



Release Notes for Cisco IOS XRv 9000 Router, Release 6.1.1

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Cisco IOS XRv 9000 Router Overview

The Cisco IOS XRv 9000 Router is based on Cisco IOS XR software, so it inherits and shares the wide breadth of routing functionality available on other IOS XR platforms. The IOS XR features available on the Cisco IOS XRv 9000 Router are discussed in *Supported Cisco IOS XR Technologies* section.

When the Cisco IOS XRv 9000 Router virtual IOS XR software is deployed as a VM, the Cisco IOS XR software functions just as if it were deployed on a traditional Cisco IOS XR hardware platform. The Cisco IOS XRv 9000 Router combines Route Processor, Line Card, and virtualized forwarding capabilities into a single, centralized forwarding instance. The Cisco IOS XRv 9000 Router has a fully featured, high speed virtual x86 data plane.

Cisco IOS XRv 9000 Router supports the same look and feel as Cisco ASR 9000 Series Aggregation Services Routers and North-bound APIs. Cisco IOS XRv 9000 Router does not support hardware specific configurations. The configuration commands for control plane and data plane features follow the same syntax as the Cisco ASR 9000 Series Aggregation Services Routers. See [Cisco ASR 9000 Series Aggregation Services Routers command references](#) for more information on configuration commands.

Cisco IOS XRv 9000 Router Licensing Model

The Cisco IOS XRv 9000 Router supports activation using Cisco Smart Licensing. By default the Cisco IOS XRv 9000 Router (without license) is rate limited to 200 Kbps.

For more information on licensing model supported on Cisco IOS XRv 9000 Router, see the *Cisco IOS XRv 9000 Router Smart Licensing* chapter in the [Cisco IOS XRv 9000 Router Installation and Configuration Guide](#).

See [Cisco Smart Software Licensing Overview](#) for more information on Cisco Smart Licensing.

License Ordering Information

The Cisco IOS XRv 9000 Router offers a flexible licensing scheme, with multiple tiers to choose from, such as Scale, and Throughput. This table lists details of Cisco IOS XRv 9000 Router's pool of software licenses or entitlements, arranged according to licensing PIDs.



Note The XRv9000 router only consumes and reports VPE licenses. VRR licenses are not consumed or reported.

Table 1: Cisco IOS XRv 9000 Router UCS M5 Based vRR Appliance PIDs

License PID	Description
R-XRV9000-66-RR	Cisco IOS XRv 9000 software, VRR profile
S-XRV-ROUTE-T4	Preloaded Software Image: IOS XRv 9000 vRR scale upgrade license from 20M up to 70M
XRV9000-APLN-ROUT	IOS XRv 9000 M5 Appliance with preloaded IOS XR functionality with 20 million route scale

Supported MIBs

The following MIBs are supported in this release:

- ENTITY-MIB
- ENTITY-STATE-MIB
- CISCO-ENTITY-ASSET-MIB
- BGP4-MIB
- CISCO-AAA-SERVER-MIB
- CISCO-ACL-MIB
- CISCO-BGP4-MIB
- CISCO-BULK-FILE-MIB
- CISCO-CDP-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-CONFIG-COPY-MIB
- CISCO-CONFIG-MAN-MIB
- CISCO-CONTEXT-MAPPING-MIB
- CISCO-FTP-CLIENT-MIB
- CISCO-IF-EXTENSION-MIB
- CISCO-PING-MIB
- CISCO-PROCESS-MIB
- CISCO-SYSLOG-MIB
- CISCO-SYSTEM-MIB
- CISCO-TCP-MIB
- CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB
- ETHERLIKE-MIB
- EVENT-MIB
- EXPRESSION-MIB
- IETF-TCP-MIB
- IETF-UDP-MIB
- IF-MIB
- IP-FORWARD-MIB
- IP-MIB

- IPV6-MIB
- IPV6-FORWARD-MIB
- ISIS-MIB
- MPLS-L3VPN-STD-MIB
- MPLS-LDP-GENERIC-STD-MIB
- MPLS-LDP-STD-MIB
- MPLS-LSR-STD-MI
- NOTIFICATION-LOG-MIB
- OSPF-MIB
- OSPF-TRAP-MIB
- OSPFV3-MIB
- RFC1213-MIB
- RFC2011-MIB
- RFC2465-MIB
- SNMP-COMMUNITY-MIB
- SNMP-FRAMEWORK-MIB
- SNMP-NOTIFICATION-MIB
- SNMP-TARGET-MIB
- SNMP-USB-MIB
- SNMPv2-MIB
- SNMP-VACM-MIB
- TCP-MIB
- UDP-MIB
- CISCO-IETF-BFD-MIB
- CISCO-IP-TAP-MIB
- CISCO-TAP2-MIB
- RADIUS-ACC-CLIENT-MIB
- RADIUS-AUTH-CLIENT-MIB
- SNMP-TARGET-MIB

New Software Features Supported in Release

- **Application Hosting**—Application hosting gives administrators a platform for leveraging their own tools and utilities. Cisco IOS XR 6.0 supports third-party off-the-shelf applications built using Linux tool chains. Users can run custom applications cross-compiled with the software development kit that Cisco provides. Application hosting is offered in two variants: Native and Container.

Cisco IOS XR uses a 64-bit Linux-based operating system that simplifies the integration of applications, configuration management tools, and industry-standard zero touch provisioning mechanisms to meet the DevOps style workflows for service providers.

- **BFD over Logical Bundle (BLB)**—BLB is a multipath (MP) single-hop session. BLB requires limited knowledge of the bundle interfaces on which the sessions run; this is because BFD treats the bundle as one big pipe. To function, BLB requires only information about IP addresses, interface types, and caps on bundle interfaces. Information such as list of bundle members, member states, and configured minimum or maximum bundle links are not required.
- **Link Bundle or Link Aggregation Group (LAG)**—A link bundle is a group of one or more ports that are aggregated together and treated as a single link. Each bundle has a single MAC, a single IP address, and a single configuration set (such as ACLs). Since XRv 9000 is a virtual platform, you must configure mac address on each bundle main interface. Use **lACP system mac** command in global configuration mode and **mac address** command in interface configuration mode to configure mac address to bundle main interface. Link Aggregation Control Protocol (LACP) for virtual E1000, VirtIO, and VMXNET3 is not supported.



Note Cisco IOS XRv 9000 supports only Layer 3 link bundle.

- **Network Service Header (NSH)**—Network Service Header is the Service Function Chaining (SFC) encapsulation required to support the SFC Architecture (defined in RFC7665). The NSH is inserted onto ingress encapsulated packets or frames to realize service function paths. NSH also provides a mechanism for metadata exchange along the instantiated service path.



Note

- A service classifier supports only IPv4 ACL 5-tuple based packet classification.
- The proxy function is not supported in this release.

- **Multisocket Dataplane**—The Cisco IOS XRv 9000 router supports a dataplane that is located on one or two sockets.
- **Platform Automated Monitoring**—Platform Automated Monitoring (PAM) is a system monitoring tool integrated into Cisco IOS XR software image to monitor issues such as process crash, memory leak, CPU hog, tracebacks, syslog and disk usage. When PAM tool detects any of these system issues, it collects the required data to troubleshoot the issue, and generates a syslog message stating the issue. The auto-collected troubleshooting information is then stored in a separate file located at the harddisk. The files are located at `harddisk:/cisco_support/` or at `/misc/disk1/cisco_support`. PAM is enabled by default on all Cisco IOS XR 64 bit platforms.

For documentation reference for above features, see *Supported Cisco IOS XR Technologies* section.

System Requirements

Hypervisors

A hypervisor enables multiple operating systems to share a single hardware host machine. While each operating system appears to have the dedicated use of the host's processor, memory, and other resources; the hypervisor controls and allocates only needed resources to each operating system and ensures that the operating systems (VMs) do not disrupt each other.

Installation of the Cisco IOS XRv 9000 Router is supported on selected Type 1 (native, bare metal) hypervisors. Installation is not supported on Type 2 (hosted) hypervisors, such as VMware Fusion, VMware Player, or Virtual Box. The following table lists release specific supported hypervisor versions.

Table 2: Support Matrix for Hypervisor Versions

Cisco IOS XR Version	VMWare ESXi	Kernel Based Virtual Machine (KVM)
	version 6.5, 6.7, and later	Linux KVM based on <ul style="list-style-type: none"> • Red Hat Enterprise Linux 7, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 8.0 • Ubuntu 14.04.03 LTS • CentOS 7, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, and 7.7 • Openstack 10

Virtual Machines

Cisco IOS XRv 9000 Router virtual machines must meet the following requirements:

Table 3: VM Requirement for VMware Environment

Parameters	Supported
VMware ESXi	Version 6.5, 6.7, 7.0 and later
Virtual CPU cores	1 socket with a minimum of 2 cores Note For production environment minimum of 4 cores is recommended.
Virtual Machine memory size	
Virtual Machine hard disk size	
Virtual Interfaces	E1000 VMXNET3 for traffic interfaces only

Parameters	Supported
Physical NICs	<p>For pass-through:</p> <ul style="list-style-type: none"> • Intel i350 Quad Port 1Gb Adapter • Intel Dual Port 10 GbE Ethernet X520 Server Adapter • Intel 4 port 10GE Fortville <p>Note PCI passthrough only. SRIOV is not supported.</p> <p>Note • Intel Forville has a lower forwarding capability (for high throughput applications in vPE profiles) when compared with Intel 82599 10GE Controller.</p> <p>Cisco UCS Virtual Interface Card (VIC) 1225</p> <p>Note If you are configuring LLDP on Cisco IOS XRv 9000, then you must first disable LLDP in the Cisco UCS VIC 1225 via Cisco Integrated Management Controller (CIMC).</p>
Number of interfaces	<p>Minimum of 4 NICs where:</p> <ul style="list-style-type: none"> • 1 for management • 2 are reserved • 1 for traffic <p>Maximum of 11 NICs where:</p> <ul style="list-style-type: none"> • 1 for management • 2 are reserved • 8 for traffic
Default video, SCSI controller set	<p>Required</p> <p>SCSI controller not required for IDE disk.</p>
Virtual CD/DVD drive installed	<p>Virtual CD/DVD is required when installing the Cisco IOS XRv 9000 Router on the VM using ISO template.</p>
IDE hard disk	<p>Single IDE hard disk</p> <p>Note Multiple hard disk drives on a VM are not supported.</p>



Note The maximum traffic performance with pass-through NIC interfaces in ESXi is lower than the performance that can be achieved in KVM environments. This is because it is not possible to configure 1G huge-pages in the ESXi hypervisor (as of VMware ESXi 6.0).

Table 4: VM Requirement for KVM Environment

Parameters	Supported
KVM versions	<ul style="list-style-type: none">• Linux KVM based on Red Hat Enterprise Linux 7, 7.1, 7.2, 7.3 and 7.4• Ubuntu 14.04.03 LTS Server 64 Bits• Openstack Release 5 (Icehouse), Openstack Juno/Icehouse (RHEL 7), Kilo (RHEL 7.1), Liberty (RHEL 7.2), Openstack 10 (Newton)• CentOS 7, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, and 7.7
Virtual CPU cores	1 socket with minimum of 2 cores.
Virtual Machine memory size	
Virtual Machine hard disk size	
Virtual Interfaces	E1000, VirtIO and VMXNET3 for traffic interfaces only
Physical NICs	<p>For pass-through:</p> <ul style="list-style-type: none">• Intel i350 Quad Port 1Gb Adapter• Intel Dual Port 10 GbE Ethernet X520 Server Adapter• Intel 4 port 10GE Fortville <p>Note PCI passthrough only. SRIOV is not support.</p> <p>Note • Intel Forville has a lower forwarding capability (for high throughput applications in vPE profiles) when compared with Intel 82599 10GE Controller.</p> <p>Cisco UCS Virtual Interface Card (VIC) 1225</p> <p>Note If you are configuring LLDP on Cisco IOS XRv 9000, then you must first disable LLDP in the Cisco UCS VIC 1225 via Cisco Integrated Management Controller (CIMC).</p>

Parameters	Supported
Number of interfaces	Minimum of 4 NICs where: <ul style="list-style-type: none"> • 1 is for management • 2 are reserved • 1 is for traffic Maximum of 11 NICs where: <ul style="list-style-type: none"> • 1 is for management • 2 are reserved • 8 is for traffic
Virtual CD/DVD drive installed	Virtual CD/DVD drive is required for ISO installation



Note In the Cisco IOS XRv 9000 Router, some CPU cores are dedicated to the control plane while others are dedicated to the data plane. Each data plane's core runs a single thread that performs packet forwarding. To achieve maximum performance, these threads constantly look for data packets to process. As a result, the OS records that these cores run at 100% utilization. This is expected behavior and not an indication that packet forwarding has reached its threshold limit.

Server

The server must support:

- Intel Westmere or later CPU versions with clock frequency of 2.0GHz for instances with Gigabit or paravirtualized interfaces
- Intel Ivy Bridge or later CPU versions for instances with 10Gb or higher interfaces
- Intel CPU must support the **sse4_2** capability flag. This can be checked in KVM by looking for the **sse4_2** flag in the flags section of */proc/cpuinfo*. For example:

```
cat /proc/cpuinfo | grep sse4_2
flags       : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr
sse sse2 ss syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon nopl xtopology tsc_reliable nonstop_tsc
aperfmperf pni pclmulqdq vmx ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c
rdrand hypervisor lahf_lm ida arat epb pln pts dtherm tpr_shadow vnmi ept vpid fsgsbase smep
```



Note To use passthrough interfaces in KVM, you must set the option **intel_iommu=on** command in the grub configuration.

Supported Cisco IOS XR Technologies

Cisco IOS XRv 9000 Router supports selected Cisco IOS XR technologies.

This table lists the major Cisco IOS XR technologies Cisco IOS XRv 9000 supports. Not all features in a given technology may be supported. To verify support for specific features, use [Cisco Feature Navigator](#).

Table 5: Cisco IOS XR Technologies Supported on the Cisco IOS XRv 9000 Router

Feature	See the Following Documentation	Introduced in Release
<ul style="list-style-type: none"> • 6PE, 6VPE 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router MPLS Layer 3 VPN Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router VPN and Ethernet Services Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • Bi-directional Policing and Marking 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Modular Quality of Service Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • Bi-directional Forwarding Detection 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference 	Release 5.4.0
Customize Installation using Golden ISO	Customize Installation using Golden ISO	Release 7.3.1
Cisco IOS XRv 9000 Router Deployment on AWS	<ul style="list-style-type: none"> • Cisco IOS XRv 9000 Router Installation and Configuration Guide 	Release 6.3.1
Create User Profiles and Assign Privileges	System Setup and Software Installation Guide for Cisco ASR 9000 Series Routers	Release 7.1.1
<ul style="list-style-type: none"> • Early Fast Discard 	<ul style="list-style-type: none"> • Early Fast discard 	Release 5.4.0
<ul style="list-style-type: none"> • IPv4 Routing • IPv6 Routing • OSPF • ISIS 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • IPv4 and IPv6 ACL 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide • Access List Commands 	Release 5.4.0

Feature	See the Following Documentation	Introduced in Release
<ul style="list-style-type: none"> • IPv4 L3VPN • 6PE, 6VPE 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router MPLS Layer 3 VPN Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router VPN and Ethernet Services Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • Lawful Intercept 	<ul style="list-style-type: none"> • Implementing Lawful Intercept • Cisco ASR 9000 Series Aggregation Services Router System Security Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • LDP 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • LPTS 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide • LPTS Commands 	Release 5.4.0
<ul style="list-style-type: none"> • MPLS 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • MP-BGP, EBGp PE-CE 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • Netconf Yang support 	<ul style="list-style-type: none"> • System Management Configuration Guide for Cisco ASR 9000 Series Routers • Network Time Protocol (NTP) Commands 	Release 5.4.0
<ul style="list-style-type: none"> • Smart Licensing 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router System Management Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router System Management Command Reference 	Release 5.4.0

Feature	See the Following Documentation	Introduced in Release
<ul style="list-style-type: none"> • SNMP support 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router System Management Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router System Management Command Reference 	Release 5.4.0
<ul style="list-style-type: none"> • Strict Unicast IPv4 and IPv6 Reverse Path Forwarding (uRPF) 	<ul style="list-style-type: none"> • Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide • IP Addresses and Services Command Reference for Cisco ASR 9000 Series Routers 	Release 5.4.0
<ul style="list-style-type: none"> • The Two-Way Active Measurement Protocol (TWAMP) 	<ul style="list-style-type: none"> • System Monitoring Configuration Guide for Cisco ASR 9000 Series Routers • Cisco ASR 9000 Series Aggregation Services Router System Monitoring Command Reference 	Release 6.0.1
gNMI Bundling of Telemetry Updates	Cisco IOS XRv 9000 Router Installation and Configuration Guide	Release 7.8.1
ORR Support for FlexAlgo	Cisco IOS XRv 9000 Router Installation and Configuration Guide	Release 7.5.1
Generic Route Encapsulation using IPv6	MPLS Layer 3 VPN Configuration Guide	Release 7.3.3
<ul style="list-style-type: none"> • Running High Availability (HA) redundancy application for AWS • QoS on IPv4 Release GRE Tunnels • Increase in BFD scale limit and BFD sessions 	Cisco IOS XRv 9000 Router Installation and Configuration Guide	Release 7.3.3

Feature	See the Following Documentation	Introduced in Release
<ul style="list-style-type: none"> Enhanced Networking Features with Elastic Network Adapter (ENA) on Amazon EC2 M5 Instances Updated DPDK Driver Version Enhanced router performance and scales ACL Based Forwarding (ABF) Redirect IPV4 and IPV6 traffic using PBR Support for IPv6 over SR-MPLS through a GRE Tunnel towards an IPv6 Next Hop device BFD on GRE Tunnel Interface 	Release Notes for Cisco IOS XRv 9000 Routers, IOS XR Release 7.3.3	Release 7.3.3
<ul style="list-style-type: none"> SR-PCE: Single PCE scale enhancement SR-PCE: Stateful North-Bound API for Tree-SID 	Release Notes for Cisco IOS XRv 9000 Routers, IOS XR Release 7.5.1	Release 7.5.1

Caveats

Caveats describe unexpected behavior in Cisco IOS XR Software release.

Related Documentation

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.

Communications, Services, and Additional Information

- To receive timely, relevant information from Cisco, sign up at [Cisco Profile Manager](#).
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- To find warranty information for a specific product or product family, access [Cisco Warranty Finder](#).

Cisco Bug Search Tool

[Cisco Bug Search Tool](#) (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



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