

Release Notes for Cisco IOS XRv 9000 Routers, IOS XR Release 24.2.1

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Release Notes for Cisco IOS XRv 9000 Router, IOS XR Release 24.2.1

Cisco IOS XRv 9000 Router is a cloud-based router that is deployed on a virtual machine (VM) instance on x86 server hardware running 64 bit IOS XR software. Cisco IOS XRv 9000 Router provides traditional Provider Edge (PE) services in a virtualized form factor, as well as virtual Route Reflector (vRR) capabilities.

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.

Note SR-IOV interfaces don't support promiscuous mode, and without promiscuous mode, L2VPN VPWS services are not possible.

What's New in Cisco IOS XR Release 24.2.1

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

Feature	Description
BGP	

Feature	Description
BGP Optimal Release Route Reflector (ORR) Add-Path Policy	This feature allows you to assign an independent routing policy to an individual Optimal Route Reflector (ORR) group. The virtual route reflector (vRR) calculates the additional paths for that ORR group based on the assigned policy. This results in having a different best and backup path for each ORR group which is the optimal path from the client point of view. This feature introduces these changes: **CLI:** The **route-policy** keyword is introduced in the **route-policy** command. **YANG Data Model:** • Cisco-IOS-XR-ipv4-bgp-cfg.yang • Cisco-IOS-XR-um-router-bgp-cfg.yang (see GitHub, YANG Data Models Navigator)
Modular QoS	
Enhanced Running Configuration Display for Policy Maps and Class Maps	Now, you can view each class map or policy map running configuration instance on a separate line using the s**how run formal** running configuration command.
System Management	
TCP Dump File Converter	From the Command Line Interface (CLI), you can convert tcp dump packet traces in binary files into other readable formats, such as text and pcap. This feature makes binary file conversion easier and creates files that support other tools, such as Wireshark, to perform network troubleshooting. This feature introduces the **tcp dump-file convert** command.

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 presentedvisually in a tree structure.

Feature	Description
Programmability	

Feature	Description
Cisco-IOS-XR-ipv4-bgp-cfg.yang	The latest update to the Cisco-IOS-XR-ipv4-bgp-cfg.yang includes the BGP ORR add-path policy which allows you to assign an independent routing policy to an individual ORR group.
Cisco-IOS-XR-infra-statsd-oper.yang	Previously, the native path for statsd included an additional 'mechanism' node, which supported 'Total', 'Cache', and 'Latest' options. This mechanism node has been removed. With the removal of the mechanism node, all queries will now be addressed using the cache only **Previous Path:** sensor-path Cisco-IOS-XR-infra-statsd-oper:infra-statistics/interfaces/interface/<**mechanism**>/<data-type> **Updated Path:** sensor-path Cisco-IOS-XR-infra-statsd-oper:infra-statistics/interfaces/interface/<data-type>" The supported paths are Cisco-IOS-XR-infra-statsd-oper:infra-statistics/interfaces/interface/**GenericCounters | DataRate | InterfacesMIBCounters | Protocols**
Cisco-IOS-XR-um-router-bgp-cfg.yang	The latest update to the Cisco-IOS-XR-um-router-bgp-cfg.yang includes the BGP ORR add-path policy which allows you to assign an independent routing policy to an individual ORR group.
Cisco-IOS-XR-ipv4-ospf-oper.yang	This native data model is enhanced with new leaves *sr-capable, ri-capabilities-tlv, te-capable, gr-capable, grh-capable*, and *host-name* in the *OSPF-SH-NEIGHBOR-DETAIL* and *OSPF-SH-NEIGHBOR* groupings to display neighbor router capabilities in OSPF networks.

System Requirements

Appliance Model

Cisco IOS XRv 9000 Appliance is the pre-installed Cisco IOS XRv 9000 Router software that is sent from the factory on a bare metal UCS server hardware. It supports hyper scalability as it can scale to 70 Million route prefixes when run as a Virtual Route Reflector. Therefore, the extra layer of software (hypervisor) is not required.

The Appliance also supports Zero Touch Provisioning (ZTP) which allows easier insertion into existing networks. Current offering is based on UCS M5 Servers, comes with 2 Intel X710 quad-port 10G SFP+ NICs.

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 1: Support Matrix for Hypervisor Versions

Cisco IOS XR Version	VMWare ESXi	Kernel Based Virtual Machine (KVM)
Release 24.2.1	version 6.5, 6.7,7.0	Linux KVM based on • 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 • Ubuntu 16.04 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 2: VM Requirement for VMware Environment

Parameters	Supported
VMware ESXi	Version 6.5, 6.7, 7.0
Virtual CPU cores	1 socket with a minimum of 2 cores **Note** For production environment minimum of 4 cores is recommended. **Note** For multicast heavy deployments we recommend to configure 8 cores (with 4 assigned for control plane and 4 assigned for data plane).
Virtual Machine memory size	12GB minimum, 19GB recommended for 10G interfaces
Virtual Machine hard disk size	64GB minimum for vPE and vRR image variants
Virtual Interfaces	• E1000 • VMXNET3 for traffic interfaces only

Parameters	Supported
Physical NICs	For pass-through: • Intel X710 SR-IOV supported for: • Intel E810 XXV (Trunk VFs Only)
Number of interfaces	Maximum of 11 NICs where: • 1 for management • 2 are reserved • 8 for traffic
Default video, SCSI controller set	Required SCSI controller not required for IDE disk.
Virtual CD/DVD drive installed	Virtual CD/DVD is required when installing the Cisco IOS XRv 9000 Router on the VM using ISO template.
IDE hard disk	Single IDE hard disk **Note** Multiple hard disk drives on a VM are not supported.



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 3: VM Requirement for KVM Environment

Parameters	Supported
KVM versions	• 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 • Ubuntu 16.04 LTS • 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

Parameters	Supported
Virtual CPU cores	1 socket with minimum of 2 cores. **Note** For multicast heavy deployments we recommend to configure 8 cores (with 4 assigned for control plane and 4 assigned for data plane).
Virtual Machine memory size	12GB Minimum, 19GB recommended for 10G interfaces
Virtual Machine hard disk size	64GB minimum
Virtual Interfaces	E1000, VirtIO and VMXNET3 for traffic interfaces only
Physical NICs	For pass-through: • Intel X710
Number of interfaces	Minimum of 4 NICs where: • 1 is for management • 2 are reserved • 1 is for traffic Maximum of 11 NICs where: • 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.

10G Optic Support

Product	Product Code	Supplier Part Number
Cisco 10GBASE SFP+, Short Range	Cisco SFP-10G-SR	Cisco SFP-10G-SR **Note** This optic is recommended for the better performance and interoperability with IOS XRv 9000.
Cisco 10GBASE SFP+, Long Range	Cisco SFP-10G-LR	Cisco SFP-10G-LR **Note** This optic is recommended for the better performance and interoperability with IOS XRv 9000.
Intel Ethernet SFP SR Optics Dual Rate 10GBASE-SR/1000BASE-SX	E10GSFPSR	FTLX8571D3BCVIT1 or AFBR-709DMZ-IN2

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.

Licensing

Starting with Cisco IOS XR Release 24.1.1, Smart Licensing Using Policy (SLP) is the default Licensing model. When you upgrade to the Cisco IOS XR Release 24.1.1 release or later, the Smart Licensing Using Policy is enabled by default.

You can migrate your devices to Smart Licensing with Policy model, see *Migrating from Smart Licensing to Smart Licensing Using Policy*, Smart Licensing Using Policy on Cisco IOS XR Routers.

We recommend that you update to the latest version of SSM On-Prem or Cisco Smart Licensing Utility.

Note SSM On-Prem and CSSM both support SLP devices and SL devices. SLP devices and SL devices can coexist in a network. The Smart Licensing (SL) model is available in releases Cisco IOS XR Release 7.11.1 and earlier.

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 4: Cisco IOS XRv 9000 Router Licensing PIDs

PIDs	Description
R-IOSXRV-SUBSCRIP	Bundle PID for IOS XRV SBP
R-VROUTER-SUB	Subscription license for Cisco IOS XRv 9000 Software
R-IOSXRV-SUB-IMG	ATO for XRv SUB
S-XRV-SUB-RR-1M	Subscription license for virtual Route Reflector (vRR) functionality with 1 million routes
S-XRV-SUB-RTU	IOS XRv 9000 license for one virtual router instantiation
S-XRV-SUB-RR-4M	Subscription license for virtual Route Reflector (vRR) scale upgrade from 4 million routes
S-XRV-SUB-RR-10M	Subscription license for virtual Route Reflector (vRR) scale upgrade from 4 to 10 million routes
S-XRV-SUB-RR-20M	Subscription license for virtual Route Reflector (vRR) scale upgrade from 10 to 20 million routes
S-XRV-SUB-XTC	Billing PID for SBP XRV9K -SR-PCE (XTC) RTU
S-XRV-B-SUB-1G	IOS XRv 9000 1G throughput license for IP MPLS base package

PIDs	Description
S-XRV-P-SUB-1G	IOS XRv 9000 1G throughput license for IP MPLS premium package
S-XRV-L3-B-SUB-1G	IOS XRv 9000 1G throughput license for IP MPLS L3VPN base package
S-XRV-L3-P-SUB-1G	IOS XRv 9000 1G throughput license for IP MPLS L3VPN premium package
S-XRV-LI-SUB-RTU	IOS XRv 9000 Advance software license for Lawful Intercept
S-XRV-HQOS-SUB-1G	IOS XRv 9000 1G Advance software license for HQoS
SVS-XRV-SUPT-BA	XRV Support - Basic

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
• Application Hosting	• Cisco IOS XR Application Hosting Configuration Guide	Release 6.1.2
• BFD over Logical Bundle	• Routing Configuration Guide for Cisco ASR 9000 Series Routers • Routing Command Reference for Cisco ASR 9000 Series Routers	Release 6.1.2
• Bi-directional Policing and Marking	• 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
• BGP Persistence	• Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference	Release 6.2.1

Feature	See the Following Documentation	Introduced in Release
• BGP Optimal Route Reflector	• Cisco IOS XRv 9000 Router Installation and Configuration Guide	Release 6.0.1
• Broadband Network Gateway (BNG) IPoE	• Broadband Network Gateway Configuration Guide for Cisco ASR 9000 Series Routers • IPoE Commands	Release 6.3.1
• Broadband Network Gateway (BNG) PPPoE	• Broadband Network Gateway Configuration Guide for Cisco ASR 9000 Series Routers • PPPoE Commands	Release 6.4.1
Customize Installation using Golden ISO	Customize Installation using Golden ISO	Release 7.3.1
Create User Profiles and Assign Privileges	System Setup and Software Installation Guide for Cisco ASR 9000 Series Routers	Release 7.1.1
• Generic Routing Encapsulation (GRE) over IPv4	• MPLS Layer 3 VPN Configuration Guide for Cisco ASR 9000 Series Routers • Generic Routing Encapsulation Commands	Release 6.3.1
• HSRP • VRRP	• IP Addresses and Services Configuration Guide for Cisco ASR 9000 Series Routers • Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Command Reference	Release 6.2.1
• Hierarchical Policers (including conform aware)	• 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 6.0.1
• IPv4 Routing • IPv6 Routing • OSPF • ISIS	• Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference	Release 5.4.0
• IPSLA • Platform Automated Monitoring	• Implementing IP Service Level Agreements • Cisco ASR 9000 Series Aggregation Services Router System Monitoring Command Reference	Release 6.0.0

Feature	See the Following Documentation	Introduced in Release
• IPv4 and IPv6 ACL	• Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide • Access List Commands	Release 5.4.0
• IPv4 L3VPN • 6PE, 6VPE	• 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
L2VPN VPWS	• L2VPN and Ethernet Services Configuration Guide for Cisco ASR 9000 Series Routers • VPN and Ethernet Services Command Reference for Cisco ASR 9000 Series Routers	Release 6.4.1
• Link Aggregation Group (LAG)	• Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide	Release 6.1.2
• Lawful Intercept	• Implementing Lawful Intercept • Cisco ASR 9000 Series Aggregation Services Router System Security Command Reference	Release 5.4.0
• LDP	• Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference	Release 5.4.0
• LPTS	• Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Configuration Guide • LPTS Commands	Release 5.4.0

Feature	See the Following Documentation	Introduced in Release

Multicast features:
• IPv4/IPv6 L3 Native Multicast: IGMP, MLD, PIM SM/SSM in default VRF
• IPv4 MVPN Rosen GRE with IGMP, PIM SM/SSM in Non-Default VRF
  • Profile 0: Rosen MVPN GRE
  • Profile 3: Rosen MVPN GRE with BGP-AD
  • Profile 11: Rosen MVPN GRE with BGP C-Multicast routing
	• Multicast Configuration Guide for Cisco ASR 9000 Series Routers
	• Multicast Command Reference for Cisco ASR 9000 Series Routers
		Release 6.4.1

• MPLS	• Cisco ASR 9000 Series Aggregation Services Router MPLS Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router MPLS Command Reference	Release 5.4.0
• MP-BGP, EBGP PE-CE	• Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference	Release 5.4.0
• Network Service Header (NSH)	• Implementing NSH Based Service Chaining • Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Command Reference	Release 6.1.2
• NSH Proxy Mode	Cisco IOS XRv 9000 Router Specific Features	Release 6.2.1
• RT Constriant	• Cisco ASR 9000 Series Aggregation Services Router Routing Configuration Guide • Cisco ASR 9000 Series Aggregation Services Router Routing Command Reference	Release 6.2.1
• Segment Routing over IPv6	• Segment Routing Configuration Guide for Cisco ASR 9000 Series Routers • Segment Routing Command Reference for Cisco ASR 9000 Series Routers	Release 6.6.1
• Telemetry	• Telemetry Configuration Guide for Cisco ASR 9000 Series Routers	Release 6.0.0

Feature	See the Following Documentation	Introduced in Release
• The Two-Way Active Measurement Protocol (TWAMP)	• 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
• Virtualised Local Mobility Anchor (vLMA)	• Configuring Proxy Mobile IPv6 Local Mobility Anchor • Proxy Mobile IPv6 Local Mobility Anchor Commands	Release 6.3.1
• VRF Support on Docker and LXC Containers	• Cisco IOS XR Application Hosting Configuration Guide	Release 6.3.1
• SRv6 Traffic Engineering	• Segment Routing Configuration Guide for Cisco ASR 9000 Series Routers	Release 7.3.2
gNMI Bundling of Telemetry Updates	Cisco IOS XRv 9000 Router Installation and Configuration Guide	Release 7.8.1
Auto-Save and Copy Router Configuration Using Public Key Authentication	General Administration on Cisco ASR 9000 Series Routers	Release 7.10.1
Smart Licensing Using Policy	Cisco IOS XR Smart Licensing Using Policy	Release 24.1.1
Multi-Factor Authentication for SSH	System Security Configuration Guide for Cisco ASR 9000 Series Routers	Release 24.1.1

Caveats

There are no caveats in this release.

There are no caveats in this release.

Other Important Information

- For the XRv 9000 platform, minimum transmission period supported for the Link Aggregation Control Protocol (LACP) is 200 milliseconds.

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).



Note The FPD related commands are not supported on IOS XRv 9000 Appliance. That includes **fpd auto-upgrade** command.

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 XRv 9000 router documentation is located at the following URL:

https://www.cisco.com/c/en/us/td/docs/iosxr/ios-xrv-9000-router.html

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