Cisco native data model to view SRv6 locator counters.

Feature	Description
Cisco-IOS-XR-segment-routing-ms-cfg	We have modified this Cisco native data mode for you to define the SRv6 policies and segment list.
Cisco-IOS-XR-crypto-act.yang	The following new leaves are added to this Cisco native data model to enable public key-based authentication of users on Cisco IOS XR routers that are configured as SSH clients: • `key-generate-authentication-ssh-rsa-keys` • `key-zeroize-authentication-ssh-rsa`
Cisco-IOS-XR-crypto-cepki-new-oper.yang	A new container, `auth-ssh-keys`, is added to this Cisco native data model to display the details of SSH RSA cryptographic keys that are used for public key-based authentication of users on Cisco IOS XR routers that are configured as SSH clients.
Cisco-IOS-XR-um-hw-module-l3-cfg.yang	The `Cisco-IOS-XR-um-hw-module-l3-cfg.yang` unified data model is enhanced with a new leaf, `per-prefix-egress-stats`, to configure per-prefix traffic statistics collection for MPLS egress traffic.
Cisco-IOS-XR-l2vpn-cfg.yang	This Cisco native data model is enhanced to support EVPN port-active with hot standby on bundle interfaces.
Cisco-IOS-XR-um-aaa-task-user-cfg	A new container, `display-login-failed-users`, is added to this Cisco unified data model to display username of the users who tried to log in to the router using invalid credentials, in the system logs.
openconfig-ospfv2.yang Version 0.4.0	The OpenConfig data model is introduced as part of the openconfig-network-instance.yang data model to configure OSPF functionalities, such as multiple processes, areas, and interfaces. Event-driven telemetry and Model-driven telemetry are not supported.

Feature	Description
openconfig-bgp-neighbor.yang Version 9.1.0	With this release, the OpenConfig data model introduces the following changes: • The datatype of the timer related leaves in the OpenConfig data model, such as`hold-time, keep-alive-interval, minimum-advertisement-interval, stale-routes-time, negotiated-hold-time` are changed. It is changed from `decimal64` to `uint16`. • The new leaf `restart-time` under Neighbor and Peer-group reflects the time interval (in sec) after which the BGP session is re-established. • Introduces the enable or disable capability of `graceful-restart` under Neighbor and Peer-group. • Supports independent configuration of the two leaves: `keepalive and hold-time`. • The new leaf `allow-multiple-as` under `global/use-multiple-paths/ebgp/config/`, enables the BGP to choose a path from different neighbouring as multipath. The hop count of the AS-path must match the hop count of the bestpath. You can now program routes with different AS-paths into the forwarding table as equal cost multipath routes. Earlier, for ECMP paths to be eligible, their AS-paths must exactly match the bestpath. • The new leaf `treat-as-withdraw` avoids the session reset when a BGP session encounters errors during parsing of received update message. The leaf discards the incoming update message as a withdraw message and ensures the subsequent actions are done. Event-driven telemetry and Model-driven telemetry are supported.

Feature	Description
openconfig-system-logging.yang Version 0.3.1	The OpenConfig data model defines configurations for common logging facilities on network systems. The model is updated with the following XPaths: openconfig-system/logging/ • console/selectors/selector/facility: to configure the facility parameter for console logging of all supported facilities. • remote-servers/remote-server/selectors/selector/facility: to configure the desired facility per remote syslog server. • remote-servers/remote-server/config/source-address: to configure the desired source-address per remote syslog server. You can use the configured facility to calculate the priority field of the remote syslog packet and use the configured source-address to choose the interface to send remote syslog packets. Model-driven telemetry and Event-driven telemetry is not applicable.

Feature	Description

openconfig-sampling-sflow.yang Version 1.1.0	The OpenConfig data model defines the sampling mechanisms implemented in an sFlow agent for monitoring traffic. This data model augments the openconfig-sampling.yang model. The model is revised from version 0.1.0 to 1.0.0 with the following XPaths:
	• `openconfig-sampling-sflow:sampling/sflow/config/`
	  • `agent-id-ipv4` and `agent-id-ipv6`: to configure the agent identifier (ID) with IPv4 or IPv6 address for all collectors. These XPaths are not mandatory. If they are not configured, then the router picks the `source-address` as the agent ID.
	  • `polling-interval`: to configure an interface counter polling-interval for all sFlow enabled interfaces.
	  • `ingress-sampling-rate` and `egress-sampling-rate`: to set the ingress and egress packet sampling rate respectively.
	  • `dscp`: DSCP marking of sFlow export packets generated by the sFlow subsystem on the network device.
	• `openconfig-sampling-sflow:sampling/sflow/collectors/collector/config/`
	  • `source-address`: to set the source IPv4 or IPv6 address for sFlow datagrams sent to sFlow collectors. In this release, the XPath is moved from the `config` container to `collectors` container. Upon configuration, the flow exporter-map associated with this collector gets the `source-address` configuration. Earlier, by default, the sFlow agent ID had the source address of the sFlow export packet.
	• `openconfig-sampling-sflow:sampling/sflow//interfaces/interface/config/`
	  • `ingress-sampling-rate` and `egress-sampling-rate`: to set the ingress and egress packet sampling rate respectively. In the absence of ingress sampling rate configuration at the interface level, the global `ingress-sampling-rate` will be used. For egress sampling on the interface, `egress-sampling-rate` must be used.
	Model-driven telemetry is supported.

Feature	Description
openconfig-telemetry.yang Version 0.5.1	The OpenConfig data model is revised from version 0.2.0 to 0.5.1 to support the two leaves encoding and protocol. This allows the selection of the transport protocol for the telemetry stream and the selection of specific encoding for telemetry messages to and from the network element. You can now get the leaf data using Netconf or gNMI requests from the router. Event-driven telemetry and Model-driven telemetry are supported.
openconfig-aft.yang Version 0.6.0	The Abstract Forwarding Table (AFT) OpenConfig data model is enhanced to stream telemetry data for conditional next-hop groups (CNHG) to provide DSCP information per prefix and list of input interfaces. This model helps to monitor the DSCP-based policy routing configuration at the forwarding layer. The Abstract Forwarding Table (AFT) OpenConfig data model is enhanced to support the following features: • The gRPC Network Management Interface (gNMI) proto is revised from version 0.7.0 to 0.8.0 to set the atomic flag to send AFT next-hop group notifications in JSON and PROTO encodings using gNMI subscribe RPC. Network events can be represented as multiple updates in the data models. The atomic flag allows NMS to interpret those multiple updates as a single event. • The nodes next-hop-group/state and next hops/next-hop defines a list of next-hop addresses and a tunnel type for packets that match the specified criteria. Model-driven telemetry and Event-driven telemetry are supported.
Cisco-IOS-XR-infra-xtc-agent-cfg.yang	This Cisco native data model is used for gathering statistics on reporting of SR-Traffic Engineering (TE) policies using BGP-Link State (LS).
Cisco-IOS-XR-um-multicast-routing-cfg	This Cisco unified data model is enhanced with a new leaf, `dynamic-ssm-translation`, to configure Dynamic Source-Specific Multicast (SSM) Translation.
Cisco-IOS-XR-um-router-pim-cfg	This Cisco unified data model is enhanced with a new leaf, `shared-tree-prune`, to prune shared-tree based on the Source Active Routes received.

Feature	Description
openconfig-system-grpc.yang Version 1.0.0	The OpenConfig data model is revised from version 0.1.1 to 1.0.0. This version enables the gRPC server to listen on any IP address bound to an interface and port of the system or listen for any specific list of IP addresses. The maximum number of supported IP addresses are 32, which may be IPv4 or IPv6, or both. Earlier, the gRPC server had the listen functionality for any IP address on the gRPC port but not to a specific list of listen addresses. Event-driven telemetry and Model-driven telemetry are supported.

Deprecated features

Starting with Cisco IOS XR release 7.10.1, the performance-measurement **{delay-profile | liveness-profile} {sr-policy | endpoint | interface} name** *name* CLI is deprecated. Old configurations stored in NVRAM will be rejected at boot-up. As a result, performance measurement delay and liveness named profiles using the old CLI must be re-configured using the **performance-measurement {delay-profile | liveness-profile} name** *name* CLI.

Note The default performance measurement delay and liveness profiles configured using the **performance-measurement { delay-profile | liveness-profile} { sr-policy | endpoint | interface} default** commands are still valid and unaffected.

For more information, see *CLI Changes for Segment Routing Performance Measurement* section under the *Link Delay Measurement* topic in *Segment Routing Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR Release 7.10.x*.

Caveats

Table 1: Cisco ASR 9000 Series Router Specific Bugs

Bug ID	Headline
CSCwf89722	EVPN VPWS down post migrating from Multi-homing to Single-Homing.
CSCwf81475	Netflow IPv6: The record-ipv6 reports incorrect interfaces with outbundlemember or outphysint options
CSCwf12282	Interfaces statistics are getting delayed for few seconds.

Behavior Changes

Starting with Cisco IOS XR Software Release 7.10.1, you must configure a name server for Smart Licensing deployment options that use HTTPS for communication with Cisco Smart Software Manager (CSSM). If the system cannot validate that the Common Name (CN) in the X.509 server certificate is a Fully Qualified Domain Name (FQDN), communication with CSSM results in an

Error during SSL communication. See the *Smart Licensing Chapter* in the *System Management Configuration Guide for ASR 9000 Series Routers* for more information and options to bypass the name server configuration.

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

Table 2: Cisco IOS XR 64 bit Software Release 7.10.1 TAR Files

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software [for RSP and RP systems]	ASR9K-x64-iosxr-px-7.10.1.tar	• Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR MPLS -TE and RSVP Package • Cisco IOS XR Multicast Package • Cisco IOS XR Optics Package • Cisco IOS XR BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Satellite Package • Cisco IOS XR EIGRP Package • Cisco IOS XR ISIS Package • Cisco IOS XR OSPF Package • Cisco IOS XR Service Package

Feature Set	Filename	Description
Cisco IOS XR IP/MPLS Core Software 3DES [for RSP and RP systems]	ASR9K-x64-iosxr-px-k9-7.10.1.tar	• Cisco IOS XR Manageability Package • Cisco IOS XR MPLS Package • Cisco IOS XR MPLS -TE and RSVP Package • Cisco IOS XR Multicast Package • Cisco IOS XR Optics Package • Cisco IOS XR BNG Package • Cisco IOS XR Lawful Intercept Package • Cisco IOS XR Satellite Package • Cisco IOS XR Security Package • Cisco IOS XR EIGRP Package • Cisco IOS XR ISIS Package • Cisco IOS XR OSPF Package • Cisco IOS XR Service Package
Cisco IOS XR IP Unicast Routing Core Bundle and Migration to IOS XR 64 bit tar image	asr9k-mini-x64-migrate_to_eXR.tar-7.10.1	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 7.10.1 and additional software for migration to 64 bit.

Table 3: Cisco IOS XR 64 bit Software Release 7.10.1 ISO and RPM Files

Composite Package		
Feature Set	**Filename**	**Description**
Cisco IOS XR IP Unicast Routing Core Bundle	asr9k-mini-x64-7.10.1.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-r7101.x86_64.rpm	Includes EIGRP protocol support software
Cisco IOS XR BNG Package	asr9k-bng-x64-1.1.0.0-r7101.x86_64.rpm	Includes binaries to support BNG features.
Cisco IOS XR 64 bit ISIS package	asr9k-isis-x64-1.1.0.0-r710.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-r710.x86_64.rpm	Includes OSPF link state protocol support software
Cisco IOS XR Manageability Package	asr9k-mgbl-x64-3.0.0.0-r7101.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-r7101.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-r7101.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-r7101.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-r7101.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-r7101.x86_64.rpm	Includes LI software images.
Cisco IOS XR Security Package	asr9k-k9sec-x64-3.1.0.0-r7101.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-r7101.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-r7101.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 7.10.1 consist of the following:

- 32 GB memory on the A99-RP-F
- 16 GB memory on the RSP880, RSP880-LT, RP2, A99-RSP-TR and A99-RSP-SE
- 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 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 : 7.10.1-7101

    Active Packages: 18
        asr9k-xr-7.10.1 version=7.10.1 [Boot image]
        asr9k-9000v-nV-x64-1.0.0.0-r7101
        asr9k-m2m-x64-1.0.0.0-r7101
        asr9k-bng-x64-1.0.0.0-r7101
        asr9k-bng-ipoe-x64-1.0.0.0-r7101
        asr9k-bng-pppoe-x64-1.0.0.0-r7101
        asr9k-eigrp-x64-1.0.0.0-r7101
        asr9k-isis-x64-1.0.0.0-r7101
        asr9k-mcast-x64-1.0.0.0-r7101
        asr9k-mgbl-x64-1.0.0.0-r7101
        asr9k-mpls-x64-1.0.0.0-r7101
        asr9k-ospf-x64-1.0.0.0-r7101
        asr9k-services-x64-1.0.0.0-r7101
        asr9k-optic-x64-1.0.0.0-r7101
        asr9k-bng-supp-x64-1.0.0.0-r7101
        asr9k-li-x64-1.0.0.0-r7101
        asr9k-k9sec-x64-1.0.0.0-r7101
        asr9k-mpls-te-rsvp-x64-1.0.0.0-r7101
```

Firmware Support on Cisco IOS XR 64-bit

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

Note

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

```
(sysadmin-vm)#show fpd package
================================================================================
                  Field Programmable Device Package
          ================================================
                                          Req     SW        Min Req     Min Req
Card Type            FPD Description      Reload  Ver       SW Ver    Board Ver
==================== ==================== ======  =======  ==========  =========
A99-10X400GE-X-CM    Aldrin-FPGA          YES      1.05       1.05      0.0
                     Beachcomber-0        YES      0.01       0.01      0.0
                     Beachcomber-1        YES      0.01       0.01      0.0
                     CBC                  NO      62.05      62.05      0.0
                     IPU-DDR4             YES      1.06       1.06      0.0
                     Primary-BIOS         YES     25.30      25.30      0.0
                     Sunstreaker          YES      0.14       0.14      0.0
                     TAMFW-Sunstreaker    YES      2.65       2.65      0.0
                     Trailbreaker-0       YES      0.24       0.24      0.0
                     Trailbreaker-1       YES      0.24       0.24      0.0
--------------------------------------------------------------------------------
A99-10X400GE-X-SE    Aldrin-FPGA          YES      1.05       1.05      0.0
                     Beachcomber-0        YES      0.01       0.01      0.0
                     Beachcomber-1        YES      0.01       0.01      0.0
                     CBC                  NO      62.05      62.05      0.0
                     IPU-DDR4             YES      1.06       1.06      0.0
                     Primary-BIOS         YES     25.30      25.30      0.0
                     Sunstreaker          YES      0.14       0.14      0.0
                     TAMFW-Sunstreaker    YES      2.65       2.65      0.0
                     Trailbreaker-0       YES      0.24       0.24      0.0
                     Trailbreaker-1       YES      0.24       0.24      0.0
--------------------------------------------------------------------------------
A99-10X400GE-X-TR    Aldrin-FPGA          YES      1.05       1.05      0.0
                     Beachcomber-0        YES      0.01       0.01      0.0
                     Beachcomber-1        YES      0.01       0.01      0.0
                     CBC                  NO      62.05      62.05      0.0
                     IPU-DDR4             YES      1.06       1.06      0.0
                     Primary-BIOS         YES     25.30      25.30      0.0
                     Sunstreaker          YES      0.14       0.14      0.0
                     TAMFW-Sunstreaker    YES      2.65       2.65      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	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-24HG-FLEX-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	57.04	57.04	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	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    25.30      25.30      0.0
                     Skylynx-0                 YES     0.12       0.12      0.0
                     Skylynx-1                 YES     0.12       0.12      0.0
                     Sunstreaker               YES     0.14       0.14      0.0
                     TAMFW-Sunstreaker         YES     2.65       2.65      0.0
-------------------------------------------------------------------------------
A99-24X10GE-1G-CM    CBC                       NO     47.03      47.03      0.1
                     IPU-FPGA                  YES     1.90       1.90      0.1
                     IPU-FSBL                  YES     1.113      1.113     0.1
                     IPU-Linux                 YES     1.113      1.113     0.1
                     Leadfoot-0                YES     1.00       1.00      0.1
                     Lewis                     YES     1.11       1.11      0.1
                     Primary-BIOS              YES    18.33      18.33      0.1
-------------------------------------------------------------------------------
A99-24X10GE-1G-SE    CBC                       NO     47.03      47.03      0.1
                     IPU-FPGA                  YES     1.90       1.90      0.1
                     IPU-FSBL                  YES     1.113      1.113     0.1
                     IPU-Linux                 YES     1.113      1.113     0.1
                     Leadfoot-0                YES     1.00       1.00      0.1
                     Lewis                     YES     1.11       1.11      0.1
                     Primary-BIOS              YES    18.33      18.33      0.1
-------------------------------------------------------------------------------
A99-24X10GE-1G-TR    CBC                       NO     47.03      47.03      0.1
                     IPU-FPGA                  YES     1.90       1.90      0.1
                     IPU-FSBL                  YES     1.113      1.113     0.1
                     IPU-Linux                 YES     1.113      1.113     0.1
                     Leadfoot-0                YES     1.00       1.00      0.1
                     Lewis                     YES     1.11       1.11      0.1
                     Primary-BIOS              YES    18.33      18.33      0.1
-------------------------------------------------------------------------------
A99-32X100GE-CM      Aldrin-FPGA               YES     1.05       1.05      0.0
                     CBC                       NO     48.09      48.09      0.0
                     Grapple-0                 YES     0.15       0.15      0.0
                     Grapple-1                 YES     0.15       0.15      0.0
                     IPU-DDR4                  YES     1.09       1.09      0.0
                     Mixmaster-0               YES     0.13       0.13      0.0
                     Mixmaster-1               YES     0.13       0.13      0.0
                     Primary-BIOS              YES    21.43      21.43      0.0
                     Scamper                   YES     0.23       0.23      0.0
                     Skylynx-0                 YES     0.12       0.12      0.0
                     Skylynx-1                 YES     0.12       0.12      0.0
-------------------------------------------------------------------------------
A99-32X100GE-DENS    Aldrin-FPGA               YES     1.05       1.05      0.0
                     CBC                       NO     57.04      57.04      0.0
                     Grapple-0                 YES     0.12       0.12      0.0
                     Grapple-1                 YES     0.12       0.12      0.0
                     IPU-DDR4                  YES     1.08       1.08      0.0
                     Mixmaster-0               YES     0.13       0.13      0.0
                     Mixmaster-1               YES     0.13       0.13      0.0
                     Primary-BIOS              YES    25.30      25.30      0.0
                     Skylynx-0                 YES     0.08       0.08      0.0
                     Skylynx-1                 YES     0.08       0.08      0.0
                     Sunstreaker               YES     0.14       0.14      0.0
                     TAMFW-Sunstreaker         YES     2.65       2.65      0.0
-------------------------------------------------------------------------------
A99-32X100GE-SE      Aldrin-FPGA               YES     1.05       1.05      0.0
```

	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
A99-32X100GE-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
A99-32X100GE-X-CM	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	57.04	57.04	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-32X100GE-X-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	57.04	57.04	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-32X100GE-X-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	57.04	57.04	0.0
	Grapple-0	YES	0.15	0.15	0.0
	Grapple-1	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Mixmaster-1	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Skylynx-1	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-48X10GE-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
A99-48X10GE-1G-SE	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Leadfoot-1	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A99-48X10GE-1G-TR	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Leadfoot-1	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A99-4HG-FLEX-FC	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-4HG-FLEX-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A99-4HG-FLEX-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	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
-----------------------------------------------------------------------------------
A99-8X100GE-SE       CBC                         NO     38.23        38.23       0.0
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                    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
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	Lionheart-FPGA	YES	0.30	0.30	0.0
	Longshot	YES	2.16	2.16	0.0
	Primary-BIOS	YES	33.30	33.30	0.0
	TamFW-Longshot	YES	2.65	2.65	0.0
	Wolfpack-FPGA	YES	0.19	0.19	0.0
A99-RP2-SE	Alpha-FPGA	YES	0.16	0.16	0.0
	CBC-0	NO	35.14	35.14	0.0
	CBC-1	NO	35.14	35.14	0.0
	Cha-FPGA	YES	0.09	0.09	0.0
	IPU-FPGA	YES	0.72	0.72	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Omega-FPGA	YES	0.20	0.20	0.0
	Optimus-FPGA	YES	0.12	0.12	0.0
	Primary-BIOS	YES	14.39	14.39	0.0
A99-RP2-TR	Alpha-FPGA	YES	0.16	0.16	0.0
	CBC-0	NO	35.14	35.14	0.0
	CBC-1	NO	35.14	35.14	0.0
	Cha-FPGA	YES	0.09	0.09	0.0
	IPU-FPGA	YES	0.72	0.72	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Omega-FPGA	YES	0.20	0.20	0.0
	Optimus-FPGA	YES	0.12	0.12	0.0
	Primary-BIOS	YES	14.39	14.39	0.0
A99-RP3-SE	Aldrin-0-FPGA	YES	1.03	1.03	0.0
	Aldrin-1-FPGA	YES	1.00	1.00	0.0
	Beta-FPGA	YES	0.07	0.07	0.0
	CBC-0	NO	51.12	51.12	0.0
	CBC-1	NO	51.12	51.12	0.0
	IPU-DDR4	YES	0.20	0.20	0.0
	Orion-FPGA	YES	0.23	0.23	0.0
	Primary-BIOS	YES	30.36	30.36	0.0
	Zenith-FPGA	YES	0.12	0.12	0.0
A99-RP3-TR	Aldrin-0-FPGA	YES	1.03	1.03	0.0
	Aldrin-1-FPGA	YES	1.00	1.00	0.0
	Beta-FPGA	YES	0.07	0.07	0.0
	CBC-0	NO	51.12	51.12	0.0
	CBC-1	NO	51.12	51.12	0.0
	IPU-DDR4	YES	0.20	0.20	0.0
	Orion-FPGA	YES	0.23	0.23	0.0
	Primary-BIOS	YES	30.36	30.36	0.0
	Zenith-FPGA	YES	0.12	0.12	0.0
A99-RP3-X-SE	Aldrin-0-FPGA	YES	1.00	1.00	0.0
	Aldrin-1-FPGA	YES	32.00	32.00	0.0
	Beta-FPGA	YES	2.02	2.02	0.0
	CBC-0	NO	12.04	12.04	0.0
	CBC-1	NO	51.12	51.12	0.0
	IPU-DDR4	YES	3.03	3.03	0.0
	Orion-FPGA	YES	2.03	2.03	0.0
	Primary-BIOS	YES	35.03	35.03	0.0
	Sigma	YES	3.33	3.33	0.0
	TamFW-Sigma	YES	2.07	2.07	0.0
	Zenith-FPGA	YES	2.07	2.07	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	3.03	3.03	0.0
	Orion-FPGA	YES	2.03	2.03	0.0
	Primary-BIOS	YES	35.03	35.03	0.0
	Sigma	YES	3.33	3.33	0.0
	TamFW-Sigma	YES	2.07	2.07	0.0
	Zenith-FPGA	YES	2.07	2.07	0.0
A99-RSP-SE	Alpha-FPGA	YES	0.16	0.16	0.0
	CBC	NO	43.03	43.03	0.0
	Cha-FPGA	YES	0.09	0.09	0.0
	IPU-FPGA	YES	0.72	0.72	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Omega-FPGA	YES	0.20	0.20	0.0
	Optimus-FPGA	YES	0.12	0.12	0.0
	Primary-BIOS	YES	16.18	16.18	0.0
A99-RSP-TR	Alpha-FPGA	YES	0.16	0.16	0.0
	CBC	NO	43.03	43.03	0.0
	Cha-FPGA	YES	0.09	0.09	0.0
	IPU-FPGA	YES	0.72	0.72	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Omega-FPGA	YES	0.20	0.20	0.0
	Optimus-FPGA	YES	0.12	0.12	0.0
	Primary-BIOS	YES	16.18	16.18	0.0
A99-SFC-S	CBC	NO	44.02	44.02	0.0
	IPU-FPGA	YES	0.37	0.37	0.0
	IPU-FSBL	YES	1.100	1.100	0.0
	IPU-Linux	YES	1.100	1.100	0.0
A99-SFC-T	CBC	NO	44.02	44.02	0.0
	IPU-FPGA	YES	0.37	0.37	0.0
	IPU-FSBL	YES	1.100	1.100	0.0
	IPU-Linux	YES	1.100	1.100	0.0
A99-SFC2	CBC	NO	37.20	37.20	0.0
	IPU-FPGA	YES	0.37	0.37	0.0
	IPU-FSBL	YES	1.100	1.100	0.0
	IPU-Linux	YES	1.100	1.100	0.0
A99-SFC3	CBC	NO	49.03	49.03	0.0
	IPU-DDR4	YES	0.25	0.25	0.0
A99-SFC3-S	CBC	NO	44.02	44.02	0.0
	IPU-DDR4	YES	0.25	0.25	0.0
A99-SFC3-T	CBC	NO	44.02	44.02	0.0
	IPU-DDR4	YES	0.25	0.25	0.0
A99L-4X100GE-SE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A99L-4X100GE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0

	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A99L-4X100GE-TR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A99L-8X100GE-SE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A99L-8X100GE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A99L-8X100GE-TR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-1600W-AC	PO-PriMCU	NO	17.137	17.137	0.0
A9K-1600W-DC	PO-PriMCU	NO	1.09	1.09	0.0
A9K-16X100GE-CM	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-16X100GE-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0

```
A9K-16X100GE-TR      Aldrin-FPGA              YES     1.05        1.05       0.0
                     CBC                      NO     48.09       48.09       0.0
                     Grapple-0                YES     0.15        0.15       0.0
                     IPU-DDR4                 YES     1.09        1.09       0.0
                     Mixmaster-0              YES     0.13        0.13       0.0
                     Primary-BIOS             YES    21.43       21.43       0.0
                     Scamper                  YES     0.23        0.23       0.0
                     Skylynx-0                YES     0.12        0.12       0.0
-------------------------------------------------------------------------------
A9K-16X100GE-TR      Aldrin-FPGA              YES     1.05        1.05       0.0
                     CBC                      NO     48.09       48.09       0.0
                     Grapple-0                YES     0.15        0.15       0.0
                     IPU-DDR4                 YES     1.09        1.09       0.0
                     Mixmaster-0              YES     0.13        0.13       0.0
                     Primary-BIOS             YES    21.43       21.43       0.0
                     Scamper                  YES     0.23        0.23       0.0
                     Skylynx-0                YES     0.12        0.12       0.0
-------------------------------------------------------------------------------
A9K-20HG-FLEX-CM     Aldrin-FPGA              YES     1.05        1.05       0.0
                     CBC                      NO     58.09       58.09       0.0
                     IPU-DDR4                 YES     1.18        1.18       0.0
                     Primary-BIOS             YES    25.30       25.30       0.0
                     Sunstreaker              YES     0.14        0.14       0.0
                     TAMFW-Sunstreaker        YES     2.65        2.65       0.0
                     Trailbreaker-0           YES     0.24        0.24       0.0
                     Trailbreaker-1           YES     0.24        0.24       0.0
                     Windcharger-0            YES     0.08        0.08       0.0
                     Windcharger-1            YES     0.08        0.08       0.0
-------------------------------------------------------------------------------
A9K-20HG-FLEX-SE     Aldrin-FPGA              YES     1.05        1.05       0.0
                     CBC                      NO     58.09       58.09       0.0
                     IPU-DDR4                 YES     1.18        1.18       0.0
                     Primary-BIOS             YES    25.30       25.30       0.0
                     Sunstreaker              YES     0.14        0.14       0.0
                     TAMFW-Sunstreaker        YES     2.65        2.65       0.0
                     Trailbreaker-0           YES     0.24        0.24       0.0
                     Trailbreaker-1           YES     0.24        0.24       0.0
                     Windcharger-0            YES     0.08        0.08       0.0
                     Windcharger-1            YES     0.08        0.08       0.0
-------------------------------------------------------------------------------
A9K-20HG-FLEX-TR     Aldrin-FPGA              YES     1.05        1.05       0.0
                     CBC                      NO     58.09       58.09       0.0
                     IPU-DDR4                 YES     1.18        1.18       0.0
                     Primary-BIOS             YES    25.30       25.30       0.0
                     Sunstreaker              YES     0.14        0.14       0.0
                     TAMFW-Sunstreaker        YES     2.65        2.65       0.0
                     Trailbreaker-0           YES     0.24        0.24       0.0
                     Trailbreaker-1           YES     0.24        0.24       0.0
                     Windcharger-0            YES     0.08        0.08       0.0
                     Windcharger-1            YES     0.08        0.08       0.0
-------------------------------------------------------------------------------
A9K-24X10GE-1G-CM    CBC                      NO     47.03       47.03       0.1
                     IPU-FPGA                 YES     1.90        1.90       0.1
                     IPU-FSBL                 YES     1.113       1.113      0.1
                     IPU-Linux                YES     1.113       1.113      0.1
                     Leadfoot-0               YES     1.00        1.00       0.1
                     Lewis                    YES     1.11        1.11       0.1
                     Primary-BIOS             YES    18.33       18.33       0.1
-------------------------------------------------------------------------------
A9K-24X10GE-1G-SE    CBC                      NO     47.03       47.03       0.1
                     IPU-FPGA                 YES     1.90        1.90       0.1
                     IPU-FSBL                 YES     1.113       1.113      0.1
                     IPU-Linux                YES     1.113       1.113      0.1
                     Leadfoot-0               YES     1.00        1.00       0.1
```

	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A9K-24X10GE-1G-TR	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A9K-400G-DWDM-TR	CBC	NO	42.04	42.04	0.0
	Doran	YES	1.05	1.05	0.0
	Frenzy	YES	49.00	49.00	0.0
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Martell	YES	1.03	1.03	0.0
	Meldun	YES	1.07	1.07	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-400GE-LSP	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-48X10GE-1G-CM	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Leadfoot-1	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A9K-48X10GE-1G-SE	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Leadfoot-1	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A9K-48X10GE-1G-TR	CBC	NO	47.03	47.03	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Leadfoot-0	YES	1.00	1.00	0.1
	Leadfoot-1	YES	1.00	1.00	0.1
	Lewis	YES	1.11	1.11	0.1
	Primary-BIOS	YES	18.33	18.33	0.1
A9K-4HG-FLEX-FC	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0

	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-4HG-FLEX-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-4HG-FLEX-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	63.03	63.03	0.0
	IPU-DDR4	YES	1.05	1.05	0.0
	Moonracer	YES	0.14	0.14	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-4X100GE	CBC	NO	46.06	46.06	0.1
	IPU-FPGA	YES	1.90	1.90	0.1
	IPU-FSBL	YES	1.113	1.113	0.1
	IPU-Linux	YES	1.113	1.113	0.1
	Morra-0	YES	1.05	1.05	0.1
	Primary-BIOS	YES	9.33	9.33	0.1
	Sideswipe-0	YES	1.02	1.02	0.1
A9K-4X100GE-SE	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-SE	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-SE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0

	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-TR	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-TR	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-TR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-4X100GE-TR-V2	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-8HG-FLEX-CM	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
	Trailbreaker-0	YES	0.24	0.24	0.0
	Windcharger-0	YES	0.08	0.08	0.0
A9K-8HG-FLEX-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
	Trailbreaker-0	YES	0.24	0.24	0.0
	Windcharger-0	YES	0.08	0.08	0.0
A9K-8HG-FLEX-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0

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

	Primary-BIOS	YES	8.51	8.51	0.0
A9K-8X100GE-TR	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-8X100GE-TR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-8X100GE-X-CM	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-8X100GE-X-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-8X100GE-X-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-8X100GE-X-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	48.09	48.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.09	1.09	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	21.43	21.43	0.0
	Scamper	YES	0.23	0.23	0.0
	Skylynx-0	YES	0.12	0.12	0.0
A9K-8X100GE-X2-CM	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0

	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-8X100GE-X2-SE	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-8X100GE-X2-TR	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	Grapple-0	YES	0.15	0.15	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Mixmaster-0	YES	0.13	0.13	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Skylynx-0	YES	0.12	0.12	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
A9K-8X100GELSE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-8X100GELTR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9K-MOD200-CM	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-MOD200-SE	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-MOD200-TR	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-MOD400-CM	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1

	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-MOD400-SE	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-MOD400-TR	Blaster	YES	1.27	1.27	0.1
	CBC	NO	39.09	39.09	0.1
	IPU-FPGA	YES	1.97	1.97	0.1
	IPU-FSBL	YES	1.103	1.103	0.1
	IPU-Linux	YES	1.103	1.103	0.1
	Primary-BIOS	YES	8.51	8.51	0.1
A9K-RSP5-SE	Aldrin-0-FPGA	YES	1.06	1.06	0.0
	Beta-FPGA	YES	0.07	0.07	0.0
	CBC	NO	53.10	53.10	0.0
	IPU-DDR4	YES	0.20	0.20	0.0
	Orion-FPGA	YES	0.23	0.23	0.0
	Primary-BIOS	YES	31.36	31.36	0.0
	Zenith-FPGA	YES	0.12	0.12	0.0
A9K-RSP5-TR	Aldrin-0-FPGA	YES	1.06	1.06	0.0
	Beta-FPGA	YES	0.07	0.07	0.0
	CBC	NO	53.10	53.10	0.0
	IPU-DDR4	YES	0.20	0.20	0.0
	Orion-FPGA	YES	0.23	0.23	0.0
	Primary-BIOS	YES	31.36	31.36	0.0
	Zenith-FPGA	YES	0.12	0.12	0.0
A9K-RSP5-X-SE	Aldrin-0-FPGA	YES	51.00	51.00	0.0
	Beta-FPGA	YES	2.02	2.02	0.0
	CBC	NO	14.04	14.04	0.0
	IPU-DDR4	YES	3.03	3.03	0.0
	Orion-FPGA	YES	2.03	2.03	0.0
	Primary-BIOS	YES	35.03	35.03	0.0
	Sigma	YES	3.33	3.33	0.0
	TamFW-Sigma	YES	2.07	2.07	0.0
	Zenith-FPGA	YES	2.07	2.07	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	3.03	3.03	0.0
	Orion-FPGA	YES	2.03	2.03	0.0
	Primary-BIOS	YES	35.03	35.03	0.0
	Sigma	YES	3.33	3.33	0.0
	TamFW-Sigma	YES	2.07	2.07	0.0
	Zenith-FPGA	YES	2.07	2.07	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

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	34.39	34.39	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	34.39	34.39	0.0
	Cha-FPGA	YES	0.09	0.09	0.0
	IPU-FPGA	YES	0.72	0.72	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Omega-FPGA	YES	0.20	0.20	0.0
	Optimus-FPGA	YES	0.12	0.12	0.0
	Primary-BIOS	YES	10.69	10.69	0.0
A9K-TEST_LSQ_DX1	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	58.09	58.09	0.0
	IPU-DDR4	YES	1.18	1.18	0.0
	Primary-BIOS	YES	25.30	25.30	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
	Trailbreaker-0	YES	0.24	0.24	0.0
	Windcharger-0	YES	0.08	0.08	0.0
A9KL-4X100GE-SE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9KL-4X100GE-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0
	Primary-BIOS	YES	8.51	8.51	0.0
A9KL-4X100GE-TR-TAA	CBC	NO	38.23	38.23	0.0
	Dalla	YES	1.09	1.09	0.0
	IPU-FPGA	YES	1.99	1.99	0.0
	IPU-FSBL	YES	1.113	1.113	0.0
	IPU-Linux	YES	1.113	1.113	0.0
	Meldun-0	YES	1.07	1.07	0.0
	Meldun-1	YES	1.07	1.07	0.0

	Primary-BIOS	YES	8.51	8.51	0.0
ASR-9006-AC	CBC	NO	7.105	7.105	0.0
ASR-9006-AC-V2	CBC	NO	7.105	7.105	0.0
ASR-9006-FAN	CBC	NO	5.04	5.04	0.0
ASR-9006-FAN-V2	CBC	NO	5.05	5.05	0.0
ASR-9010-AC	CBC	NO	7.105	7.105	0.0
ASR-9010-AC-V2	CBC	NO	7.105	7.105	0.0
ASR-9010-FAN	CBC	NO	4.03	4.03	0.0
ASR-9010-FAN-V2	CBC	NO	29.12	29.12	0.0
ASR-9901-LC	CBC	NO	55.07	55.07	0.1
	Gamora-FPGA	YES	0.36	0.36	0.1
	IPU-FPGA	YES	1.10	1.10	0.1
	IPU-FSBL	YES	1.104	1.104	0.1
	IPU-Linux	YES	1.104	1.104	0.1
	Primary-BIOS	YES	23.22	23.22	0.1
ASR-9901-RP	CBC	NO	54.11	54.11	0.1
	Drax-FPGA	YES	0.38	0.38	0.1
	IPU-FPGA	YES	2.05	2.05	0.1
	IPU-FSBL	YES	1.104	1.104	0.1
	IPU-Linux	YES	1.104	1.104	0.1
	Primary-BIOS	YES	22.26	22.26	0.1
ASR-9902	FAN-CBC	NO	61.25	61.25	0.0
ASR-9902-LC	Aldrin-FPGA	YES	1.05	1.05	0.0
	CBC	NO	17.03	17.03	0.0
	Chromia	YES	0.14	0.14	0.0
	IPU-DDR4	YES	1.17	1.17	0.0
	Primary-BIOS	YES	34.30	34.30	0.0
	Skywarp-0	YES	0.11	0.11	0.0
	Skywarp-1	YES	0.11	0.11	0.0
	Sunstreaker	YES	0.15	0.15	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	0.0
ASR-9903	FAN-CBC	NO	61.25	61.25	0.0
ASR-9903-LC	Aldrin-0-FPGA	YES	1.05	1.05	0.0
	CBC	NO	60.12	60.12	0.0
	Harpoon-0	YES	0.11	0.11	0.0
	Harpoon-1	YES	0.11	0.11	0.0
	IPU-DDR4	YES	1.25	1.25	0.0
	Metalmaster-0	YES	0.02	0.02	0.0
	Metalmaster-1	YES	0.02	0.02	0.0
	Primary-BIOS	YES	34.30	34.30	0.0
	Scattershot	YES	0.14	0.14	0.0
	Sunstreaker	YES	0.14	0.14	0.0
	Supernaut	YES	0.14	0.14	0.0
	TAMFW-Sunstreaker	YES	2.65	2.65	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      3.00        3.00       0.1
                     QCS-SecMCU                NO      4.01        4.01       0.1
-------------------------------------------------------------------------------
PWR-1.6KW-DC         PriMCU                    NO      1.03        1.03       0.0
-------------------------------------------------------------------------------
PWR-2KW-DC-V2        DT-PriMCU                 NO      6.03        6.03       0.12
                     DT-Sec54vMCU              NO      6.02        6.02       0.12
                     DT-Sec5vMCU               NO      6.03        6.03       0.12
                     EM-PriMCU                 NO      3.13        3.13       0.12
                     EM-Sec54vMCU              NO      3.21        3.21       0.12
                     EM-Sec5vMCU               NO      3.20        3.20       0.12
-------------------------------------------------------------------------------
PWR-3KW-AC-V2        DT-PriMCU                 NO      6.02        6.02       1.0
                     DT-Sec54vMCU              NO      6.02        6.02       1.0
                     DT-Sec5vMCU               NO      6.04        6.04       1.0
                     EM-Sec54vMCU              NO      3.12        3.12       0.21
                     EM-Sec5vMCU               NO      3.18        3.18       0.21
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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-LT-SE	Cisco ASR 9000 Series Aggregation Services Router RSP880-Lite, Service Edge Optimized	Release 6.4.1
A9K-RSP880-LT-TR	Cisco ASR 9000 Series Aggregation Services Router RSP880-Lite, Packet Transport Optimized	Release 6.4.1
A99-RSP-SE	Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Service Edge Optimized for ASR 9910 from Release 6.0.1.	Release 6.2.1
A99-RSP-TR	Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Packet Transport Optimized for ASR 9910 from Release 6.0.1.	Release 6.2.1
A99-RSP-SE	Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Service Edge Optimized for ASR 9906 from Release 6.3.1.	Release 6.3.1
A99-RSP-TR	Cisco ASR 9000 Series Aggregation Services Router RSP4-S, Packet Transport Optimized for ASR 9906 supported from Release 6.3.1	Release 6.3.1
A9K-RSP880-SE	ASR9K Route Switch Processor with 880G/slot and 32 GB for Service Edge	Release 6.1.2
A9K-RSP880-TR	ASR9K Route Switch Processor with 880G/slot and 16 GB for Packet Transport	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

A99-RP2-SE	ASR Route Processor 32 GB for Service Edge	Release 6.1.2
A99-RP2-TR	ASR Route Processor 16 GB for Packet Transport	Release 6.1.2
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
A99-SFC2	Cisco ASR 9000 Fabric Card	Release 6.1.2
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

A99-SFC2	Cisco ASR 9000 Fabric Card	Release 6.1.2
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-FAN-V2	Cisco ASR 9000 Series Aggregation Services Router 6-Slot Version 2 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
A99-SFC-T	ASR 9906 Switch Fabric Card 3	Release 6.3.1
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-FAN-V2	Cisco ASR 9000 Series Aggregation Services Router 10-Slot Version 2 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-SFC-S	Cisco ASR 9000 Series Aggregation Services Router 10-Slot (9910) Switch Fabric Card	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-4X100GE	ASR 9000 4-port 100-Gigabit Ethernet 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
A99-8X100GE-SE	ASR 9900 8-port 100GE Service Edge optimized	Release 6.1.2
A99-8X100GE-TR	ASR 9900 8-port 100GE Packet Transport optimized	Release 6.1.2
A99-8X100GE-CM	ASR 9900 8-port 100GE Consumption Model	Release 6.1.2
A99-12X100GE	Cisco ASR 9000 Series Aggregation Services Router 12-Port 100-Gigabit Ethernet Line Card	Release 6.1.2
A99-12X100GE-CM	Cisco ASR 9000 Series Aggregation Services Router 12-port 100GE Ethernet Line card CM	Release 6.1.2
A9K-8X100GE-CM	Cisco ASR 9000 Series Aggregation Services Router 8-Port 100-Gigabit Ethernet, Consumption Model Optimized with CPAK	Release 6.1.2

A9K-8X100GE-SE	Cisco ASR 9000 Series Aggregation Services Router 8-Port 100-Gigabit Ethernet, Service Edge Optimized	Release 6.1.2
A9K-8X100GE-TR	Cisco ASR 9000 Series Aggregation Services Router 8-Port 100-Gigabit Ethernet, Packet Transport Optimized	Release 6.1.2
A9K-4X100GE-SE	Cisco ASR 9000 Series Aggregation Services Router 4--Port 100-Gigabit Ethernet, Service Edge Optimized	Release 6.1.2
A9K-4X100GE-TR	Cisco ASR 9000 Series Aggregation Services Router 4-Port 100-Gigabit Ethernet, Packet Transport Optimized	Release 6.1.2
Cisco ASR 9000 Series Aggregation Services Router - Modular Line Cards		
Part Number	**Description**	**Support Initially Provided in IOS XR 64 bit Release**
A9K-MOD200-TR A9K-MOD200-SE	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 6.3.1
A9K-MOD400-CM	Cisco ASR 9000 Modular 400G Consumption Model Line Card	Release 6.2.1
A9K-MOD400-SE	Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Service Edge Optimized	Release 6.2.1
A9K-MOD400-TR	Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Packet Transport 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 Digital Pluggable Optical Modules		
CFP2-WDM-DET-1HL=	200G, 100G, WDM Digital CFP2 pluggable Licensed for 100G only – TOF	Release 6.6.2
CFP2-WDM-D-1HL=	200G, 100G, WDM Digital CFP2 pluggable Licensed for 100G only – NON TOF	Release 6.6.2
Cisco ASR 9000v Satellite Shelf		
Part Number	**Description**	**Support Initially Provided in IOS XR 64 bit Release**
A9KV-V2-DC-A=	Cisco ASR 9000v Satellite Shelf Version 2 DC power ANSI chassis	Release 6.2.1
A9KV-V2-DC-E=	Cisco ASR 9000v Satellite Shelf Version 2 DC power chassis	Release 6.2.1
A9KV-V2-AC=	Cisco ASR 9000v Satellite Shelf AC power chassis	Release 6.2.1
A9KV-V2-FAN=	Cisco ASR 9000v Satellite Shelf Version 2 Fan Tray	Release 6.2.1
Cisco NCS 5000 Satellite Shelf		
Part Number	**Description**	**Support Initially Provided in IOS XR 64 bit Release**
NCS-5001	Cisco NCS 5001 Series Router	Release 6.2.1
NCS-5002	Cisco NCS 5002 Series Router	Release 6.2.1
NCS-5001-ACSR	Cisco NCS 5001 Router Accessory Kit	Release 6.2.1
NCS-5002-ACSR	Cisco NCS 5002 Router Accessory Kit	Release 6.2.1
NCS-5001-FN-BK	Cisco NCS 5001 Router Fan Back to Front AirFlow	Release 6.2.1
NCS-5002-FN-BK	Cisco NCS 5002 Router Fan Back to Front AirFlow	Release 6.2.1
NCS-5001-FLT-BK	Cisco NCS 5001 Air Filter Back to Front Airflow	Release 6.2.1
NCS-5002-FLT-BK	Cisco NCS 5002 Air Filter Back to Front Airflow	Release 6.2.1
NCS-5001-FN-FR	Cisco NCS 5001 Fan Front to Back Airflow	Release 6.2.1
NCS-5002-FN-FR	Cisco NCS 5002 Fan Front to Back Airflow	Release 6.2.1

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

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.
- ISSU on ASR 9000 third-generation line cards will be supported until the Cisco IOS XR Releases 7.10.x only.
- The ISSU SMU for ASR 9000 third-generation line cards will be supported until the Cisco IOS XR Release 7.11.2 only. The ISSU SMU will not be supported in the future releases for ASR 9000 third-generation line cards.
- Installing a Line Card—For a fully populated Line Card with cable optics, maintenance time required for card replacement is higher. For more information about Line Card installation and removal, refer to the *Cisco ASR 9000 Aggregation Services Router Ethernet Line Card Installation Guide*.
- For ZTP, In Cisco IOS XR Release 7.3.1 and earlier, the system accepts the device sending **user-class = "exr-config"**; however starting Cisco IOS XR Release 7.3.2 and later, you must use only **user-class = "xr-config"**.

  In Cisco IOS XR Release 7.3.2 and later, use:

```
host cisco-rp0 {
   hardware ethernet e4:c7:22:be:10:ba;
   fixed-address 172.30.12.54;
   if exists user-class and option user-class = "iPXE" {
      filename = "http://172.30.0.22/boot.ipxe";
   } elsif exists user-class and option user-class = "xr-config" {
      filename = "http://172.30.0.22/scripts/cisco-rp0_ztp.sh";
   }
}
```

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

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