

Cisco IOS XR Software Release 5.1.1 for Cisco ASR 9000 Series Routers

PB731401

Product Overview

Cisco® ASR 9000 Series Aggregation Services Routers (ASR 9000) deliver unprecedented scale, service flexibility, and high availability for service provider fixed and mobile networks, data centers, and transport networks. The routers are powered by Cisco IOS® XR Software, an innovative, self-healing, distributed operating system designed for always-on operation while scaling system capacity into multiple terabits per second (Tbps).

Cisco IOS XR Software Release 5.1.1 introduces Evolved Programmable Networks (EPN) on the edge of the network, with comprehensive and innovative feature set on the ASR 9000. With EPN we are entering the next generation of network design and service delivery with converged and programmable networks created around rapid service delivery. The Cisco ASR 9000 is at the heart of the new EPN solution for both service providers and enterprises. Cisco IOS XR Software Release 5.1.1 delivers innovative and differentiated features on technologies such as network virtualization (nV) satellite, carrier ethernet, and virtualization that will help you transition to a converged, programmable, and simpler network.

New Hardware Features

The Cisco ASR 9000 Series is introducing support for the next-generation service card, the Cisco ASR 9000 Virtualized Services Module (VSM) with Cisco IOS XR Software Release 5.1.1. Cisco IOS XR Software Release 5.1.1 brings a new paradigm for service delivery at the edge of the network with the introduction of VSM. The VSM module has its own processors, cryptography hardware, network interfaces, and memory that operate independently of the host router resources, helping ensure maximum concurrent routing and application performance. The initial service supported on the Cisco IOS XR Software Release 5.1.1 is the Carrier Grade Network Address Translation 444 (NAT444) capability with 65Gbps throughput (In + Out) and 80 million translations.

Table 1 lists the new hardware support added in Cisco IOS XR Software Release 5.1.1

Table 1. New Hardware Supported on Cisco ASR 9000 Series Routers in Cisco IOS XR Software Release 5.1.1

Part Number	Description
A9K-VSM-500	ASR9000 Virtualized Service Module
A9K-VSM-500=	ASR9000 Virtualized Service Module Spare
A9K-XLAT-LIC-5M	CGN License Unit for 5 Million translations
A9K-XLAT-LIC-5M=	CGN License Unit for 5 Million translations Spare

Table 2 lists the new optics support that has been added to Cisco IOS XR Software Release 5.1.1

Table 2. Optics Support

Part Number	Supported on
ONS-XC-10G-XXXX (all wavelengths)	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD(80)160-TR(SE)
ONS-SC+-10G-SR=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SC+-10G-ER=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SC+-10G-LR=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SC+-10G-ZR=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SE+-10G-LR=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SC+-10G-xx.y=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
ONS-SC+-10G-C=	A9k-24x10GE-TR (SE), A9k-36x10GE-TR (SE), A9K-MOD160-TR(SE), 8x10MPA
GLC-FE-100EX/ZX	A9K-MOD80-SE, A9K-MOD8-TR, ASR-9001, ASR-9001-S, A9K-MPS-20X1GE
CFP-100G-ER4	A9k-2(1)x100GE-TR (SE)

New Software Features

Table 3 lists new software features in Cisco IOS XR Software Release 5.1.1 supported on Cisco ASR 9000 Series Aggregation Services Routers.

Table 3. New Software Features Supported on Cisco ASR 9000 Series Routers in Cisco IOS XR Software Release 5.1.1

Feature	Description
Pseudowire Head-End (PW-HE) virtual interface enhancements	Cisco IOS XR Software Release 5.1.1 implements PW-HE as a truly virtual interface, replicating interface functions over a pseudowire. You can tunnel traffic from any access (ATM, TDM, and Ethernet) over Multiprotocol Label Switching (MPLS) aggregation and terminate services on a single service edge, the ASR 9000. With the introduction of sub-interface support, a single pseudowire can carry multiple services simultaneously, reducing new service addition network touch points from multiple to one. Service multiplexing is implemented with VLAN rewrite functions, giving the service provider the ability to use cookie-cutter pre-configuration on the customer-premises-equipment (CPE) side. Triple quality-of-service (QoS) hierarchy allows differentiating service levels within a pseudowire, including Shared Policy Instance (SPI) support for VLANs within the PW-HE. Multicast support completes Layer 3 VPN implementation, bringing global and multicast VPN (MVPN) support over PW-HE, overcoming the limitations of non-multicast enabled access networks. In addition, the support of Loop Free Alternative (LFA) and MPLS Traffic Engineering (MPLS-TE) is providing 50 ms restoration for PW-HE infrastructure.
Auto-IP	The Cisco ASR 9000 along with the Cisco ASR 903, Cisco ASR 901, and Cisco ME 3600 are part of the Carrier Ethernet (CE) ecosystem. In the effort to make the CE network plug and play, Cisco has introduced the Auto-IP protocol across these platforms. This protocol allows you to auto-negotiate local neighbor addresses on a ring and thus limit the touch points in the network for new device insertion.
Two-Way Active Measurement Protocol (TWAMP)	Cisco IP Service-Level Agreement (IP SLA) provides a scalable way of monitoring network performance and reliability. In Cisco IOS XR Software Release 5.1.1, the ASR 9000 will also implement the TWAMP responder, providing a standardized way of monitoring infrastructure performance for Layer 3 networks.
Carrier Ethernet scalability enhancements	Cisco IOS XR Software Release 5.1.1 brings Carrier Ethernet scalability to the next level. Connectivity Fault Management (CFM) hardware offload allows service providers to implement connectivity monitoring at 3.3 ms and 10 ms for physical and bundle interfaces, respectively, and achieve extremely high network availability for Layer 2 in conjunction with protocols such as G.8032. In addition, bridge-virtual-interface (BVI) scalability has been increased to 16,000.
Multiprotocol Label Switching (MPLS) enhancements	Cisco IOS XR Software Release 5.1.1 implements multiple enhancements for MPLS Traffic Engineering (MPLS TE) protocols: <ul style="list-style-type: none"> Virtual Route Forwarding (VRF) forwarding to MPLS-TE simplifies the configuration by allowing static route for VRF traffic redirect to be configured under the tunnel interface. MPLS Label Distribution Protocol (LDP) based Carrier Supporting Carrier (CSC) in addition to Border Gateway Protocol (BGP)-based CSC, give you the flexibility to implement an LDP-based CSC model. MPLS static label support gives explicit control to service providers to assign labels and related push, pop, and swap actions to build a label switched path (LSP). IPv6 autoroute announce for Intermediate System-to-Intermediate System (IS-IS) allows dynamic IPv6 routing over an IPv4 MPLS-TE infrastructure.

Feature	Description
Cisco ASR 9000 Series Virtualized Services Module (VSM)	<p>The VSM enables the transition of network infrastructure services to virtual workloads with the capability to host Cisco, third-party, and custom applications in a virtualized environment similar to a server blade on a router.</p> <p>This flexible, elastic approach allows the increase or decrease of service capacity as needed, such that there is no need to design for maximum capacity. It supports simplified provisioning and upgrades to help save time and reduce costly truck rolls for upgrades or troubleshooting. The Cisco ASR 9000 Series VSM maximizes the availability of services through virtual machine migration in the event of hardware failures. This module has its own processors, cryptography hardware, network interfaces, and memory that operate independently of the host router resources, helping ensure maximum concurrent routing and application performance.</p> <p>With the availability of VSM, Cisco IOS -XR Software has been enhanced to add service-enablement features that allow installation, configuration, and activation of services on the standards based Open Virtualization Format (OVF). The initial service supported on IOS-XR 5.1.1 Cisco IOS XR Software Release 5.1.1 is the Carrier Grade NAT444 capability with 65-Gbps Throughput (In + Out) and 80 million translations.</p>
Network Virtualization (nV) Satellite enhancements: Simple ring, Layer 2 fabric, dual head, and QoS offload	<p>Cisco IOS XR Software Release 5.1.1 brings many innovative features on nV satellite to extend the zero-touch capability and operational cost savings to a wide variety of networks:</p> <ul style="list-style-type: none"> • The newly introduced nV satellite simple ring eliminates complex configuration from traditional ring topology. This technology eliminates all ring configuration, including resiliency (Resilient Ethernet Protocol [REP] and G.8032) and manual IP addressing configurations, and collapses rings up to 20 nodes into one logical node. • The nV satellite Layer 2 fabric innovation is targeted at simplifying leased mobile backhaul networks. This technology eliminates all configuration between cell site and edge, including the routing protocols (OSPF, IS-IS, etc.) and resiliency configurations (Bidirectional Forwarding Detection [BFD], etc.) and collapses hundreds of cell-site routers into one logical node. • The nV satellite dual-head function provides a zero-touch resiliency, eliminating traditional resiliency protocol configuration, and delivers a sub-second convergence with built-in Connectivity Fault Management (CFM) technology to detect failure. • The nV satellite advanced Quality of Service (QoS) offload provides you the flexibility to extend QoS policies on host to satellite access and Inter-Chassis Link (ICL) ports.
Broadband Network Gateway (BNG) enhancements	<p>Cisco IOS Software Release 5.1.1 increased scale with support for up to 256,000 subscribers. The architecture has moved to line card-based BNG termination and enables a Pay-as-you-Grow (PAYG) model. With this release, BNG will also support Routed Session for v4 the packet trigger case along with static session support for enterprises.</p>
BGP Link-State (BGP-LS)	<p>BGP Link-State (BGP-LS) is an Address Family Identifier (AFI) and Sub-address Family Identifier (SAFI) defined to carry an interior gateway protocol (IGP) link-state database through BGP. BGP-LS delivers network topology information to topology servers and Application Layer Traffic Optimization (ALTO) servers. BGP-LS allows policy-based control to aggregation, information hiding, and abstraction. BGP-LS supports IS-IS and OSPFv2.</p>
BGP IPv6 SA/DA Flexible Mask Routing Policy	<p>In XR 5.1.1, IPv6 Prefix-List supports matching of wildcard bits.</p>
BGP Multi-Instance Multicast Support	<p>The BGP Multi-Instance Multi-Autonomous system supports hosting of multicast-enabled VPNs, Multicast Distribution Tree sub-address family identifier (MDT-SAFI), MVPN sub-address family identifier (MVPN-SAFI), and Multicast Source Discovery Protocol (MSDP) queries on multiple BGP instances.</p>
OSPFv2/v3 IP Fast Reroute (FRR) over VRF	<p>IOS-XR 5.1.1 extends the OSPFv2 and OSPFv3 IPFRR functionality for VRF's.</p>
Flow-aware Call Admission Control (CAC)	<p>This innovation allows admission control over queues of any IPv4 5-tuple flow in the data-plane without any control-plane such as RSVP.</p>
Integrated Routing and Bridging (IRB) Multicast VPN (MVPN)	<p>IOS-XR 5.1.1 adds MVPN support to the Bridge Virtual Interface (BVI) interfaces.</p>
MVPN with Dynamic Point-to-Multi Point Traffic Engineering (P2MP-TE) LSP	<p>Feature provides dynamic setup of MVPN P2MP-TE I-PMSI and S-PMSI LSP's across all Provider Edge (PE) routers reducing the manual creation of core trees using the P2MP-TE CLI's.</p>
Stateful Path Computation Element (PCE)	<p>IOS-XR release 5.1.1 adds stateful PCE client (PCC) capabilities to the software implementing the stateless PCC and PCE in IOS-XR MPLS-TE. The stateful model also enables a PCC to allow the PCE to initiate computations, which allows the PCE to perform network-wide orchestration.</p>
Access control list (ACL) MIB support	<p>Added new capability of pulling packet count as well as byte count statistics through SNMP polling. Supports both IPv4 and IPv6 ACL on typhoon based linecards.</p>
Generic routing encapsulation (GRE) 1:1 support	<p>GRE 1:1 support allows processing as well as encapsulation of packet with configured key value and key flag.</p>
CFM software offload on bundles	<p>IOS-XR release 5.1.1 release textends the CFM Software offload support for physical interfaces to Bundles with CCM intervals of 10ms - 1 min.</p>

Feature	Description
Multicast Label Distribution Protocol Version 2 (MLDPv2) VRF	IOS-XR Release 5.1.1 adds VRF support for IPv6 MLDv2 joins. Now, the access IPv6 CE switch/router can send MLDv2 joins into a PE VRF and a MLDv2 join state will be installed in VRF's MRIB table.
Prefix-based Local Packet Transport Services (LPTS) Policer	New functionality is added to allow you to specify the prefixes that need a different policer rate. Feature allows the use of existing ACL functionality and sets these rates on the linecard providing dynamic LPTS.

Ordering Information

Table 4 lists ordering information for Cisco IOS XR Software Release 5.1.1 for Cisco ASR 9000 Series Aggregation Services Routers. When future rebuilds of Cisco IOS XR Software Release 5.1.1 are available, the latest release is automatically shipped when this product is ordered.

Table 4. Ordering Information for Cisco IOS XR Software Release 5.1.1 for Cisco ASR 9000 Series Aggregation Services Routers

Product Name	Part Number
XR-A9K-PX-05.01	Cisco IOS-XR IP/MPLS Core Software
XR-A9K-PXK9-05.01	Cisco IOS-XR IP/MPLS Core Software 3DES

Release 5.1.1 Lifecycle

The Cisco IOS XR Software release strategy is time-based, with a fixed release date and lifecycle, rather than being a feature-based release strategy with a variable release date. Table 5 lists the major milestones of Cisco IOS XR Software Release 5.1.1 and later.

Table 5. Major Milestones for Cisco IOS XR Software Release 5.1.1

Milestone	Definition	Date
Availability date	The date that Cisco IOS XR Software Release 5.1.1 information is published on Cisco.com and becomes available to the general public.	Feb. 5, 2014
End-of-life announcement date	The date when the official end-of-life documents announcing the end of sale and end of life of Cisco IOS XR Software 5.1 (and later versions of 5.1) are distributed to the general public.	Mar. 11, 2014
End-of-sale date	The last date to order Cisco IOS XR Software 5.1.1 through Cisco point-of-sale mechanisms. (The product is no longer for sale after this date)	Mar. 11, 2015
End of software maintenance (Standard Maintenance Release)	The last date that Cisco Engineering may release any final software maintenance releases or bug fixes. (After this date, Cisco Engineering will no longer develop, repair, maintain, or test the product software.) Applies to Standard rebuilds only. Refer to Cisco IOS XR Software Policy Guideline bulletin for more details.	Sept. 11, 2015
End of software maintenance (Extended Maintenance Release)	The last date that Cisco Engineering may release any final software maintenance releases or bug fixes. (After this date, Cisco Engineering will no longer develop, repair, maintain, or test the product software.) Applies to Standard rebuilds only. Refer to Cisco IOS XR Software Policy Guideline bulletin for more details.	Sept. 11, 2016
End of software maintenance for Product Security Incident Response Team (PSIRT)	The last date that Cisco Engineering may release any final software maintenance releases or bug fixes for PSIRTs through Software Maintenance Unit to Release 5.1. (Beyond this date, PSIRT bugs become candidates for following feature releases)	Sept. 11, 2017
Last date of support	The last date to receive applicable service and support for the product, as entitled by active service contracts or by warranty terms and conditions. (After this date, all support services for the product are unavailable, and the product becomes obsolete)	Mar. 11, 2020

For More Information

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 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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