



## **Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 7.11.1**

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# Release Notes for Cisco ASR 9000 Series Routers, IOS XR Release 7.11.1

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 7.11.1

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   |
|--|---|
| <b>Broadband Network Gateway</b>                                     |   |
| <a href="#">Geo Redundancy with Ethernet Virtual Private Network</a> | <p>You can now deploy BNG Geo redundancy for access networks connected over a multi-homing EVPN control plane. This enhances redundancy for BNG devices across different geographic locations in the multi-homing EVPN network. The backup BNG device synchronizes the subscriber session state at regular intervals, ensuring seamless continuation of sessions after a failover without the need to establish new connections. This multi-homing EVPN capability guarantees seamless load balancing and failover between devices, providing uninterrupted connectivity for your customers. Previously, BNG Geo redundancy was only available for non-EVPN access networks.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"><li>• The <b>src-driven</b> keyword is added to the <b>ethernet-segment service-carving</b> command.</li><li>• The <b>vlan-aware</b> keyword is added to the <b>neighbor evpn</b> command.</li></ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"><li>• New Xpaths for <code>Cisco-IOS-XR-l2vpn-cfg.yang</code></li></ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |

| Feature   | Description   |
|---|---|
| <a href="#">Subscriber Redundancy Group for IPoE-LC based Subscribers</a> | <p>Subscriber Redundancy Group (SRG) offers the advantage of enabling planned switch over or failover for all subscriber groups in case of a failure, proving especially advantageous for subscribers requiring high availability and geo-redundancy as part of their service level agreement (SLA).</p> <p>You can now configure subscriber redundancy group (SRG) for IPoE-LC based subscribers on the following:</p> <ul style="list-style-type: none"> <li>• <a href="#">A99-32X100GE-X-SE</a></li> <li>• <a href="#">A9K-20HG-FLEX-SE</a></li> <li>• <a href="#">A9K-8HG-FLEX-SE</a></li> <li>• <a href="#">A9K-4HG-FLEX-SE</a></li> <li>• <a href="#">Cisco ASR 9902 Router</a></li> <li>• <a href="#">Cisco ASR 9903 Router</a></li> <li>• <a href="#">Cisco ASR 9000 Series Route Switch Processor 5 (RSP5)</a></li> </ul>  |
| <b>CGv6</b>   |   |
| <a href="#">MAP-T Enhancements</a>  | <p>Using Mapping of Address and Port Translation (MAP-T), you can now configure the IPv6 CPE domain prefix length as a non-multiple of eight, which enhances the prefix pool to accommodate a flexible size of the network portion of the IPv6 address. MAP-T also supports non-TCP/UDP/ICMP packets, ICMP error messages, and fragmented packets, which ensure reliable IPv6 connectivity over an IPv4 infrastructure and the other way around. These enhancements are available only on Cisco ASR 9000 Series Fifth Generation high-density Ethernet line cards.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b> New</p> <ul style="list-style-type: none"> <li>• <b>service-ipv4-mtu</b></li> <li>• <b>service-ipv6-mtu</b></li> <li>• <b>service-ipv4-nexthop addr</b></li> <li>• <b>service-ipv6-nexthop addr</b> commands.</li> </ul> <p><b>YANG Data Model:</b> Cisco-IOS-XR-se-cgn-cfg<br/>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <b>Programmability</b>  |   |
| <a href="#">Automatic Resynchronization of OpenConfig Configuration</a>   | <p>OpenConfig infrastructure can now reapply all the OpenConfig configurations automatically if there are any discrepancies in the running configuration.</p> <p>With this feature, there is no need for manual replacement of the OpenConfig configuration using Netconf or gNMI.</p> <p>The re-sync operation is triggered if the running configurations and the OpenConfig configuration go out of sync after any system event that removes some running configurations from the system. A corresponding system log gets generated to indicate the re-sync status.</p>   |

| Feature  | Description   |
|--|---|
| <a href="#">gRPC Network Security Interface</a>                    | <p>This release implements authorization mechanisms to restrict access to gRPC applications and services based on client permissions. This is made possible by introducing an authorization protocol buffer service for gRPC Network Security Interface (gNSI).</p> <p>Prior to this release, the gRPC services in the gNSI systems could be accessed by unauthorized users.</p> <p>This feature introduces the following change:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">gnsi load service authorization policy</a></li> <li>• <a href="#">show gnsi service authorization policy</a></li> </ul> <p>To view the specification of gNSI, see <a href="#">Github</a> repository.</p>  |
| <b>MPLS</b>  |   |
| <a href="#">Teardown and Reestablishment of RSVP-TE Tunnels</a>    | <p>You can now teardown and reestablish the existing tunnels of headend, midend, or tailend router tunnels of an MPLS network for optimized distribution of the traffic across MPLS and RSVP-TE to improve network performance and enhance resource utilization.</p> <p>Previously, you could reestablish tunnels only at the headend router using the <a href="#">mpls traffic-eng resetup</a> command.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b> <a href="#">mpls traffic-eng teardown</a></p> <p><b>YANG Data Model:</b> Cisco-IOS-XR-mpls-te-act.yang<br/>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p>  |
| <b>Multicast</b>   |   |
| <a href="#">MLD Snooping Synchronization for EVPN Multi-Homing</a> | <p>The Designated Forwarder (DF) PE router in an EVPN multi-homed network can now efficiently forward multicast traffic from the source to the interested receivers, avoiding unnecessary replication and reducing network bandwidth consumption.</p> <p>This is made possible by introducing support for Multicast Listener Discovery, MLDv1, and MLDv2 (IPv6) snooping state synchronization for EVPN multi-homing peers or provider edge (PE) devices, expanding the scope of the previous support for IGMP (IPv4) snooping state synchronization.</p>   |
| <a href="#">Statistics for Egress Multicast Traffic Route Rate</a> | <p>With the ability to now view the route rates or rate of data being forwarded or transmitted per interface, you can monitor your network performance at a granular level, effectively troubleshoot network issues, and have greater control over bandwidth management.</p> <p>Previously, you could view the route rates only at the router level.</p> <p>This feature introduces the following changes:</p> <ul style="list-style-type: none"> <li>• <b>CLI</b> <ul style="list-style-type: none"> <li>• The <b>rate</b> keyword is introduced in the <a href="#">show mrib route</a> command.</li> </ul> </li> <li>• <b>YANG Data Model</b> <ul style="list-style-type: none"> <li>• New XPathS for <code>Cisco-IOS-XR-mfwd-oper.yang</code> (see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>).</li> </ul> </li> </ul> |

| Feature   | Description  |
|---|--|
| <b>Netflow</b>  |  |
| <a href="#">NetFlow for IPv6 Pseudowire Headend Interface</a>         | <p>In this release, we have introduced NetFlow support for IPv6 Pseudowire Headend (PWHE) interfaces. This enhancement helps monitor traffic congestion and make decisions for the efficient operation of networks. This is achieved by providing increased visibility into IPv6 traffic on PWHE interfaces that allows termination of pseudowire connections from legacy non-IP traffic sources and their encapsulation into native IP packets.</p>   |
| <b>Modular QoS</b>  |  |
| <a href="#">Low Queue Limit and WRED Values for Low Access Speeds</a> | <p>You can now design your infrastructure for low access speeds, allowing your customers to use low-speed Layer 3 VPN services. Your customers can thus deliver these low-speed services to their end-customers, who can use them to connect their branch offices, home-workers, or any other business scenario requiring low-speed services. To achieve these services, we have enabled the configuration of lower minimum values for queue limit and WRED on the fourth and fifth generations of the ASR 9000 Series High Density Ethernet line cards. You can configure lower queue limit values only for 1 Gbps, 10 Gbps, and 400 Gbps interfaces and lower WRED values for 1 Gbps and 10 Gbps interfaces.</p> <p>There's no action required for you to enable this functionality, and there are no changes to command options.</p>  |
| <b>Routing</b>  |  |
| <a href="#">Maximum Paths Per Flexible Algorithm Per Prefix</a>       | <p>Previously, you could configure a maximum number of Equal-Cost Multi-path (ECMP) to be set for SPF algo 0.</p> <p>This feature provides additional granularity to the IS-IS Maximum Paths Per-Algorithm feature by allowing you to specify a set of prefixes for SPF algo 0.</p> <p>Now you can achieve a balance between path diversity and computational and memory requirements by controlling the number of paths for each specific algorithm and destination prefix combination.</p> <p>This feature introduces these changes:</p> <p><b>CLI</b></p> <ul style="list-style-type: none"> <li>• <b>maximum-paths route-policy</b> <i>name</i></li> </ul> <p>YANG Data Models:</p> <ul style="list-style-type: none"> <li>• This feature extends the native <code>Cisco-IOS-XR-clns-isis-cfg.yang</code> model</li> </ul> <p>See <a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a></p> |

| Feature   | Description  |
|---|--|
| <a href="#">Peering Between BGP Routers Within the Same Confederation</a> | <p>Now you can enable BGP peering between routers in the sub-AS within a confederation to advertise specific router updates using iBGP. This capability ensures that the mesh of routers between sub-ASes in a confederation maintains consistent routing tables, ensuring proper network reachability. Enabling this feature will improve preventing performance reduction and traffic management challenges.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>New Command:</p> <ul style="list-style-type: none"> <li>• <code>allowconfedas-in</code></li> </ul> <p><b>YANG Data Models</b></p> <ul style="list-style-type: none"> <li>• New XPaths for <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ipv4-bgp-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-um-router-bgp-cfg</code></li> </ul> </li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <a href="#">Virtual Routing Forwarding Next Hop Routing Policy</a>        | <p>Now you can enable a route policy at the BGP next-hop attach point to limit notifications delivered to BGP for specific prefixes. This enables the network administrators to make better routing decisions.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <p>Modified Command:</p> <ul style="list-style-type: none"> <li>• The <code>nexthop route-policy</code> command is extended to VRF address-family configuration mode.</li> </ul> <p><b>YANG Data Models</b></p> <ul style="list-style-type: none"> <li>• New XPaths for <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ipv4-bgp-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-um-router-bgp-cfg</code></li> </ul> </li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p>  |
| <b>Segment Routing</b>  |  |

| Feature   | Description  |
|---|--|
| <a href="#">Configure Flow Labels in SRv6 Header for PM Liveness</a>                        | <p>You can now monitor the activeness of multiple paths for a given segment list using flow labels in the SRv6 header.</p> <p>In earlier releases, the SRv6 header didn't include flow labels.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>flow-label</b> keyword is introduced in the <b>performance-measurement liveness-profile</b> command.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-um-performance-measurement-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-perf-meas-oper.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p>  |
| <a href="#">Configure Segment Lists to Activate Candidate Paths in SRv6 for PM Liveness</a> | <p>You can now enable a candidate path to be up by configuring the minimum number of active segment lists associated with the candidate path. The head-end router determines that a candidate path is up based on the minimum number of active segment lists configured.</p> <p>In earlier releases, the head-end router identified a candidate path as up only when all the segment lists associated with the path were active.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>validation-cp minimum-active segment-lists</b> option is introduced in the <b>performance-measurement liveness-detection</b> command.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-infra-xtc-agent-cfg.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p> |

| Feature  | Description   |
|--|---|
| <a href="#">Flex Algo Constraint for Tree-SID Path Computation</a>             | <p>This feature introduces support for Static and mVPN/Dynamic TreeSID with Flexible Algorithm constraint. Unlike SR-TE point-to-point (P2P) policies, where the primary objective for Flexible Algorithm is to reduce or compress the number of segments on the packet, the objective for Flexible Algorithm-based point-to-multipoint (P2MP) policies:</p> <ul style="list-style-type: none"> <li>• Another method of traffic engineering</li> <li>• LFA FRR – Without Flex-Algo, the primary and backup paths chosen by the local node might not follow the traffic engineering constraints specified in the policy.</li> </ul> <p>This feature introduces these changes:</p> <p><b>CLI</b></p> <ul style="list-style-type: none"> <li>• The <b>sid-algorithm</b> <i>algo</i> keyword is introduced in the <a href="#">pce segment-routing traffic-eng p2mp policy</a> command.</li> <li>• The output of the <b>show pce lsp p2mp</b> command is modified to display Flex-Algo associated with a Tree, the Metric Type from Flex-Algo definition at Root, and the hop node-SIDs.</li> <li>• The output of the <b>show segment-routing traffic-eng p2mp policy</b> command is modified to display Flex-Algo associated with Tree SID state, and the hop node-SIDs.</li> </ul> |
| <a href="#">IS-IS Flexible Algorithm with Exclude Maximum Delay Constraint</a> | <p>This feature enables you to configure topologies that exclude links that have delays over a specific threshold. This is especially critical for high-frequency trading applications, in satellite networks, or wherever there are fluctuations in link delays.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>router isis instance flex-algo</b> <i>algo</i> command is modified with the new <a href="#">maximum-delay value</a> option.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>• This feature extends the native Cisco-IOS-XR-clns-isis-cfg.yang model (see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</li> </ul>   |



| Feature  | Description   |
|--|---|
| <a href="#">IS-IS Flexible Algorithm with Exclude Minimum Bandwidth Constraint</a> | <p>Traffic engineering in networks can be optimized by avoiding low-bandwidth links that may not be capable of handling high volumes of traffic.</p> <p>This feature allows you to use Flexible Algorithm to create topologies in your network that explicitly exclude high bandwidth traffic from utilizing links below a specified capacity. This constraint is achieved by introducing a new bandwidth-based metric type within the Flexible Algorithm framework. Links that do not satisfy the constraint are ignored when computing the associated Flexible Algorithm topology.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>router isis instance flex-algo algo</b> command is modified with the new <b>minimum-bandwidth value</b> option.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>• This feature extends the native <code>Cisco-IOS-XR-clns-isis-cfg.yang</code> model (see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</li> </ul> |
| <a href="#">Maximum Paths Per IS-IS Flexible Algorithm Per Prefix</a>              | <p>Previously, you could configure a maximum number of Equal-Cost Multi-path (ECMP) to be set for individual Flex Algorithms.</p> <p>This feature provides additional granularity to the IS-IS Maximum Paths Per-Algorithm feature by allowing you to specify a set of prefixes for Flexible Algorithm.</p> <p>Now you can achieve a balance between path diversity and computational and memory requirements by controlling the number of paths for each specific algorithm and destination prefix combination.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• <b>maximum-paths route-policy name</b></li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• This feature extends the native <code>Cisco-IOS-XR-clns-isis-cfg.yang</code> model</li> </ul> <p>See <a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a></p>   |

| Feature  | Description   |
|--|---|
| <a href="#">Microloop Avoidance for IS-IS with Per-Prefix Filtering</a>                            | <p>Currently, when SR Microloop Avoidance for IS-IS is enabled, it applies to all prefixes.</p> <p>This feature allows you to selectively allow or deny specific IPv4 or IPv6 prefixes or routes that may cause microloops, which allows for efficient use of hardware resources and ensures overall network stability.</p> <p>This feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>The <b>microloop avoidance segment-routing</b> command is modified with the new <b>route-policy name</b> option for IS-IS.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>This feature extends the native <code>Cisco-IOS-XR-um-router-isis-cfg.yang</code> model (see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</li> </ul> |
| <a href="#">Microloop Avoidance for OSPFv2 Single-Node Cost-in and Single-Node Cost-out Events</a> | <p>Microloops disrupt network connectivity and cause suboptimal routing decisions. This feature avoids microloops by implementing the Greedy walk algorithm, which is similar to TI-LFA computation.</p> <p>This feature extends the microloop avoidance support for additional scenarios in OSPFv2, such as cost-in and cost-out events.</p> <p>This feature introduces these changes:</p> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li><code>Cisco-IOS-XR-ipv4-ospf-oper.yang</code></li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p>  |
| <a href="#">SR Policy Liveness Monitoring on Segment Routing over IPv6 (SRv6)</a>                  | <p>In segment routing over IPv6 (SRv6), you can now verify end-to-end traffic forwarding over an SR policy candidate path by periodically sending probe messages. Performance monitoring on an SRv6 network enables you to track and monitor traffic flows at a granular level.</p> <p>Earlier releases supported SR policy liveness monitoring over an SR policy candidate path on MPLS.</p>   |

| Feature  | Description  |
|--|--|
| <a href="#">SR-TE Application Programming Interface (API)</a>              | <p>This feature introduces an API solution that simplifies the task of building SR-TE controllers and managing SRTE policies. It does so by defining gRPC API services that allow applications to request SR policy operations.</p> <p>The solution leverages the gRPC Service API and GPB Data models, providing a unified, scalable, and secure method for network programming.</p> <p>This feature introduces these changes:</p> <p><b>New CLI</b></p> <ul style="list-style-type: none"> <li>• <code>grpc segment-routing traffic-eng policy-service</code></li> </ul> <p><b>YANG Data Models:</b></p> <p>EMSD Yang model is updated to have this config under "segment-routing" container.</p> <ul style="list-style-type: none"> <li>• Native model: <code>Cisco-IOS-XR-man-ems-cfg.yang</code></li> <li>• UM model: <code>Cisco-IOS-XR-um-grpc-cfg.yang</code></li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <a href="#">SR-TE Explicit Path with a BGP Prefix SID as First Segment</a> | <p>This feature allows you to configure an SR-TE policy with an explicit path that uses a remote BGP prefix SID as its first segment. This path is achieved by leveraging the recursive resolution of the first SID, which is a BGP-Label Unicast (BGP-LU) SID. BGP-LU labels are used as the first SID in the SR policy to determine the egress paths for the traffic and program the SR-TE forwarding chain accordingly.</p> <p>This allows users to enable Segment Routing to leverage their existing BGP infrastructure and integrate it with the required Segment Routing functionalities.</p>  |
| <a href="#">SRv6 ESI Filtering</a>   | <p>Split Horizon Group (SHG) labels and Ethernet Segment Identifier (ESI) filtering functionalities exist on MPLS underlay networks.</p> <p>This feature introduces ESI filtering functionality to SRv6 underlay networks, using the End.DT2M SRv6 endpoint behavior. This behavior uses the "Arg.FE2" argument for SRv6, which is similar to the SHG label for MPLS.</p> <p>This feature allows nodes to identify BUM traffic based on the advertised ESI and prevent a loop by avoiding re-broadcasting the same traffic back towards the access node.</p> <p>This functionality is enabled by default.</p>  |
| <a href="#">SRv6-Services: L2 EVPN Services with Local SIDs from W-LIB</a> | <p>This feature enables an SRv6 headend node to allocate and advertise local SIDs with Wide (32-bit) functions (Local W-LIB). The Local W-LIB is supported for Layer 2 EVPN services (ELAN/ELINE) services.</p> <p>Users with a large number of L2 EVPN services can now have a larger address space (local ID block) for local identifiers because this functionality enables an SRv6 headend node to allocate and advertise local SIDs with Wide (32-bit) functions (Local W-LIB). The larger address space for local identifiers ensures efficient address space utilization and better scalability for BGP deployments.</p> <p>This feature introduces the <b>usid allocation wide-local-id-block</b> command.</p>   |

| Feature  | Description   |
|--|---|
| <a href="#">SRv6-Services: L3 Services with Local SIDs from W-LIB</a>              | <p>This feature enables an SRv6 headend node to allocate and advertise local SIDs with Wide (32-bit) functions (Local W-LIB).</p> <p>The headend router utilizes the local W-LIB functionality to define and implement SR policies using SRv6 SIDs.</p> <p>The Local W-LIB is supported for Layer 3 (VPNv4/VPNv6/BGPv4/BGPv6 global) services.</p> <p>This feature introduces the <b>usid allocation wide-local-id-block</b> command.</p>   |
| <a href="#">Two-Way Active Measurement Protocol Light Source Address Filtering</a> | <p>You can now restrict unauthorized users from sending packets to the network and prevent compromising the network security and reliability. For a destination UDP port, you can configure the list of IP addresses that can send Two-Way Active Measurement Protocol (TWAMP)-light packets to responder or querier nodes.</p> <p>In earlier releases, the responder or querier node accepted TWAMP-light packets from all IP addresses. The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>querier</b> and <b>responder</b> keywords are introduced in the <b>performance-measurement protocol twamp-light measurement delay</b> command.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-um-performance-measurement-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-perf-meas-oper.yang</code></li> </ul> <p>See (<a href="#">GitHub</a>, <a href="#">Yang Data Models Navigator</a>)</p> |
| <b>IP Addresses and Services</b>   |   |

| Feature  | Description  |
|--|--|
| <a href="#">Unicast VRRP</a>   | <p>We have now enabled Layer 3 unicast transport mode in VRRP, allowing it to enhance its capacity to send data to other networks, including cloud networks. Pairwise router redundancy enables high availability in cloud network scenarios. However, a virtual IP (VIP) address is required by the default route of the cloud native function because there is no pre-designated active member in paired routers. HSRP can provide a VIP, but cloud networks do not support Layer 2 multicast or broadcast transports. You can configure VRRP to support Layer 3 unicast transport to overcome the limitation of Layer 2 multicast and broadcast transports.</p> <p>The feature introduces these changes:</p> <p>New Command:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">unicast-peer</a></li> </ul> <p>Modified Commands:</p> <ul style="list-style-type: none"> <li>• <a href="#">show vrrp</a> command is modified to support new fields: <b>Mcast packet in Ucast mode</b> , <b>IPv4 Unicast Peer</b> , and <b>IPv4 Unicast Peer</b> .</li> </ul> <p><b>YANG Data Model:</b></p> <p>New Xpaths for:</p> <ul style="list-style-type: none"> <li>• <code>Cisco-IOS-XR-ipv4-vrrp-cfg.yang</code></li> <li>• <code>Cisco-IOS-XR-ipv4-vrrp-oper.yang</code></li> </ul> <p>(see <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <b>System Management</b>   |  |
| <a href="#">Hitless FPD Firmware Upgrade for Optical Transceiver Modules</a> | <p>We now support a hitless FPD firmware upgrade for some optical transceiver modules where the FPD upgrades without shutting down the laser on the optical line card modules. This functionality avoids operational downtime.</p> <p>This process is more efficient and avoids traffic loss.</p> <p>Prior to this release, the FPD upgrades used to shut down the laser. This resulted in traffic loss.</p> <p>This feature is supported on the following variants:</p> <ul style="list-style-type: none"> <li>• A9K-8HG-FLEX-SE/TR</li> <li>• A9K-20HG-FLEX-SE/TR</li> <li>• A99-10X400GE-X-SE/TR</li> <li>• A9903-20HG-PEC</li> </ul>   |
| <b>System Security</b>   |  |

| Feature   | Description   |
|---|---|
| <a href="#">Multiple Public Keys per User for Public Key-based Authentication</a> | <p>We provide greater flexibility to access secure routers by allowing four public keys to be used for authentication. With the ability to associate multiple public keys with your user account on the router, we've also simplified the authentication process by eliminating the need to create unique users for each SSH client device.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>second</b> , <b>third</b> , and <b>fourth</b> keywords are introduced in the <b>crypto key import authentication rsa</b> command.</li> <li>• The <b>second</b> , <b>third</b> , and <b>fourth</b> keywords are introduced in the <b>crypto key zeroize authentication rsa</b> command.</li> <li>• The <b>second</b> , <b>third</b> , and <b>fourth</b> keywords are introduced in the <b>keystring</b> command.</li> </ul> <p><b>YANG Data Models:</b></p> <ul style="list-style-type: none"> <li>• Cisco-IOS-XR-crypto-act</li> <li>• Cisco-IOS-XR-um-ssh-cfg</li> </ul> <p>(See <a href="#">GitHub</a>, <a href="#">YANG Data Models Navigator</a>)</p> |
| <b>System Monitoring</b>  |   |
| <a href="#">System Logging Message Count</a>                                      | <p>Instead of calculating the bytes consumed by Syslog as you did previously, you can now easily and effectively manage the buffer size of the system log messages by specifying the number of entries the system log displays.</p> <p>The feature introduces these changes:</p> <p><b>CLI:</b></p> <ul style="list-style-type: none"> <li>• The <b>entries-count</b> keyword is added to the <b>logging buffered</b> command.</li> </ul> <p><b>YANG Data Model:</b></p> <ul style="list-style-type: none"> <li>• New Xpaths for Cisco-IOS-XR-infra-syslog-cfg</li> <li>• New Xpaths for Cisco-IOS-XR-um-logging-cfg</li> </ul>   |

## 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 presented visually in a tree structure.

| Feature                                   | Description   |
|---|---|
| <b>Programmability</b>                    |   |
| openconfig-system.yang Version 0.13.1     | This OpenConfig data model is revised from version 0.6.0 to 0.13.1. There are no functional changes between these two versions. |
| openconfig-vlan.yang Version 3.2.2        | This OpenConfig data model is revised from version 3.2.0 to 3.2.2. There are no functional changes between these two versions.  |
| openconfig-mpls-static.yang Version 3.3.0 | The OpenConfig data model is revised from version 3.2.2 to 3.3.0. There are no functional changes between these two versions.   |

| Feature  | Description  |
|--|--|
| openconfig-network-instance.yang Version 1.3.0 | <p>This OpenConfig data model introduces the following changes to the BGP container:</p> <ul style="list-style-type: none"> <li>• Enable the parameters related to the use of multiple paths for the same Network Layer Reachability Information (NLRI) using use-multiple-paths leaf. The router uses this information in Address Family Indicator (AFI) and Subsequent Address Family Indicator (SAFI) in multi-protocol extensions during exchange of neighbor capabilities when loading the peers.</li> <li>• Enable the route dampening to minimize the propagation of flapping routes across an internetwork and learn the dampened routes from neighbor or peers using route-flap-damping leaf.</li> <li>• Configure the default metric within the RIB for entries that are installed by the protocol instance using default-metric leaf. The lower the metric specified the more preferable the RIB entry is to be selected for use within the network instance.</li> <li>• Specify the type of extended community to be sent to the neighbor group or address family group using send-community leaf.</li> <li>• Specify the number of occurrences to allow the BGP speaker to accept the BGP updates even if its own BGP autonomous system (AS) number is in the AS-Path attribute using allow-own-as leaf.</li> <li>• Replace occurrences of the peer's AS in the AS_Path with the local AS number using replace-peer-as leaf.</li> <li>• Use disable-peer-as-filter for filtering the routes. When set to true, the system advertises routes to a peer even if the peer's AS was in the AS-Path. The default behavior (false) suppresses advertisements to peers if their AS number is in the AS-Path of the route.</li> <li>• Ignore the Interior Gateway Protocol (IGP) metric to the next-hop when calculating the best-path using ignore-next-hop-igp-metric leaf. The default is to select the route for which the metric to the next-hop is lowest.</li> </ul> |



| Feature                                 | Description   |
|---|---|
| openconfig-lldp.yang                    | <p>This OpenConfig data model supports streaming model-driven telemetry (MDT) data for the leaves deviated in the previous releases.</p> <p>You can stream cadence-driven telemetry data for the following nodes:</p> <ul style="list-style-type: none"> <li>• Retrieve the counters cleared and the number number of valid TLVs received using last-clear and tlv-accepted leaves</li> <li>• Gather data about LLDP interface counters using frame-in, frame-out, frame-error-in, frame-discard, tlv-discard, tlv-unknown, last-clear, and frame-error-out leaves</li> <li>• Stream operational state data for LLDP neighbors using age and last-update leaves</li> </ul> <p>You can stream event-driven telemetry (EDT) data for system-name, system-description, chassis-id, and chassis-id-type leaves.</p> |
| openconfig-mpls-igp.yang Version 3.3.0  | <p>This OpenConfig data model is revised from version 2.3.0 to 3.3.0. There are no functional changes between these two versions.</p>   |
| openconfig-if-tunnel.yang               | <p>This release introduces streaming model-driven telemetry (MDT) data for the operational state of source, destination, time-to-live (hop limit) and GRE key of tunnel interfaces using src, dest, ttl, and gre-key nodes respectively.</p>  |
| openconfig-spanning-tree.yang           | <p>This release introduces support for the following OpenConfig data models to define the configuration for Spanning Tree Protocol (STP):</p> <ul style="list-style-type: none"> <li>• openconfig-spanning-tree.yang version 0.3.1</li> <li>• openconfig-spanning-tree-types.yang version 0.4.1</li> </ul> <p>Using these data models, you can configure STP for a loop free topology within Ethernet networks, allowing redundancy within the network to deal with link failures.</p> <p>Rapid STP (RSTP) and streaming telemetry data for the operational state of nodes is not supported.</p>  |
| openconfig-mpls-te.yang Version 3.3.0   | <p>This OpenConfig data model, which is part of the openconfig-network-instance.yang data model is revised from version 3.0.1 to 3.3.0. There are no functional changes between these two versions.</p>   |
| openconfig-mpls-rsvp.yang Version 4.0.0 | <p>This OpenConfig data model, which is part of the openconfig-network-instance.yang data model is revised from version 3.0.2 to 4.0.0. There are no functional changes between these two versions.</p>   |

| Feature                                  | Description  |
|--|--|
| openconfig-procmon.yang version 0.4.0    | <p>This OpenConfig data model is revised from version 0.3.1 to 0.4.0. It is used to retrieve the operational data for processes running on a node. It is introduced to support the openconfig-system.yang data model to configure the following xpaths:</p> <ul style="list-style-type: none"> <li>• Fetch the process related information using the the pid leaf.</li> <li>• View the process name using the name leaf.</li> <li>• Fetch the current process command line arguments using args leaf.</li> <li>• View the time at which the process started using start-time leaf.</li> <li>• Check the CPU time consumed by the process in user mode using the cpu-usage-user leaf.</li> <li>• Check the CPU time consumed by this process in kernel mode using cpu-usage-system leaf.</li> <li>• Check the percentage of CPU that is being used by the process using cpu-utilization leaf.</li> <li>• Check the bytes allocated and still in use by the process using memory-usage leaf.</li> <li>• View the percentage of RAM that is being used by a process using memory-utilization leaf.</li> </ul> |
| openconfig-mpls.yang Version 3.3.0       | <p>This OpenConfig data model is revised from version 3.2.2 to 3.3.0. It is a part of the openconfig-network-instance.yang data model and introduces the following leaves:</p> <ul style="list-style-type: none"> <li>• Enable Time To Live (TTL) propagation in the MPLS domain using the ttl-propagation leaf.</li> <li>• Enable MPLS forwarding capability on an interface using mpls-enabled leaf.</li> </ul> <p>You can stream model-driven telemetry data (MDT) for the operational state of the nodes.</p>  |
| openconfig-mpls-types.yang Version 3.4.0 | <p>This OpenConfig data model, which is part of the openconfig-network-instance.yang data model is revised from version 3.2.0 to 3.4.0. There are no functional changes between these two versions.</p>  |
| Cisco-IOS-XR-se-cgn-cfg                  | <p>This Cisco native YANG data model lets you to configure MTUs for a specific service or a network. It allows you to configure the next-hop service set for a redirection to another router, which can handle the fragmentation for IPv4 or IPv6 MAP-T traffic</p>  |

| Feature  | Description  |
|--|--|
| openconfig-platform.yang                         | <p>This OpenConfig data model supports improved cadence of under 30 seconds to stream cadence-driven telemetry data for the operational state of the following components—power supply, fan, software modules, linecards and subcomponents.</p> <p>Event-driven telemetry is already supported for these components in the previous releases.</p>  |
| openconfig-network-instance.yang                 | <p>This OpenConfig data model introduces cadence-driven telemetry support to obtain and monitor the total active route counts on IPv4 or IPv6 default tables in a route processor using <code>installed-routes</code> leaf.</p> <p>Model-driven telemetry (MDT) sensor subscription can be enabled.</p> <p>Event-driven telemetry and Netconf protocol for default VRF table are not supported.</p>  |
| Cisco-IOS-XR-um-performance-measurement-cfg.yang | <p>This unified data model is enhanced as follows:</p> <ul style="list-style-type: none"> <li>• New containers <i>allow-querier</i> and <i>allow-responder</i>, to configure the list of IP addresses that can send TWAMP-light packets to responder or querier nodes.</li> <li>• A new container, <i>flow-label</i>, to monitor the liveness of multiple paths for a given segment list.</li> </ul>   |
| Cisco-IOS-XR-perf-meas-oper.yang                 | <p>This native data model is enhanced as follows:</p> <ul style="list-style-type: none"> <li>• New containers, <i>allowed-responder-summary</i> and <i>allowed-querier-summary</i>, to configure the list of IP addresses that can send TWAMP-light packets to responder or querier nodes.</li> <li>• new container, <i>usid-info</i>, and new leaves such as <i>sid-value</i>, <i>usid-length</i>, <i>sid-format</i>, and <i>sid-behavior</i> in the <i>PM-USID-INFO</i> grouping, to monitor the liveness of a SRv6 candidate path.</li> </ul> |
| Cisco-IOS-XR-infra-xtc-agent-cfg.yang            | <p>This native data model is enhanced with a new leaf, <i>minimum-active-segment-lists</i>, to configure the minimum number of active segment lists associated with the candidate path.</p>  |

| Feature                      | Description  |
|------------------------------|--|
| Cisco-IOS-XR-crypto-act.yang | <p>This native data model is enhanced with a new leaf, <i>key-num</i>, under the following containers:</p> <p><i>key-import-authentication-rsa</i>: To import SSH public keys to the router for the currently logged-in user</p> <p><i>key-import-authentication-rsa-username</i>: To import SSH public keys to the router for a specific user</p> <p><i>key-zeroize-authentication-rsa</i>: To delete SSH public keys in the router for the currently logged-in user</p> <p><i>key-zeroize-authentication-rsa-username</i>: To delete SSH public keys in the router for a specific user</p> <p>The data model supports the following values for the <i>key-num</i> leaf:</p> <ul style="list-style-type: none"> <li>• 2: second key</li> <li>• 4: third key</li> <li>• 8: fourth key</li> </ul> |
| Cisco-IOS-XR-um-ssh-cfg.yang | <p>This unified data model is enhanced with the following new leaves under the <code>ssh server username</code> container to add up to 4 multiple public keys per user for public key-based authentication.</p> <p><code>keystring-second</code>: Adds a second SSH public key for a user in the router.</p> <p><code>keystring-third</code>: Adds a third SSH public key for a user in the router.</p> <p><code>keystring-fourth</code>: Adds a fourth SSH public key for a user in the router.</p>   |

| Feature                            | Description  |
|------------------------------------|--|
| openconfig-aft.yang Revision 0.9.0 | <p>The Abstract Forwarding Table (AFT) OpenConfig data model is enhanced to support the following features:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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. It now eliminates multiple lookups to map an IP prefix to an outgoing interface and IP address when internal labels are involved in that route. This is accomplished internally by reducing the hierarchy levels or flattening the nested next-hop telemetry updates.</li> </ul> <p>You can stream Event-driven telemetry (EDT) data.</p> |

## Hardware Introduced

No new hardware introduced in this release.

## Caveats

*Table 1: Cisco ASR 9000 Series Router Specific Bugs*

| Bug ID                     | Headline   |
|----------------------------|--|
| <a href="#">CSCwh02807</a> | Due to high frequency ACL deny log messages, logging buffer wrapping up fast |

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

**Table 2: Cisco IOS XR 64 bit Software Release 7.11.1 TAR Files**

| Feature Set  | Filename                         | Description  |
|--|----------------------------------|--|
| Cisco IOS XR IP/MPLS Core Software [for RSP and RP systems]      | ASR9K-x64-iosxr-px-7.11.1.tar    | <ul style="list-style-type: none"> <li>• Cisco IOS XR Manageability Package</li> <li>• Cisco IOS XR MPLS Package</li> <li>• Cisco IOS XR MPLS -TE and RSVP Package</li> <li>• Cisco IOS XR Multicast Package</li> <li>• Cisco IOS XR Optics Package</li> <li>• Cisco IOS XR BNG Package</li> <li>• Cisco IOS XR Lawful Intercept Package</li> <li>• Cisco IOS XR Satellite Package</li> <li>• Cisco IOS XR EIGRP Package</li> <li>• Cisco IOS XR ISIS Package</li> <li>• Cisco IOS XR OSPF Package</li> <li>• Cisco IOS XR Service Package</li> </ul>  |
| Cisco IOS XR IP/MPLS Core Software 3DES [for RSP and RP systems] | ASR9K-x64-iosxr-px-k9-7.11.1.tar | <ul style="list-style-type: none"> <li>• Cisco IOS XR Manageability Package</li> <li>• Cisco IOS XR MPLS Package</li> <li>• Cisco IOS XR MPLS -TE and RSVP Package</li> <li>• Cisco IOS XR Multicast Package</li> <li>• Cisco IOS XR Optics Package</li> <li>• Cisco IOS XR BNG Package</li> <li>• Cisco IOS XR Lawful Intercept Package</li> <li>• Cisco IOS XR Satellite Package</li> <li>• Cisco IOS XR Security Package</li> <li>• Cisco IOS XR EIGRP Package</li> <li>• Cisco IOS XR ISIS Package</li> <li>• Cisco IOS XR OSPF Package</li> <li>• Cisco IOS XR Service Package</li> </ul> |

| Feature Set  | Filename                                 | Description   |
|--|--|---|
| Cisco IOS XR IP Unicast Routing Core Bundle and Migration to IOS XR 64 bit tar image | asr9k-mini-x64-migrate_to_eXR.tar-7.11.1 | Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, FPD, SNMP Agent, and Alarm Correlation.<br><br>Contains mini.iso file for XR 64 bit 7.11.1 and additional software for migration to 64 bit. |

**Table 3: Cisco IOS XR 64 bit Software Release 7.11.1 ISO and RPM Files**

| Composite Package                            |   |   |
|--|---|---|
| Feature Set                                  | Filename  | Description   |
| Cisco IOS XR IP Unicast Routing Core Bundle  | asr9k-mini-x64-7.11.1.iso                       | Contains the required core packages, including OS, Admin, Base, Forwarding, Modular Services Card, Routing, FPD, SNMP Agent, and Alarm Correlation.<br><br>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-r7111.x86_64.rpm        | Includes EIGRP protocol support software  |
| Cisco IOS XR BNG Package                     | asr9k-bng-x64-1.1.0.0-r7111.x86_64.rpm          | Includes binaries to support BNG features.  |
| Cisco IOS XR 64 bit ISIS package             | asr9k-isis-x64-1.1.0.0-r7111.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-r7111.x86_64.rpm         | Includes OSPF link state protocol support software  |
| Cisco IOS XR Manageability Package           | asr9k-mgbl-x64-3.0.0.0-r7111.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.<br><br>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-r7111.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-r7111.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-r7111.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-r7111.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-r7111.x86_64.rpm       | Includes LI software images.   |
| Cisco IOS XR Security Package                     | asr9k-k9sec-x64-3.1.0.0-r7111.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-r7111.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-r7111.x86_64.rpm | Includes RPM to support Cisco IOS XR 64-bit inline MAP-T function  |

## Software Compatibility

Cisco IOS XR Software Release 7.11.1 is compatible with the following Cisco ASR 9000 Series Aggregation Services Router systems.

- Cisco ASR 9900 Series Chassis
  - Cisco ASR 9922 Chassis
  - Cisco ASR 9912 Chassis
  - Cisco ASR 9910 Chassis
  - Cisco ASR 9906 Chassis
  - Cisco ASR 9904 Chassis
  - Cisco ASR 9903 Chassis



- Cisco ASR 9902 Chassis
- Cisco ASR 9901 Chassis
- Cisco ASR 9000 Series Chassis
  - Cisco ASR 9010 Chassis
  - Cisco ASR 9006 Chassis

For Cisco license support, please contact your Cisco Sales Representative or Customer Service at 800- 553-NETS (6387) or 408-526-4000. For questions on the program other than ordering, please send e-mail to: [cwm-license@cisco.com](mailto: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 : 7.11.1

Active Packages: 18
  asr9k-xr-7.11.1 version=7.11.1 [Boot image]
  asr9k-services-x64-1.0.0.0-r7111
  asr9k-eigrp-x64-1.0.0.0-r7111
  asr9k-9000v-nV-x64-1.0.0.0-r7111
  asr9k-m2m-x64-1.0.0.0-r7111
  asr9k-bng-x64-1.0.0.0-r7111
  asr9k-bng-ipoe-x64-1.0.0.0-r7111
  asr9k-bng-pppoe-x64-1.0.0.0-r7111
  asr9k-isis-x64-1.0.0.0-r7111
  asr9k-mcast-x64-1.0.0.0-r7111
  asr9k-mgbl-x64-1.0.0.0-r7111
  asr9k-mpls-x64-1.0.0.0-r7111
  asr9k-ospf-x64-1.0.0.0-r7111
  asr9k-bng-supp-x64-1.0.0.0-r7111
  asr9k-optic-x64-1.0.0.0-r7111
  asr9k-k9sec-x64-1.0.0.0-r7111
  asr9k-li-x64-1.0.0.0-r7111
  asr9k-mpls-te-rsvp-x64-1.0.0.0-r7111
```

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

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

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

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

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

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



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

|              |                |     |       |       |     |
|--------------|----------------|-----|-------|-------|-----|
|              | Lionheart-FPGA | YES | 0.30  | 0.30  | 0.0 |
|              | Longshot       | YES | 2.16  | 2.16  | 0.0 |
|              | Primary-BIOS   | YES | 33.30 | 33.30 | 0.0 |
|              | TamFW-Longshot | YES | 2.65  | 2.65  | 0.0 |
|              | Wolfpack-FPGA  | YES | 0.19  | 0.19  | 0.0 |
| -----        |                |     |       |       |     |
| A99-RP2-SE   | Alpha-FPGA     | YES | 0.16  | 0.16  | 0.0 |
|              | CBC-0          | NO  | 35.14 | 35.14 | 0.0 |
|              | CBC-1          | NO  | 35.14 | 35.14 | 0.0 |
|              | Cha-FPGA       | YES | 0.09  | 0.09  | 0.0 |
|              | IPU-FPGA       | YES | 0.72  | 0.72  | 0.0 |
|              | IPU-FSBL       | YES | 1.113 | 1.113 | 0.0 |
|              | IPU-Linux      | YES | 1.113 | 1.113 | 0.0 |
|              | Omega-FPGA     | YES | 0.20  | 0.20  | 0.0 |
|              | Optimus-FPGA   | YES | 0.12  | 0.12  | 0.0 |
|              | Primary-BIOS   | YES | 14.39 | 14.39 | 0.0 |
| -----        |                |     |       |       |     |
| A99-RP2-TR   | Alpha-FPGA     | YES | 0.16  | 0.16  | 0.0 |
|              | CBC-0          | NO  | 35.14 | 35.14 | 0.0 |
|              | CBC-1          | NO  | 35.14 | 35.14 | 0.0 |
|              | Cha-FPGA       | YES | 0.09  | 0.09  | 0.0 |
|              | IPU-FPGA       | YES | 0.72  | 0.72  | 0.0 |
|              | IPU-FSBL       | YES | 1.113 | 1.113 | 0.0 |
|              | IPU-Linux      | YES | 1.113 | 1.113 | 0.0 |
|              | Omega-FPGA     | YES | 0.20  | 0.20  | 0.0 |
|              | Optimus-FPGA   | YES | 0.12  | 0.12  | 0.0 |
|              | Primary-BIOS   | YES | 14.39 | 14.39 | 0.0 |
| -----        |                |     |       |       |     |
| A99-RP3-SE   | Aldrin-0-FPGA  | YES | 1.03  | 1.03  | 0.0 |
|              | Aldrin-1-FPGA  | YES | 1.00  | 1.00  | 0.0 |
|              | Beta-FPGA      | YES | 0.07  | 0.07  | 0.0 |
|              | CBC-0          | NO  | 51.12 | 51.12 | 0.0 |
|              | CBC-1          | NO  | 51.12 | 51.12 | 0.0 |
|              | IPU-DDR4       | YES | 0.20  | 0.20  | 0.0 |
|              | Orion-FPGA     | YES | 0.23  | 0.23  | 0.0 |
|              | Primary-BIOS   | YES | 30.36 | 30.36 | 0.0 |
|              | Zenith-FPGA    | YES | 0.12  | 0.12  | 0.0 |
| -----        |                |     |       |       |     |
| A99-RP3-TR   | Aldrin-0-FPGA  | YES | 1.03  | 1.03  | 0.0 |
|              | Aldrin-1-FPGA  | YES | 1.00  | 1.00  | 0.0 |
|              | Beta-FPGA      | YES | 0.07  | 0.07  | 0.0 |
|              | CBC-0          | NO  | 51.12 | 51.12 | 0.0 |
|              | CBC-1          | NO  | 51.12 | 51.12 | 0.0 |
|              | IPU-DDR4       | YES | 0.20  | 0.20  | 0.0 |
|              | Orion-FPGA     | YES | 0.23  | 0.23  | 0.0 |
|              | Primary-BIOS   | YES | 30.36 | 30.36 | 0.0 |
|              | Zenith-FPGA    | YES | 0.12  | 0.12  | 0.0 |
| -----        |                |     |       |       |     |
| A99-RP3-X-SE | Aldrin-0-FPGA  | YES | 1.00  | 1.00  | 0.0 |
|              | Aldrin-1-FPGA  | YES | 32.00 | 32.00 | 0.0 |
|              | Beta-FPGA      | YES | 2.02  | 2.02  | 0.0 |
|              | CBC-0          | NO  | 12.04 | 12.04 | 0.0 |
|              | CBC-1          | NO  | 51.12 | 51.12 | 0.0 |
|              | IPU-DDR4       | YES | 3.03  | 3.03  | 0.0 |
|              | Orion-FPGA     | YES | 2.03  | 2.03  | 0.0 |
|              | Primary-BIOS   | YES | 35.08 | 35.08 | 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 | 35.08 | 35.08 | 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 | 0.19  | 0.19  | 0.0 |
|                   | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
|                   | Trailbreaker-0    | YES | 0.24  | 0.24  | 0.0 |
|                   | Trailbreaker-1    | YES | 0.24  | 0.24  | 0.0 |
|                   | Windcharger-0     | YES | 0.08  | 0.08  | 0.0 |
|                   | Windcharger-1     | YES | 0.08  | 0.08  | 0.0 |
| -----             |                   |     |       |       |     |
| A9K-20HG-FLEX-SE  | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                   | CBC               | NO  | 58.09 | 58.09 | 0.0 |
|                   | IPU-DDR4          | YES | 1.18  | 1.18  | 0.0 |
|                   | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                   | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                   | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
|                   | Trailbreaker-0    | YES | 0.24  | 0.24  | 0.0 |
|                   | Trailbreaker-1    | YES | 0.24  | 0.24  | 0.0 |
|                   | Windcharger-0     | YES | 0.08  | 0.08  | 0.0 |
|                   | Windcharger-1     | YES | 0.08  | 0.08  | 0.0 |
| -----             |                   |     |       |       |     |
| A9K-20HG-FLEX-TR  | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                   | CBC               | NO  | 58.09 | 58.09 | 0.0 |
|                   | IPU-DDR4          | YES | 1.18  | 1.18  | 0.0 |
|                   | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                   | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                   | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
|                   | Trailbreaker-0    | YES | 0.24  | 0.24  | 0.0 |
|                   | Trailbreaker-1    | YES | 0.24  | 0.24  | 0.0 |
|                   | Windcharger-0     | YES | 0.08  | 0.08  | 0.0 |
|                   | Windcharger-1     | YES | 0.08  | 0.08  | 0.0 |
| -----             |                   |     |       |       |     |
| A9K-24X10GE-1G-CM | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-24X10GE-1G-SE | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |

|                   |                   |     |       |       |     |
|-------------------|-------------------|-----|-------|-------|-----|
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-24X10GE-1G-TR | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-400G-DWDM-TR  | CBC               | NO  | 42.04 | 42.04 | 0.0 |
|                   | Doran             | YES | 1.05  | 1.05  | 0.0 |
|                   | Frenzy            | YES | 49.00 | 49.00 | 0.0 |
|                   | IPU-FPGA          | YES | 1.97  | 1.97  | 0.1 |
|                   | IPU-FSBL          | YES | 1.103 | 1.103 | 0.1 |
|                   | IPU-Linux         | YES | 1.103 | 1.103 | 0.1 |
|                   | Martell           | YES | 1.03  | 1.03  | 0.0 |
|                   | Meldun            | YES | 1.07  | 1.07  | 0.1 |
|                   | Primary-BIOS      | YES | 8.51  | 8.51  | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-400GE-LSP     | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                   | CBC               | NO  | 63.03 | 63.03 | 0.0 |
|                   | IPU-DDR4          | YES | 1.05  | 1.05  | 0.0 |
|                   | Moonracer         | YES | 0.14  | 0.14  | 0.0 |
|                   | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                   | Skywarp-0         | YES | 0.11  | 0.11  | 0.0 |
|                   | Skywarp-1         | YES | 0.11  | 0.11  | 0.0 |
|                   | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                   | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
| -----             |                   |     |       |       |     |
| A9K-48X10GE-1G-CM | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |
|                   | Leadfoot-1        | YES | 1.00  | 1.00  | 0.1 |
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-48X10GE-1G-SE | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |
|                   | Leadfoot-1        | YES | 1.00  | 1.00  | 0.1 |
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-48X10GE-1G-TR | CBC               | NO  | 47.03 | 47.03 | 0.1 |
|                   | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                   | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                   | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                   | Leadfoot-0        | YES | 1.00  | 1.00  | 0.1 |
|                   | Leadfoot-1        | YES | 1.00  | 1.00  | 0.1 |
|                   | Lewis             | YES | 1.11  | 1.11  | 0.1 |
|                   | Primary-BIOS      | YES | 18.33 | 18.33 | 0.1 |
| -----             |                   |     |       |       |     |
| A9K-4HG-FLEX-FC   | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                   | CBC               | NO  | 63.03 | 63.03 | 0.0 |
|                   | IPU-DDR4          | YES | 1.05  | 1.05  | 0.0 |
|                   | Moonracer         | YES | 0.14  | 0.14  | 0.0 |
|                   | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                   | Skywarp-0         | YES | 0.11  | 0.11  | 0.0 |

|                    |                   |     |       |       |     |
|--------------------|-------------------|-----|-------|-------|-----|
|                    | Skywarp-1         | YES | 0.11  | 0.11  | 0.0 |
|                    | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                    | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4HG-FLEX-SE    | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                    | CBC               | NO  | 63.03 | 63.03 | 0.0 |
|                    | IPU-DDR4          | YES | 1.05  | 1.05  | 0.0 |
|                    | Moonracer         | YES | 0.14  | 0.14  | 0.0 |
|                    | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                    | Skywarp-0         | YES | 0.11  | 0.11  | 0.0 |
|                    | Skywarp-1         | YES | 0.11  | 0.11  | 0.0 |
|                    | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                    | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4HG-FLEX-TR    | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                    | CBC               | NO  | 63.03 | 63.03 | 0.0 |
|                    | IPU-DDR4          | YES | 1.05  | 1.05  | 0.0 |
|                    | Moonracer         | YES | 0.14  | 0.14  | 0.0 |
|                    | Primary-BIOS      | YES | 25.30 | 25.30 | 0.0 |
|                    | Skywarp-0         | YES | 0.11  | 0.11  | 0.0 |
|                    | Skywarp-1         | YES | 0.11  | 0.11  | 0.0 |
|                    | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                    | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4X100GE        | CBC               | NO  | 46.06 | 46.06 | 0.1 |
|                    | IPU-FPGA          | YES | 1.90  | 1.90  | 0.1 |
|                    | IPU-FSBL          | YES | 1.113 | 1.113 | 0.1 |
|                    | IPU-Linux         | YES | 1.113 | 1.113 | 0.1 |
|                    | Morra-0           | YES | 1.05  | 1.05  | 0.1 |
|                    | Primary-BIOS      | YES | 9.33  | 9.33  | 0.1 |
|                    | Sideswipe-0       | YES | 1.02  | 1.02  | 0.1 |
| -----              |                   |     |       |       |     |
| A9K-4X100GE-SE     | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                    | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                    | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                    | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                    | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                    | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                    | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |
|                    | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4X100GE-SE     | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                    | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                    | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                    | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                    | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                    | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                    | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |
|                    | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4X100GE-SE-TAA | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                    | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                    | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                    | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                    | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                    | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                    | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |
|                    | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| -----              |                   |     |       |       |     |
| A9K-4X100GE-TAA    | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                    | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                    | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                    | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                    | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |

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



|                    |                |     |       |       |     |
|--------------------|----------------|-----|-------|-------|-----|
|                    | 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 | 0.19  | 0.19  | 0.0 |

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

|                  |               |     |       |       |     |
|------------------|---------------|-----|-------|-------|-----|
|                  | 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 | 35.08 | 35.08 | 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 | 35.08 | 35.08 | 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 | 0.19  | 0.19  | 0.0 |
|                     | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
|                     | Trailbreaker-0    | YES | 0.24  | 0.24  | 0.0 |
|                     | Windcharger-0     | YES | 0.08  | 0.08  | 0.0 |
|                     | -----             |     |       |       |     |
| A9KL-4X100GE-SE-TAA | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                     | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                     | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                     | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                     | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                     | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                     | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |
|                     | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| -----               |                   |     |       |       |     |
| A9KL-4X100GE-TAA    | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                     | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                     | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                     | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                     | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                     | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                     | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |
|                     | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| -----               |                   |     |       |       |     |
| A9KL-4X100GE-TR-TAA | CBC               | NO  | 38.23 | 38.23 | 0.0 |
|                     | Dalla             | YES | 1.09  | 1.09  | 0.0 |
|                     | IPU-FPGA          | YES | 1.99  | 1.99  | 0.0 |
|                     | IPU-FSBL          | YES | 1.113 | 1.113 | 0.0 |
|                     | IPU-Linux         | YES | 1.113 | 1.113 | 0.0 |
|                     | Meldun-0          | YES | 1.07  | 1.07  | 0.0 |
|                     | Meldun-1          | YES | 1.07  | 1.07  | 0.0 |

|                     |                   |     |       |       |     |
|---------------------|-------------------|-----|-------|-------|-----|
|                     | Primary-BIOS      | YES | 8.51  | 8.51  | 0.0 |
| ASR-9006-AC         | CBC               | NO  | 7.105 | 7.105 | 0.0 |
| ASR-9006-AC-V2      | CBC               | NO  | 7.105 | 7.105 | 0.0 |
| ASR-9006-FAN        | CBC               | NO  | 5.04  | 5.04  | 0.0 |
| ASR-9006-FAN-V2     | CBC               | NO  | 5.05  | 5.05  | 0.0 |
| ASR-9010-AC         | CBC               | NO  | 7.105 | 7.105 | 0.0 |
| ASR-9010-AC-V2      | CBC               | NO  | 7.105 | 7.105 | 0.0 |
| ASR-9010-FAN        | CBC               | NO  | 4.03  | 4.03  | 0.0 |
| ASR-9010-FAN-V2     | CBC               | NO  | 29.12 | 29.12 | 0.0 |
| ASR-9901-LC         | CBC               | NO  | 55.07 | 55.07 | 0.1 |
|                     | Gamora-FPGA       | YES | 0.36  | 0.36  | 0.1 |
|                     | IPU-FPGA          | YES | 1.10  | 1.10  | 0.1 |
|                     | IPU-FSBL          | YES | 1.104 | 1.104 | 0.1 |
|                     | IPU-Linux         | YES | 1.104 | 1.104 | 0.1 |
|                     | Primary-BIOS      | YES | 23.22 | 23.22 | 0.1 |
| ASR-9901-RP         | CBC               | NO  | 54.11 | 54.11 | 0.1 |
|                     | Drax-FPGA         | YES | 0.38  | 0.38  | 0.1 |
|                     | IPU-FPGA          | YES | 2.05  | 2.05  | 0.1 |
|                     | IPU-FSBL          | YES | 1.104 | 1.104 | 0.1 |
|                     | IPU-Linux         | YES | 1.104 | 1.104 | 0.1 |
|                     | Primary-BIOS      | YES | 22.28 | 22.28 | 0.1 |
| ASR-9902            | FAN-CBC           | NO  | 61.25 | 61.25 | 0.0 |
| ASR-9902-LC         | Aldrin-FPGA       | YES | 1.05  | 1.05  | 0.0 |
|                     | CBC               | NO  | 17.03 | 17.03 | 0.0 |
|                     | Chromia           | YES | 0.14  | 0.14  | 0.0 |
|                     | IPU-DDR4          | YES | 1.17  | 1.17  | 0.0 |
|                     | Primary-BIOS      | YES | 34.30 | 34.30 | 0.0 |
|                     | Skywarp-0         | YES | 0.11  | 0.11  | 0.0 |
|                     | Skywarp-1         | YES | 0.11  | 0.11  | 0.0 |
|                     | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                     | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
| ASR-9903            | FAN-CBC           | NO  | 61.25 | 61.25 | 0.0 |
| ASR-9903-LC         | Aldrin-0-FPGA     | YES | 1.05  | 1.05  | 0.0 |
|                     | CBC               | NO  | 60.12 | 60.12 | 0.0 |
|                     | Harpoon-0         | YES | 0.11  | 0.11  | 0.0 |
|                     | Harpoon-1         | YES | 0.11  | 0.11  | 0.0 |
|                     | IPU-DDR4          | YES | 1.25  | 1.25  | 0.0 |
|                     | Metalmaster-0     | YES | 0.02  | 0.02  | 0.0 |
|                     | Metalmaster-1     | YES | 0.02  | 0.02  | 0.0 |
|                     | Primary-BIOS      | YES | 34.30 | 34.30 | 0.0 |
|                     | Scattershot       | YES | 0.14  | 0.14  | 0.0 |
|                     | Sunstreaker       | YES | 0.19  | 0.19  | 0.0 |
|                     | Supernaut         | YES | 0.14  | 0.14  | 0.0 |
|                     | TAMFW-Sunstreaker | YES | 2.72  | 2.72  | 0.0 |
|                     | Warstar-0         | YES | 0.02  | 0.02  | 0.0 |
|                     | Warstar-1         | YES | 0.02  | 0.02  | 0.0 |
| ASR-9903-PXC800G-LC | Harpoon-0         | YES | 0.11  | 0.11  | 0.0 |
|                     | Harpoon-1         | YES | 0.11  | 0.11  | 0.0 |

|                 |               |     |       |       |      |
|-----------------|---------------|-----|-------|-------|------|
| ASR-9904-AC     | CBC           | NO  | 7.105 | 7.105 | 0.0  |
| ASR-9904-FAN    | CBC           | NO  | 31.06 | 31.06 | 0.0  |
| ASR-9906        | CBC           | NO  | 7.105 | 7.105 | 0.0  |
| ASR-9906-FAN    | CBC           | NO  | 56.01 | 56.01 | 0.0  |
|                 | PSOC          | NO  | 2.06  | 2.06  | 0.0  |
| ASR-9910        | CBC           | NO  | 7.105 | 7.105 | 0.0  |
| ASR-9910-FAN    | CBC           | NO  | 45.02 | 45.02 | 0.0  |
|                 | PSOC          | NO  | 2.06  | 2.06  | 0.0  |
| ASR-9912-AC     | CBC           | NO  | 7.105 | 7.105 | 0.0  |
| ASR-9912-FAN    | CBC           | NO  | 31.06 | 31.06 | 0.0  |
| ASR-9912-SFC220 | CBC           | NO  | 37.20 | 37.20 | 0.0  |
|                 | IPU-FPGA      | YES | 0.37  | 0.37  | 0.0  |
|                 | IPU-FSBL      | YES | 1.100 | 1.100 | 0.0  |
|                 | IPU-Linux     | YES | 1.100 | 1.100 | 0.0  |
| ASR-9922-AC     | CBC-0         | NO  | 7.105 | 7.105 | 0.0  |
|                 | CBC-1         | NO  | 7.105 | 7.105 | 0.0  |
| ASR-9922-FAN    | CBC           | NO  | 29.12 | 29.12 | 0.0  |
| ASR-9922-FAN-V2 | CBC           | NO  | 40.07 | 40.07 | 0.0  |
|                 | PSOC          | NO  | 2.06  | 2.06  | 0.0  |
| ASR-9922-FAN-V3 | CBC           | NO  | 40.07 | 40.07 | 0.0  |
|                 | PSOC          | NO  | 2.06  | 2.06  | 0.0  |
| PWR-1.6KW-AC    | PO-PrimMCU    | NO  | 17.20 | 17.20 | 0.0  |
|                 | QCS-PrimMCU   | NO  | 3.02  | 3.02  | 0.1  |
|                 | QCS-SecMCU    | NO  | 4.04  | 4.04  | 0.1  |
| PWR-1.6KW-DC    | PrimMCU       | NO  | 1.03  | 1.03  | 0.0  |
| PWR-2KW-DC-V2   | DT-PrimMCU    | 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-PrimMCU    | 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-PrimMCU    | NO  | 6.02  | 6.02  | 1.0  |
|                 | DT-Sec54vMCU  | NO  | 6.02  | 6.02  | 1.0  |
|                 | DT-Sec5vMCU   | NO  | 6.04  | 6.04  | 1.0  |
|                 | EM-Sec54vMCU  | NO  | 3.12  | 3.12  | 0.21 |
|                 | EM-Sec5vMCU   | NO  | 3.18  | 3.18  | 0.21 |
| PWR-3KW-HVDC    | DT-PrimMCU    | NO  | 2.02  | 2.02  | 1.0  |
|                 | DT-Sec54vMCU  | NO  | 2.02  | 2.02  | 1.0  |
|                 | DT-Sec5vMCU   | NO  | 2.03  | 2.03  | 1.0  |
| PWR-4.4KW-DC-V3 | AB-Pri0MCU    | NO  | 3.02  | 3.02  | 0.1  |
|                 | AB-Pri1MCU    | NO  | 3.02  | 3.02  | 0.1  |
|                 | AB-Sec054vMCU | NO  | 3.04  | 3.04  | 0.1  |
|                 | AB-Sec154vMCU | NO  | 3.04  | 3.04  | 0.1  |
|                 | AB-Sec5vMCU   | NO  | 3.06  | 3.06  | 0.1  |
|                 | DT-Pri0MCU    | NO  | 3.01  | 3.01  | 0.1  |
|                 | DT-Pri1MCU    | NO  | 3.01  | 3.01  | 0.1  |

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

## Supported Hardware

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

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

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

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

| Cisco ASR 9000 Series Aggregation Services Router - Route Switch Processor Cards |   |   |
|--|---|---|
| Part Number  | Description   | Support Initially Provided in IOS XR 64 bit Release |
| A9K-RSP5-X-SE  | ASR 9000 Series Route Switch Processor 5 for Service Edge, Premium  | Release 7.6.2                                       |
| A9K-RSP5-X-TR  | ASR 9000 Series Route Switch Processor 5 for Packet Transport, Premium  | Release 7.6.2                                       |
| A9K-RSP5-SE  | ASR 9000 Route Switch Processor 5 for Service Edge  | Release 6.5.15                                      |
| A9K-RSP5-TR  | ASR 9000 Route Switch Processor 5 for Packet Transport  | Release 6.5.15                                      |
| 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  |
| <b>Cisco ASR 9000 Series Aggregation Services Router - Route Processor Cards</b> |  |  |
| <b>Part Number</b>   | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9901 Router</b>   |  |  |
| <b>Part Number</b>   | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9902 Router</b>   |  |  |
| <b>Part Number</b>   | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9903 Router</b> |   |  |
| <b>Part Number</b>           | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9904 Router</b> |   |  |
| <b>Part Number</b>           | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9912 Router</b> |   |  |
| <b>Part Number</b>           | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |

|                              |  |  |
|------------------------------|--|--|
| 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  |
| <b>Cisco ASR 9922 Router</b> |  |  |
| <b>Part Number</b>           | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9006 Router</b> |  |  |
| <b>Part Number</b>           | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| ASR-9006-SYS                 | Cisco ASR 9000 Series Aggregation Services Router 6-Slot System                                  | Release 6.1.2  |

|                              |  |  |
|------------------------------|--|--|
| ASR-9006-AC-V2               | Cisco ASR 9000 Series Aggregation Services Router 6-Slot AC Chassis Version 2  | Release 6.1.2  |
| ASR-9006-DC-V2               | Cisco ASR 9000 Series Aggregation Services Router 6-Slot DC Chassis Version 2  | Release 6.1.2  |
| ASR-9006-FAN                 | Cisco ASR 9000 Series Aggregation Services Router 6-Slot Fan Tray              | Release 6.1.2  |
| ASR-9006-DOOR                | Cisco ASR 9000 Series Aggregation Services Router 6-Slot Door Kit              | Release 6.1.2  |
| ASR-9006-FILTER              | Cisco ASR 9000 Series Aggregation Services Router 6-Slot Air Filter            | Release 6.1.2  |
| <b>Cisco ASR 9906 Router</b> |  |  |
| <b>Part Number</b>           | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco ASR 9010 Router</b> |  |  |
| <b>Part Number</b>           | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| ASR-9010-SYS                 | Cisco ASR 9000 Series Aggregation Services Router 10-Slot System               | Release 6.1.2  |
| ASR-9010-AC-V2               | Cisco ASR 9000 Series Aggregation Services Router 10-Slot AC Chassis Version 2 | Release 6.1.2  |
| ASR-9010-DC-V2               | Cisco ASR 9000 Series Aggregation Services Router 10-Slot DC Chassis Version 2 | Release 6.1.2  |
| ASR-9010-FAN                 | Cisco ASR 9000 Series Aggregation Services Router 10-Slot Fan Tray             | Release 6.1.2  |
| ASR-9010-DOOR                | Cisco ASR 9000 Series Aggregation Services Router 10-Slot Door Kit             | Release 6.1.2  |
| ASR-9010-2P-KIT              | Cisco ASR 9000 Series Aggregation Services Router 2 Post Mounting Kit          | Release 6.1.2  |
| ASR-9010-2P-KIT              | Cisco ASR 9000 Series Aggregation Services Router 4 Post Mounting Kit          | Release 6.1.2  |
| ASR-9010-FILTER              | Cisco ASR 9000 Series Aggregation Services Router 10-Slot Air Filter           | Release 6.1.2  |
| <b>Cisco ASR 9910 Router</b> |  |  |

| <b>Part Number</b> | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
|--------------------|---|--|
| 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**

| <b>Part Number</b> | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
|--------------------|---|--|
| 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   |
| <b>Cisco ASR 9000 Series Aggregation Services Router - Line Cards</b> |   |  |
| <b>Part Number</b>  | <b>Description</b>  | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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<br>A9K-20HG-FLEX-TR                                  | ASR 9000 2T Combo Line Card - 5th Generation  | Release 7.1.15   |
| A9K-8HG-FLEX-SE<br>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  |

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| 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  |
| <b>Cisco ASR 9000 Series Aggregation Services Router - Modular Line Cards</b> |  |  |
| <b>Part Number</b>  | Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Packet Transport Optimized<br>Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Service Edge Optimized | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| A9K-MOD200-TR<br>A9K-MOD200-SE  | Cisco ASR 9000 Modular 400G Consumption Model Line Card  | Release 6.3.1  |
| A9K-MOD400-CM   | Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Service Edge Optimized   | Release 6.2.1  |

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| A9K-MOD400-SE   | Cisco ASR 9000 Series Aggregation Services Router 400 Gigabyte Modular Line Card, Packet Transport Optimized   | Release 6.2.1  |
| A9K-MOD400-TR   | Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Packet Transport Optimized<br>Cisco ASR 9000 Series Aggregation Services Router 200 Gigabit Modular Line Card, Service Edge Optimized | Release 6.2.1  |
| <b>Cisco ASR 9000 Series Aggregation Services Router - Modular Port Adapters (MPAs)</b> |  |  |
| <b>Part Number</b>  | <b>Description</b>   | <b>Support Initially Provided in IOS XR 64 bit Release</b> |
| 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  |
| <b>Cisco Digital Pluggable Optical Modules</b>  |  |  |
| 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  |
| <b>Cisco ASR 9000v Satellite Shelf</b>  |  |  |



| 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                                       |
| <b>Cisco NCS 5000 Satellite Shelf</b> |   |   |
| Part Number                           | Description   | Support Initially Provided in IOS XR 64 bit Release |
| NCS-5001                              | Cisco NCS 5001 Series Router                                    | Release 6.2.1                                       |
| NCS-5002                              | Cisco NCS 5002 Series Router                                    | Release 6.2.1                                       |
| NCS-5001-ACSR                         | Cisco NCS 5001 Router Accessory Kit                             | Release 6.2.1                                       |
| NCS-5002-ACSR                         | Cisco NCS 5002 Router Accessory Kit                             | Release 6.2.1                                       |
| NCS-5001-FN-BK                        | Cisco NCS 5001 Router Fan Back to Front AirFlow                 | Release 6.2.1                                       |
| NCS-5002-FN-BK                        | Cisco NCS 5002 Router Fan Back to Front AirFlow                 | Release 6.2.1                                       |
| NCS-5001-FLT-BK                       | Cisco NCS 5001 Air Filter Back to Front Airflow                 | Release 6.2.1                                       |
| NCS-5002-FLT-BK                       | Cisco NCS 5002 Air Filter Back to Front Airflow                 | Release 6.2.1                                       |
| NCS-5001-FN-FR                        | Cisco NCS 5001 Fan Front to Back Airflow                        | Release 6.2.1                                       |
| NCS-5002-FN-FR                        | Cisco NCS 5002 Fan Front to Back Airflow                        | Release 6.2.1                                       |
| NCS-5001-FLT-FR                       | Cisco NCS 5001 Air Filter Front to Back Airflow                 | Release 6.2.1                                       |
| NCS-5002-FLT-FR                       | Cisco NCS 5002 Air Filter Front to Back Airflow                 | Release 6.2.1                                       |

## Compatibility Matrix for EPNM and Crosswork with Cisco IOS XR Software

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

**Table 5: Compatibility Matrix**

| Cisco IOS XR   | Crosswork   | EPNM   |
|----------------|---|--|
| Release 7.11.1 | <a href="#">Crosswork Optimization Engine 6.0</a> | <a href="#">Evolved Programmable Network Manager 7.1.1</a> |

## Important Notes

- Repetitive Smart Licensing evaluation expired warning messages are displayed on the console every hour, but no functionality impact is observed on the device. To stop these repetitive messages, you should register the device again with a new registration token.
- From IOS XR Release 7.0, 1st and 2nd generation of Ethernet ASR 9000 line cards are not supported.
- Country-specific laws, regulations, and licenses—In certain countries, use of these products may be prohibited and subject to laws, regulations, or licenses, including requirements applicable to the use of the products under telecommunications and other laws and regulations; customers must comply with all such applicable laws in the countries in which they intend to use the products.
- Exceeding Cisco testing—If you intend to test beyond the combined maximum configuration tested and published by Cisco, contact your Cisco Account Team or Technical Support representative to discuss how to engineer a large-scale configuration for your purpose.
- The ISSU SMU for ASR 9000 third-generation line cards will be supported until the Cisco IOS XR Releases 7.11.x only.
- 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";
  } elseif 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.



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**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.

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## 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>





**Americas Headquarters**  
Cisco Systems, Inc.  
San Jose, CA 95134-1706  
USA

**Asia Pacific Headquarters**  
CiscoSystems(USA)Pte.Ltd.  
Singapore

**Europe Headquarters**  
CiscoSystemsInternationalBV  
Amsterdam,TheNetherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).