Cisco IOS XR Software Release 4.2.0 for Cisco ASR 9000 Series Routers

Product Overview

The Cisco® ASR 9000 Series Aggregation Services Routers deliver unprecedented 10-Gb and 100-Gb port density, scale, service flexibility, and high availability into Carrier Ethernet, Broadband Network Gateway (BNG), Data Center Interconnect (DCI), Data Center WAN, mobile backhaul transport, video on demand (VoD) and business VPN services transport networks. The routers are powered by Cisco IOS® XR Software, an innovative, self-healing, distributed operating system designed for always-on operation.

Cisco IOS XR Software Release 4.2.0 provides new software and hardware feature support for Cisco ASR 9000 Series routers. This release further enhances the role of the Cisco ASR 9000 Series in the IP Next-Generation Network (NGN). The Cisco IP NGN delivers a Carrier Ethernet design for converged, resilient, intelligent, and scalable transport of consumer, business, wholesale, and mobile services. Applications supported within this framework include residential broadband services with high-scale Ethernet subscriber and session awareness, Internet Protocol Television (IPTV) and VoD, Layer 2 (L2) and Layer 3 (L3) business-VPN services, DCI, and next-generation mobile backhaul transport.

New Hardware Features

Cisco IOS XR Software Release 4.2.0 introduces support for the following new hardware.

- **Route Switch Processor (RSP) 440:** The Cisco ASR 9000 Series RSP 440 is designed to deliver the high scalability, performance, and fast convergence required for today's and tomorrow's video, cloud, and mobile services. The Cisco RSP 440 provides a superior set of features that deliver unprecedented scale, service flexibility, and high availability. The RSP includes an active-active, low latency, nonblocking switch fabric architecture that provides service intelligence, traffic prioritization, scalability, and high availability. Cisco RSP 440 also provides superior network timing capabilities with support for centralized Building Integrated Timing Supply (BITS), DOCSIS® Timing Interface (DTI) timing reference systems, Precision Time Protocol (PTP) or IEEE 1588-2008, and bidirectional time of day (ToD) with 10-MHz and 1-pps interfaces. The RSP is available in Service Edge Optimized and Packet Transport Optimized models. The Service Edge Optimized version offers the higher amount of memory essential for large-scale comprehensive service deployments.

- **24-Port 10 Gigabit Ethernet Line Card and 2-Port 100 Gigabit Ethernet Line Card**: The Cisco ASR 9000 Series 24-Port 10 Gigabit Ethernet Line Cards deliver industry-leading twenty-four 10 Gigabit Ethernet ports to any slot of a Cisco ASR 9000 Series Aggregation Services Router. The Cisco ASR 9000 Series 2-Port 100 Gigabit Ethernet Line Cards deliver an industry-leading two 100 Gigabit Ethernet ports to any slot of a Cisco ASR 9000 Series Aggregation Services Router. These high-capacity line cards are designed to remove bandwidth bottlenecks in the network today that are caused by a large increase in VoD, IPTV, point-to-point video, Internet video, and cloud computing traffic. The line cards are available in Service Edge Optimized and Packet Transport Optimized variants. The Service Edge Optimized line cards are designed for customer deployments requiring high scale, comprehensive services, and enhanced

quality of service (QoS), while the Packet Transport Optimized line cards are designed for network deployments where basic scale and QoS is required.

- **Mod80 Modular Line Card:** The Cisco ASR 9000 Series Mod80 Modular Line Cards provide customers with a flexible solution supporting multiple combinations of Ethernet ports, all in a single slot of the Cisco ASR 9000 Series Aggregation Services Routers. Each modular line card supports up to two modular port adapters that come in the following modular port adapter types:
    ◦ 20-port Gigabit Ethernet
    ◦ 4-port 10-Gigabit Ethernet

    Using the modular line cards, the Cisco ASR 9000 Series can support customer applications including VoD, IPTV, point-to-point video, Internet video, and cloud-based computing. The line cards are available in Service Edge Optimized and Packet Transport Optimized variants. Service Edge Optimized line cards are designed for customer deployments requiring high scale, comprehensive services, and enhanced QoS, while Packet Transport Optimized line cards are designed for network deployments where basic scale and QoS is required.

- **Power Entry Module and Power Supply Version 2:** The new Power Entry Module Version 2 (PEMv2) and Power Supply Version 2 for the Cisco ASR 9010 and ASR 9006 routers provide investment protection by offering increased power efficiency and power density per Cisco ASR 9006 and ASR 9010 chassis. Cisco PEMv2 is capable of holding up to four v2 power supplies. PEMv2 is field upgradeable or may be configured with the Cisco ASR 9010 or ASR 9006 chassis.

- **C Form-Factor Pluggable (CFP) optical transceiver:** Cisco IOS XR Software Release 4.2.0 introduces support for the Cisco CFP optical transceiver for 100 Gigabit Ethernet applications on Cisco ASR 9000 Series routers. The transceiver is a 100 Gigabit Ethernet long-reach over 4 WDM lanes (LR4) optical transceiver for distances of up to 10 km.

Table 1 lists the new hardware support added in Cisco IOS XR Software Release 4.2.0 for the Cisco ASR 9000 Series routers.

Table 1.   New Hardware Supported on Cisco ASR 9000 Series Routers in Cisco IOS XR Software Release 4.2.0

Part Number	Description
A9K-RSP440-SE	Route Switch Processor 440 G bandwidth optimized for service edge
A9K-RSP440-TR	Route Switch Processor 440 G bandwidth optimized for packet transport
A9K-24X10GE-SE	Cisco ASR 9000 24-Port 10 GE Service Edge Optimized Line Card, Requires SFP+ optics
A9K-24X10GE-TR	Cisco ASR 9000 24-Port 10 GE Packet Transport Optimized Line Card, Requires SFP+ optics
A9K-2X100GE-SE	Cisco ASR 9000 2-Port 100 GE Service Edge Optimized Line Card, Requires CFP optics
A9K-2X100GE-TR	Cisco ASR 9000 2-Port 100 GE Packet Transport Optimized Line Card, Requires CFP optics
A9K-MOD80-SE	ASR 9000 Mod80 Modular Line Card, Service Edge Optimized, requires modular port adapters
A9K-MOD80-TR	ASR 9000 Mod80 Modular Line Card, Packet Transport Optimized, requires modular port adapters
A9K-MPA-20x1GE	ASR 9000 20-Port 1-Gigabit Ethernet Modular Port Adapter, requires SFP optics
A9K-MPA-4x10GE	ASR 9000 4-Port 10-Gigabit Ethernet Modular Port Adapter, requires XFP optics
CFP-100G-LR4	100 Gigabit Ethernet LR4 optics (single-mode fiber)
PWR-3KW-AC-V2	3kW AC Power Module Version 2 for ASR-9006 & ASR-9010
PWR-2KW-DC-V2	2kW DC Power Module Version 2 for ASR-9006 & ASR-9010
A9K-AC-PEM-V2	ASR 9000 AC Power Entry Module (power tray) Version 2
A9K-DC-PEM-V2	ASR 9000 DC Power Entry Module (power tray) Version 2

Part Number	Description
ASR-9006-AC-V2	ASR 9006 AC Chassis with support for PEM Version 2
ASR-9006-DC-V2	ASR 9006 DC Chassis with support for PEM Version 2
ASR-9010-AC-V2	ASR 9010 AC Chassis with support for PEM Version 2
ASR-9010-DC-V2	ASR 9010 DC Chassis with support for PEM Version 2

New Software Features

Cisco IOS XR Software Release 4.2.0 adds new software features for the Cisco ASR 9000 Series, including BNG to enhance residential service offerings; Multiprotocol Label Switching Transport Profile (MPLS-TP) for smooth transition from SONET/SDH to packet-based networks; IEEE 1588-2008 protocol for precision time and frequency propagation; circuit emulation and ATM legacy interface support on the Cisco SIP-700 card; and Carrier Grade Network Address Translation (NAT) through stateful NAT444 translation to manage IPv4 to IPv6 transition. The release also provides new Layer 3 Multiservice Edge (L3MSE) features such as Selective Virtual Route Forwarding (VRF) Download, QoS Policy Propagation Using BGP (QPPB), Packet over SONET/SDH (PoS) link bundling; and new high availability and resiliency features such as BFD multihop, Unidirectional Link Detection (UDLD), and local connection redundancy. The release supports scale increases in the new hardware for multiple features: IPv4 routes, IPv6 routes, MAC address, bridge domains, L2 and L3 interfaces, VRF, pseudowires, MPLS Traffic Engineering (MPLS-TE) midpoints, and number of queues.

Table 2 lists new software features in Cisco IOS XR Software Release 4.2.0 supported on the Cisco ASR 9000 Series Aggregation Services Routers.

Table 2.   New Software Features Supported on Cisco ASR 9000 Series Routers in Cisco IOS XR Software Release 4.2.0

Feature	Description
BNG	The initial set of features available as part of the BNG solution set include support for IP over Ethernet (IPoE) sessions driven by a Dynamic Host Configuration Protocol (DHCP) lifecycle, Point-to-Point Protocol over Ethernet (PPPoE) sessions, and PPPoE into L2TP tunnels (LAC). These session constructs authenticate with an authentication, authorization, and accounting (AAA) server where individualized profiles and session attributes can be applied based on the service subscriptions for each subscriber. Additionally, as service subscriptions change, a Policy Server and RADIUS Change of Authorization (CoA) can be used to trigger policy change based on the new subscriptions. Customizable attributes for each subscriber include Access Control Lists (ACLs), QoS service policies, IP and MAC spoofing protection, per-subscriber control plane policing (CoPP), and multicast. Simple Network Management Protocol (SNMP)-based Lawful Intercept can also be enabled. BNG is supported only on the service-edge-optimized new hardware line cards and software license A9K-BNG-LIC-8K is required to enable the feature.
MPLS-TP	MPLS-TP provides an effective tool for a smooth transition from SONET/SDH and other legacy infrastructures to packet-based networks. While benefitting from major MPLS advantages such as statistical multiplexing and sub-50-ms convergence, MPLS-TP provides a static simplified infrastructure and improved operations, administration, and maintenance (OAM) for fault management. Paired with Cisco Prime Network Management System (NMS), MPLS-TP provides a highly resilient, multiservice infrastructure for access and aggregation networks.
Mobile features	• IEEE 1588-2008: The IEEE 1588-2008 standard specifies a timing protocol known as Precision Time Protocol Version 2 (PTPv2), which is designed to provide precise time and frequency synchronization over packet-based infrastructures. In Cisco IOS XR 4.2.0 Grand Master, boundary clock and slave functionality is supported. This feature is supported only using the Cisco RSP 440 route switch processor in combination with new hardware line cards listed in this bulletin. It is a licensed feature that can be activated with the purchase of software license A9K-MOBILE-LIC. • Circuit Emulation over Packet (CEoP): Support for channelized ATM shared port adapter (SPA) modules on Cisco SIP-700 is added in Cisco IOS XR 4.2.0 allowing customers to use CEoP technology to carry time-division multiplexing (TDM) traffic transparently using Structure Agnostic TDM over Packet (SAToP) or Circuit Emulation Service over Packet (CESoP) Pseudowire Emulation (PWE3) connectivity. This is especially helpful for mobile service providers who wish to migrate their TDM-based second-generation (2G) RAN to a packet-based 2G RAN. • ATM: Support for ATM SPA modules on the SIP-700 line card is added as well. In Cisco IOS XR 4.2.0 the Layer 3 ATM features are supported only, allowing customers to deploy the Cisco ASR 9000 series in multiservice edge (MSE) environments requiring ATM connectivity on legacy access infrastructures.

Feature	Description
High-availability and resiliency features	• BFD multihop: In a BFD multihop session, BFD control packets on IPv4 are used to confirm whether the remote peer is alive. BFD multihop also detects interruptions of the forwarding path between two BFD peers based on the detection time used for a BFD multihop session. • UDLD: UDLD is a Layer 2 protocol that works with the Layer 1 mechanisms to determine the physical status of a link. UDLD performs tasks such as detecting the identities of neighbors, detecting unidirectional connectivity faults, and shutting misconnected ports. • Local Connect Redundancy: Cisco ASR 9000 resiliency support is further enhanced by Local Connect Redundancy. The feature allows the specification of a backup Ethernet Flow Point (EFP) for an EFP with local connection. This supports dual-homing EFPs with connectivity local to the router. • OSPFv3 Non-stop Routing (NSR): OSPFv3 NSR provides the ability to perform hitless switchovers when OSPF is used as a routing protocol without the need for neighboring routers to be NSR capable • Hot Standby Router Protocol (HSRP) Multiple Group Optimization (MGO): HSRP MGO provides the ability to create client HSRP groups that follow the status of the master HSRP group. This helps reduce the control traffic and boost the system HSRP scalability.
Carrier Grade NAT (CGN)	The CGN solution helps supplement the IPv4 address space while maintaining the same services that people are used to today. This solution uses the carrier-class Cisco IOS XR control plane, the purpose-built hardware-based forwarding Ethernet line cards and the Integrated Services Module (ISM) for NAT444 translation setup. This stateful NAT444 solution is also equipped with an extremely scalable and innovative NetFlow logging system to facilitate historical tracking of private to public translations. CGN is a licensed feature that can be activated with the purchase of the A9K-CGN-LIC-5M software license.
Layer 3 multiservice edge (L3 MSE features)	• Selective VRF Download (SVD): SVD is a solution used to download only those prefixes and labels to a line card that are actively required to forward traffic through that line card. SVD reduces scalability and convergence problems in L3VPNs by enabling selective download of a VRF routes to only those line cards which are configured with that VRF. • QPPB: QPPB helps to classify packets by QoS Group ID, based on access control lists (ACLs), Border Gateway Protocol (BGP) community lists, BGP autonomous system (AS) paths, Source Prefix address, or Destination Prefix address. After packet classification, other QoS features such as policing and weighted random early detection (WRED) can be used to specify and enforce policies to fit a specific business model. • PoS link bundling on Cisco ASR 900 SIP-700 line card: Link bundling is used to group multiple point-to-point links together into one logical link to provide higher bidirectional bandwidth, redundancy, and load balancing between two routers. The Cisco ASR 9000 Series routers support bundling for PoS interfaces on the ASR 9000 SIP-700 line card. The line card can physically accommodate up to 32 PoS link bundles provided that all of them have the same speed. • IPv4 unicast Generic Routing Encapsulation (GRE) on Cisco SIP-700: GRE is a tunneling protocol used to encapsulate many types of packets to enable data transmission using a tunnel. IPv4 unicast GRE is now supported on the Cisco ASR 9000 SIP-700. • ACL Based Forwarding (ABF) v6 and v4/v6 VRF aware: ABF provides an alternative to regular routing by providing the ability to forward to a next hop, based on packet content that extends beyond the destination IP address.. Cisco IOS XR 4.2.0 release enables ABF support for v6 and ABF support on VRF interface for both v4 and v6 • BGP multi-AS per Address Family (AF): Multi-AS BGP allows each instance of a multi instance BGP to be configured with a different AS number. It offers the following benefits: consolidates the services provided by multiple routers using a common routing infrastructure into a single IOS-XR router; provides a mechanism to achieve AF isolation by configuring the different AFs in different BGP instances; provides a means to achieve higher session scale by distributing the overall peering sessions between multiple instances
Video features	• Vidmon unicast: New hardware line cards will support video monitoring functionality for unicast flows. Full backward compatibility with the multicast features (including Trap and Clone) will be maintained. Unicast flows will be supported with SPAN configuration with the limitations similar to L3 SPAN from bandwidth and TM usage perspective.
Scale increase on new hardware	• IPv4 routes increase to 4 million and IPv6 routes increase to 2 million • MAC increases to 2 million addresses, bridge domain and VFI to 64,000, and L2 interfaces to 128,000. • Pseudowires increase to 128,000. • MPLS TE midpoint scale increases to 50,000. • L3 interface scale increases to 20,000 (-SE line cards) and VRF scale to 4,000. • Queues per line card increase to 2 million (Cisco 24-port 10 GE line card).
Lawful Intercept enhancements	The ability to enable Lawful Intercept is enhanced to include tapping on IPv6-addressed subinterfaces as well as tapping on attachment circuits for an L3VPN-enabled service.

Ordering Information

Table 3 lists ordering information for Cisco IOS XR Software Release 4.2.0 for Cisco ASR 9000 Series Aggregation Services Routers. Only these part numbers are orderable. When future releases of Cisco IOS Software Release 4.2.0 are available, Cisco will automatically ship the latest release if you order these part numbers.

Table 3.   Ordering Information for Cisco IOS XR Software Release 4.2.0 for Cisco ASR 9000 Series Aggregation Services Routers

Part Number	Product Name
XR-A9K-PX-04.02	Cisco IOS-XR IP/MPLS Core Software for A9K-RSP440-SE or A9K-RSP440-TR based system
XR-A9K-PXK9-04.02	Cisco IOS-XR IP/MPLS Core Software 3DES for A9K-RSP440-SE or A9K-RSP440-TR based system
XR-A9K-P-04.02	Cisco IOS-XR IP/MPLS Core Software for A9K-RSP-8G or A9K-RSP-4G based system
XR-A9K-PK9-04.02	Cisco IOS-XR IP/MPLS Core Software 3DES for A9K-RSP-8G or A9K-RSP-4G based system

Release 4.2 Lifecycle

The Cisco IOS XR Software release strategy is time-based, with a fixed release date and lifecycle, rather than a feature-based release strategy with a variable release date.

Table 4 lists the major milestones of Cisco IOS XR Software Release 4.2.0.

Table 4.   Major Milestones for Cisco IOS XR Software Release 4.2.0

Milestone	Definition	Date
Availability date	The date that Cisco IOS XR Software Release 4.2.0 information is published on Cisco.com and becomes available to the general public.	December 30, 2011
End-of-life announcement date	The date when the official end-of-life document that announces the end of sale and end of life of Cisco IOS XR Software Release 4.2.0 is distributed to the general public.	June 30, 2012
End-of-sale date and end-of-maintenance date	The last date to order Cisco IOS XR Software 4.2.0 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 through rebuilds of Cisco IOS XR Software 4.2.x. After this date, maintenance rebuilds and software-fix support will be provided only through rebuilds of Cisco IOS XR Software 4.3.x or later.	June 30, 2013
End of software maintenance releases through migration: OS software	The last date that Cisco Engineering may release any final software maintenance releases or bug fixes through Software Maintenance Updates (SMUs). From June 30, 2013, until December 30, 2013, maintenance rebuilds and software fixes through SMU support for Cisco IOS XR Software 4.2.x will be provided only through migration to rebuilds of Cisco IOS XR Software 4.3.x. After December 30, 2013, Cisco Engineering will no longer develop, repair, maintain, or test Cisco IOS XR Software 4.2.x.	December 30, 2013
Last date of support	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.	June 30, 2018

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.