

Cisco IOS XR Software Release 3.7.2 for Cisco ASR 9000 Series Aggregation Services Routers

PB500024

Product Overview

The Cisco ASR 9000 Series delivers exceptional scale, service flexibility, and high availability into Carrier Ethernet transport networks. It is powered by Cisco IOS® XR Software – an innovative, self-healing, distributed operating system designed for always-on operation while scaling system capacity up to 6.4 Tbps. Cisco IOS® XR Software Release 3.7.2 introduces support for the Cisco ASR 9000 Series Router, which is designed to address the Carrier Ethernet foundation for visual networking. The Cisco ASR 9000 further enhances the IP Next-Generation Network (NGN) Carrier Ethernet design for converged, resilient, intelligent, and scalable transport of consumer, business, wholesale, and mobile services. Carrier Ethernet applications supported include residential broadband services such as IPTV, business services such as Layer 2 and Layer 3 VPN (L2VPN and L3VPN, respectively), and next-generation mobile backhaul transport.

Cisco IOS XR Software Release 3.7.2 introduces the Cisco ASR 9000 Series, a new route switch processor, 40-port Gigabit Ethernet, 4-port 10 Gigabit Ethernet, and 8-port 10 Gigabit Ethernet line cards. New software features are also supported for the Cisco ASR 9000 Series, including Ethernet services; L2VPN; IPv4, IPv6, and L3VPN; Layer 2 and Layer 3 Multicast; Ethernet operations, administration, and management (E-OAM); Multiprotocol Label Switching (MPLS) OAM; Layer 2 and Layer 3 access control lists (ACLs); hierarchical quality of service (H-QoS); MPLS Traffic Engineering/Fast Reroute (MPLS TE/FRR); and Nonstop Forwarding/Nonstop Routing (NSF/NSR).

New Hardware Features

Table 1 lists the hardware modules that Cisco IOS XR Software Release 3.7.2 supports.

Table 1. New Hardware Supported on Cisco ASR 9000 in Cisco IOS XR Software Release 3.7.2

Part Number	Description
ASR-9010-AC=	ASR-9010 AC Chassis
ASR-9010-DC=	ASR-9010 DC Chassis
ASR-9006-AC=	ASR-9006 AC Chassis
ASR-9006-DC=	ASR-9006 DC Chassis
A9K-RSP-4G=	ASR9K Fabric, Controller, 4G memory
A9K-40GE-B=	ASR9K, 40xGE Line Card
A9K-40GE-E=	ASR9K, 40xGE Extended Line Card
A9K-4T-B=	ASR9K, 4x10GE Line Card
A9K-4T-E=	ASR9K, 4x10GE Extended Line Card
A9K-8T/4-B=	ASR9K, 8x10GE DX Line Card
A9K-8T/4-E=	ASR9K, 8x10GE DX Extended Line Card

New Software Features

Table 2 lists new software features in Cisco IOS XR Software Release 3.7.2 supported on the Cisco ASR 9000 Series Aggregation Services Routers.

Table 2. New Software Features Supported on Cisco ASR 9000 in Cisco IOS XR Software Release 3.7.2

Part Number	Description
Cisco IOS XR Software support	<ul style="list-style-type: none"> • Modular software design: Cisco IOS XR Software represents a continuation of the Cisco networking leadership in helping customers realize the power of their networks and the Internet. It provides unprecedented routing-system scalability, high availability, service isolation, and manageability to meet the mission-critical requirements of next-generation networks. • Operating system infrastructure protection: Cisco IOS XR provides a microkernel architecture that forces all but the most critical functions, such as memory management and thread distribution, outside of the kernel, thereby preventing failures in applications, file systems, and even device drivers from causing widespread service disruption. • Process and thread protection: Each process – even individual process threads – is executed in its own protected memory space, and communications between processes are accomplished through well-defined, secure, and version-controlled application programming interfaces (APIs), significantly minimizing the effect that any process failure can have on other processes. • Cisco In-Service Software Upgrade (ISSU): Cisco IOS XR Software modularity sustains system availability during installation of a software upgrade. ISSUs or hitless software upgrades (HSUs) allow you to upgrade most Cisco ASR 9000 software features without affecting deployed services. You can target particular system components for upgrades based on software packages or composites that group selected features. Cisco preconfigures and tests these packages and composites to help ensure system compatibility. • Process restart: You can restart critical control-plane processes both manually and automatically in response to a process failure versus restarting the entire operating system. This feature supports the Cisco IOS XR goal of continuous system availability and allows for quick recovery from process or protocol failures with minimal disruption to customers or traffic. • State checkpointing: You can maintain a memory and critical operating state across process restarts in order to sustain routing adjacencies and signaling state during a route-switch-processor (RSP) switchover.
Flexible Ethernet services	<ul style="list-style-type: none"> • Ethernet virtual connections (EVCs): Ethernet services are supported using individual EVCs to carry traffic belonging to a specific service type or end user through the network. You can use EVC-based services in conjunction with MPLS-based L2VPNs and native IEEE bridging deployments. • Flexible VLAN classification: VLAN classification into Ethernet flow points (EFPs) includes single-tagged VLANs, double-tagged VLANs (QinQ and 802.1ad), contiguous VLAN ranges, and noncontiguous VLAN lists. • IEEE Bridging: The software supports native bridging based on IEEE 802.1Q, IEEE 802.1ad, and QinQ VLAN encapsulation mechanisms on the Cisco ASR 9000 Series. • IEEE 802.1s Multiple Spanning Tree (MST): MST extends the 802.1w Rapid Spanning Tree Protocol (MSTP) to multiple spanning trees, providing rapid convergence and load balancing. • MST Access Gateway: This feature provides a resilient, fast-convergence mechanism for aggregating and connecting to Ethernet-based access rings.
L2VPN services	<ul style="list-style-type: none"> • Virtual Private LAN Services (VPLS): VPLS is a class of VPN that supports the connection of multiple sites in a single, bridged domain over a managed IP/MPLS network. It presents an Ethernet interface to customers, simplifying the LAN and WAN boundary for service providers and customers, and enabling rapid and flexible service provisioning because the service bandwidth is not tied to the physical interface. All services in a VPLS appear to be on the same LAN, regardless of location. • Hierarchical VPLS (H-VPLS): H-VPLS provides a level of hierarchy at the edge of the VPLS network for increased scale. QinQ access and H-VPLS pseudowire access options are supported. • Virtual Private WAN Services/Ethernet over MPLS (VPWS/EoMPLS): EoMPLS transports Ethernet frames across an MPLS core using pseudowires. Individual EFPs or an entire port can be transported over the MPLS backbone using pseudowires to an egress interface or subinterface. • Pseudowire redundancy: Pseudowire redundancy supports the definition of a backup pseudowire to protect a primary pseudowire that fails. • Multisegment pseudowire stitching: Multisegment pseudowire stitching is a method for interworking two pseudowires together to form a cross-connect relationship.
Multicast	<ul style="list-style-type: none"> • IPv4 Multicast: IPv4 Multicast supports Internet Group Management Protocol Versions 2 and 3 (IGMPv2/v3), Protocol Independent Multicast Source Specific Multicast (SSM) and Sparse Mode (SM), Multicast Source Discovery Protocol (MSDP), and Anycast Rendezvous Point (RP). • IGMP v2/v3 Snooping: This Layer 2 mechanism efficiently tracks multicast membership on an L2VPN network. Individual IGMP joins are snooped at the VLAN level or pseudowire level and then summarizes results into a single upstream join message. In residential broadband deployments, this feature enables the network to send only channels that are being watched to the downstream users.
OAM	<ul style="list-style-type: none"> • E-OAM (IEEE 802.3ah): Ethernet link layer OAM is a vital component of EOAM that provides physical-link OAM to monitor link health and assist in fault isolation. Along with 802.1ag, Ethernet link layer OAM can be used to assist in rapid link-failure detection and signaling to remote end nodes of a local failure. • E-OAM (IEEE 802.1ag): Ethernet Connectivity Fault Management is a subset of EOAM that provides numerous mechanisms and procedures that allow discovery and verification of the path through 802.1 bridges and LANs. • MPLS OAM: This protocol supports label-switched-path (LSP) ping, LSP TraceRoute, and virtual circuit

Part Number	Description
	connectivity verification (VCCV).
Layer 3 routing	<ul style="list-style-type: none"> • IPv4 Routing: Cisco IOS XR Software supports a wide range of IPv4 services and routing protocols, including Border Gateway Protocol (BGP), Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), static routing, IPv4 Multicast, Routing Policy Language (RPL), and Hot Standby Router Protocol (HSRP) and Virtual Router Redundancy Protocol (VRRP) features. • IPv6 Routing: Cisco IOS XR Software supports IPv6 services including OSPFv3 and static routing. • BGP Prefix Independent Convergence (PIC): This feature provides the ability to converge BGP routes using the fast-convergence innovation that is unique to Cisco IOS XR Software.
MPLS L3VPN	<ul style="list-style-type: none"> • MPLS L3VPN: The IP VPN feature for MPLS allows a Cisco IOS Software or Cisco IOS-XR Software network to deploy scalable IPv4 Layer 3 VPN backbone services. An IP VPN is the foundation that companies use for deploying or administering value-added services, including applications and data hosting network commerce and telephony services to business customers. • Carrier Supporting Carrier (CSC): CSC allows a MPLS VPN service provider to connect geographically isolated sites using another backbone service provider and still maintain a private address space for its customer VPNs. It is implemented as defined by IETF RFC 4364.
QoS	<ul style="list-style-type: none"> • QoS: Comprehensive QoS support with up to 3 million queues, Class-Based Weighted Fair Queuing (CBWFQ) based on a three-parameter scheduler, Weighted Random Early Detection (WRED), two-level strict priority scheduling with priority propagation, and 2-rate, 3-color (2R3C) Policing are all supported. • Cisco IOS XR Software: This software supports a rich variety of QoS mechanisms, including policing, marking, queuing, dropping, and shaping. Additionally, the operating systems support Modular QoS CLI (MQC). Modular CLI is used to configure various QoS features on various Cisco platforms. • H-QoS: Four-level H-QoS support is provided for EVCs with the following hierarchy levels: port, group of EFPs, EFP, and class of service. This level of support allows for per-service and per-end user QoS granularity.
MPLS TE	<ul style="list-style-type: none"> • MPLS TE: Cisco IOS XR Software supports MPLS protocols such as Traffic Engineering/Fast Reroute (TE-FRR), Resource Reservation Protocol (RSVP), Label Distribution Protocol (LDP), and Targeted Label Distribution Protocol (T-LDP). • MPLS TE Preferred Path: Preferred tunnel path functions let you map pseudowires to specific TE tunnels. Attachment circuits are cross-connected to specific MPLS TE tunnel interfaces instead of remote provider-edge router IP addresses (reachable using Interior Gateway Protocol [IGP] or Label Distribution Protocol [LDP]).
High availability	<ul style="list-style-type: none"> • MPLS TE FRR: This feature delivers Layer 3 protection switching for networks currently configured with MPLS LSPs. MPLS TE FRR provides temporary rerouting around a failed link or node. • Bidirectional Forwarding Detection (BFD): BFD is a detection protocol that is designed to provide fast-forwarding path failure detection times for all media types, encapsulations, topologies, and routing protocols. It is supported for OSPFv2, IS-IS, PIM v4, and BFD-triggered FRR. • Standard IEEE 802.3ad link aggregation bundles: A bundle of multiple links can be supported to provide added resiliency and the ability to load balance traffic over multiple member links. • NSF: NSF support for BGP, OSPF, IS-IS, MPLS-TE, LDP, and T-LDP allows traffic to continue to be forwarded if a failure occurs. This feature requires neighboring nodes to be NSF-aware. • NSR: NSR maintains OSPFv2 and LDP sessions and state information across Stateful Switchover (SSO) functions as well as ISSU support on a provider-edge device providing MPLS VPN services.
Manageability	<ul style="list-style-type: none"> • Cisco IOS XR Software manageability: This feature provides industry-standard management interfaces, including a modular command-line interface (CLI), Simple Network Management Protocol (SNMP), and native XML interfaces. • Cisco Active Network Abstraction (ANA): Cisco ANA is a flexible, vendor-neutral network resource-management solution for a multitechnology, multiservice network environment. Operating between the network and the operations-support-system (OSS) layer, Cisco ANA aggregates virtual network elements (VNEs) into a software-based virtual network, much as real network elements create the real-world network. Cisco ANA dynamically discovers network components and tracks the status of network elements in near real time. • Cisco ANA offers service providers: <ul style="list-style-type: none"> ◦ Simplified integration of OSS applications with network information ◦ A flexible common infrastructure for managing network resources ◦ Consistent procedures and interfaces for all network elements
Security	<ul style="list-style-type: none"> • Cisco IOS XR Software: This software provides comprehensive network security features, including ACLs; control-plane protection; routing authentications; authentication, authorization, and accounting (AAA); TACACS+; IP Security (IPsec); Secure Shell (SSH) Protocol; SNMPv3; and leading Routing Policy Language (RPL) support. • Layer 2 ACLs: You can use this security feature to filter packets under an EVC based on MAC addresses. • Layer 3 ACLs: This feature matches ACLs by IPv4 protocol packet attributes. • Security: Many critical security features are supported: <ul style="list-style-type: none"> ◦ Standard 802.1ad Layer 2 Control Protocol (L2CP) and bridge-protocol-data-unit (BPDU) filtering ◦ MAC limiting per EFP or bridge domain ◦ Unicast, multicast, and broadcast storm control blocking on any interface or port ◦ Unknown Unicast Flood Blocking (UUFB) ◦ Dynamic Host Configuration Protocol (DHCP) Snooping ◦ Unicast Reverse Path Forwarding (URPF) ◦ Control-plane security

Ordering Information

Table 3 lists ordering information for Cisco IOS XR Software Release 3.7.2 for Cisco ASR 9000 Series. Only these part numbers are orderable. When future releases of Cisco IOS Software Release 3.7.0 are available, if you order these part numbers we will automatically ship the latest release.

Table 3. Ordering Information for Cisco IOS XR Software Release 3.7.2 for Cisco ASR 9000 Series

Product Name	Part Number
A9K-03.07	Cisco IOS-XR IP/MPLS Core Software
A9K-K9-03.07	Cisco IOS-XR IP/MPLS Core Software 3DES

Release 3.7 Lifecycle

The Cisco IOS XR Software release strategy is time-based, with a fixed release date and lifecycle, as opposed to being a feature-based release strategy with a variable release date. Table 4 lists the major milestones of Cisco IOS XR Software Release 3.7.2 and later.

Table 4. Major Milestones for Cisco IOS XR Software Release 3.7.2 and Later

Milestone	Definition	Date
Availability date	The date that the Cisco IOS XR Software Release 3.7.2 information is published on Cisco.com and becomes available to the general public.	March 27, 2009
End-of-life announcement date	The official End-of-Life document that announces the end of sale and end of life of Cisco IOS XR 3.7 is distributed to the public.	December 27, 2009
End-of-sale date and end-of-maintenance date	The last date to order the product through Cisco point-of-sale mechanisms. The product is no longer for sale after this date. This date also marks the end of engineering, maintenance rebuilds, and software fixes of rebuilds of Release 3.7.x. After this date, maintenance rebuilds and software-fix support will be provided only through rebuilds of Cisco IOS XR Release 3.9 or later. Refer to guidelines for Cisco IOS XR Software (refer to link in the next paragraph).	September 27, 2010
Last date of support	This is the last date to receive service and support for the product. After this date, all support services for the product are unavailable and the product becomes obsolete.	March 27, 2014

For official end-of-life and end-of-sale announcements for Cisco IOS XR Software, please visit http://www.cisco.com/en/US/products/ps5845/prod_eol_notices_list.html or contact your local Cisco account representative.

For More Information

For more information about the Cisco ASR 9000 Series or Cisco IOS XR Software, visit <http://www.cisco.com/> or contact your local Cisco account representative.



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