



Cisco IOS XRv Router Overview

This chapter covers these topics:

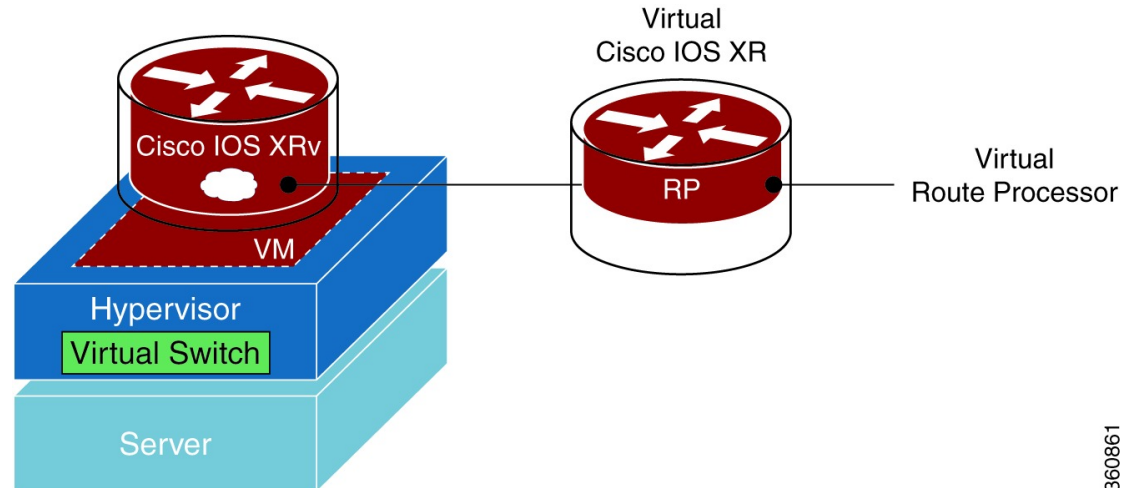
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Cisco IOS XRv Router

The Cisco IOS XRv Router is a Virtual Machine (VM) based platform running 32-bit IOS XR software with the QNX microkernel. This VM contains a single route processor (RP) with control plane functionality, and line card (LC) network interfaces with their associated functionality. It is a representation of the IOS XR software and operating system, including manageability, control plane features, routing and forwarding functionality. The Cisco IOS XRv Router is not an emulation of any physical router or hardware component.

For more information on installing and configuring the Cisco IOS XRv Router, refer to the *Cisco XR Virtual Router Installation and Configuration Guide*.

Figure 1: Cisco IOS XRv Router Virtual Form Factor



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Features and Usages

The Cisco IOS XRv Router provides the features and usages described in this table.

Table 1: Cisco IOS XRv Router features and usages

Features	Description
SMUs and PIEs	Provides full support for SMUs and PIEs.
Cisco IOS XR Software Feature Set	Provides support for the Cisco IOS XR Software feature set, including the manageability, control plane, routing, and forwarding features.
Multiple CPUs	Supports up to eight CPUs on a single VM in demonstration deployment. Supports single CPU on a single VM in production deployment. The number of CPUs are configured in the hypervisor and automatically detected by the Cisco IOS XRv Router.

Features	Description
Network Drivers	<p>Supports E1000 and VirtIO drivers to pass the traffic to support a wide array of hypervisors.</p> <p>Note The Intel E1000 Driver is a suite of Linux kernel drivers for all Intel Ethernet adapters. Intel E1000 Ethernet chips are provided in most modern hypervisors. The Intel E1000 Drive is the only network driver supported for IOS XRv running on ESXi.</p> <p>VirtIO is an abstraction layer over devices in a paravirtualized hypervisor. It provides an efficient abstraction for hypervisors and a common set of I/O virtualization drivers.</p>

Benefits of Virtualization Using the Cisco IOS XRv Router

The Cisco IOS XRv Router provides these virtualization benefits in a cloud environment.

Table 2: Virtualization benefits

Benefits	Description
Hardware independence	The Cisco IOS XRv Router runs on a virtual machine. It can be supported on a x86 hardware that is supported by the virtualization platform.
Resources sharing	The resources used by the Cisco IOS XRv Router are managed by the hypervisor, and can be shared among VMs. The amount of hardware resources that the VM server allocates to a specific VM, can be reallocated to another VM on the server.
Flexibility in deployment	You can easily move a VM from one server to another. Thus, you can move the Cisco IOS XRv Router from a server in one physical location to a server in another physical location without moving any hardware resources.

Software Configuration and Management

You can perform software configuration and manage the Cisco IOS XRv Router using these methods:

- Provision a serial port in the VM and connect to access the Cisco IOS XRv Router CLI commands.
- Use remote Secure Shell (SSH) or Telnet to connect to the management Ethernet interface to access the Cisco IOS XRv Router CLI commands.

Cisco IOS XRv Router System Architecture

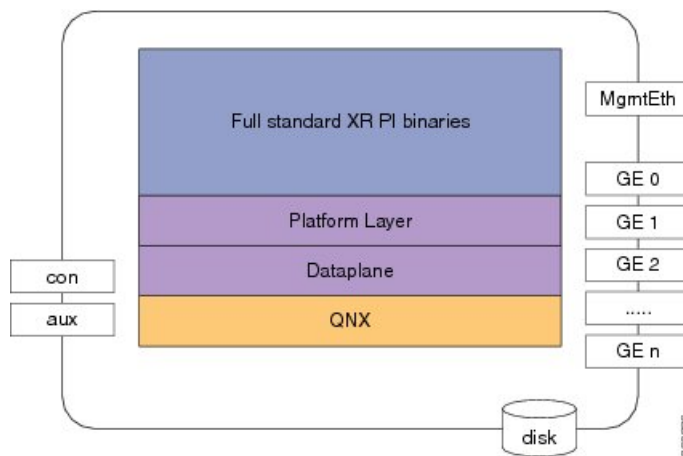
The physical resources of the Cisco IOS XRv Router are provided to the VM by the hypervisor, such that, from the Cisco IOS XRv Router perspective, it appears to the router as if the router is running on a bare metal x86 based machine. These resources are:

- CPU and memory
- Standard PC hardware, such as clock, Interrupt Request Controller (IRQ), and Peripheral Component Interconnect (PCI) bus
- Serial console and auxiliary ports
- Management Ethernet interface
- Network interfaces
- An optional CD-ROM drive that can be mounted by the hypervisor and used to apply bootstrap configuration.



Note The Cisco IOS XRv Router supports disk0 (default, formatted with QNX), harddisk (default, formatted with FAT32), disk1 (optional additional disk, user specified format), boot flash (default, formatted with FAT32) and NVRAM (default, formatted with FAT32).

Figure 2: Cisco IOS XRv Router System Architecture



The Cisco IOS XRv Router platform image (figure above) is made up of these major components:

- Cisco IOS XR PI binaries—The standard platform-independent Cisco IOS XR packages built in the same manner as that for other Cisco IOS XR platforms.
- Platform layer—A virtual platform layer providing the minimal functionality for the PI code to run, including platform services, such as node ID and chassis management, and various capability and utility libraries.

- Data plane—The software data plane providing a software packet path for Cisco IOS XR features, enabling forwarding and host stack to the router.
- QNX—The standard Cisco IOS XR QNX kernel.

Cisco IOS XRv Router Components

This section describes the components of the Cisco IOS XRv Router.

Virtual Machine

A VM is a software implementation of a computing environment in which an operating system or program can be installed and run. The VM typically emulates a physical computing environment, but requests for CPU, memory, hard disk, network, and other hardware resources are managed by a virtualization layer which translates these requests to the underlying physical hardware.

Hypervisor

A hypervisor, also called a virtual machine manager (VMM), is a piece of computer software, firmware, or hardware that creates and runs VMs.

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 the required resources to each operating system and ensures that the operating systems (VMs) do not disrupt each other. A computer on which a hypervisor is running one or more VMs is defined as a host machine. Each VM is called a guest machine. The hypervisor presents the guest operating systems with a virtual operating platform and manages the execution of the guest operating systems.

The Cisco IOS XRv Router is hypervisor agnostic. The demo image, provided without support, is suitable to deploy on a laptop or on a server that meets the requirements outlined below. For production image, VMWare ESXi 5.0 or later is the only supported hypervisor. For simulation mode, the supported hypervisors are VMWare ESXi 5.0 or later or QEMU 1.0. Additional details regarding VMWare ESXi and QEMU are as follows:

- VMWare ESXi 5.0 and later—VMWare ESX and VMWare ESXi are both bare-metal-embedded hypervisors from VMWare's enterprise software for guest virtual servers that run directly on host server hardware without requiring an additional underlying operating system.
- QEMU 1.0—Quick EMUlator (QEMU) is a free and open-source software product that performs hardware virtualization. QEMU is a hosted virtual machine monitor. The QEMU emulates central processing units through dynamic binary translation and provides a set of device models, enabling it to run a variety of unmodified guest operating systems. It also provides an accelerated mode for supporting a mixture of binary translation (for kernel code) and native execution (for user code), same way that VMWare Workstation and VirtualBox do. QEMU can also be used for CPU emulation for user-level processes, allowing applications compiled for one architecture to be run on another.

Kernel-based Virtual Machine (KVM) is virtualization infrastructure for the Linux kernel, which QEMU can use to improve performance. KVM requires a processor with hardware virtualization extension.

Router Interfaces

The Cisco IOS XRv Router interfaces behave the similar way as those on hardware-based Cisco routers. These interfaces function as follows:

- The supported interfaces are Management Ethernet and Gigabit Ethernet interfaces.
- Interface port numbering from 0 and up to a maximum of 128 interfaces (including Management Ethernet interface) are supported. The maximum interfaces count depends on the hypervisor used.
- The first interface 0 is reserved for the Management Ethernet interface and subsequent interfaces become the Cisco IOS XRv Router data interfaces.
- The Cisco IOS XRv Router interfaces map to virtual network interface card (vNIC) interfaces on the VM.

For more information, see the [Mapping the Cisco IOS XRv Router Network Interfaces to vNICs](#)

Server Requirements

The Cisco IOS XRv Router can run on the Cisco Unified Computing System (UCS) server or servers from leading vendors that support VMWare ESXi 5.0, or the combination of Ubuntu Linux 12.04LTS and KVM-QEMU 1.0. The server must support at least:

- Intel Nehalem CPU with clock frequency of 2.0 GHz
- Gigabit Ethernet interfaces

Cisco IOS XRv Router Packaging

The Cisco IOS XRv Router packaging includes these images:

- Demo Locked Image (iosxrv-demo-5.1.1.tar)
- Demo Locked Image with Crypto (iosxrv-k9-demo-5.1.1.tar)
- Production Capable Image (iosxrv-5.1.1.tar)
- Production Capable Image with Crypto (iosxrv-k9-5.1.1.tar)

Table 3: Cisco IOS XRv Router images and modes

Images	Modes
Demo Locked Image and Demo Locked Image with Crypto Support	<p>Demo Locked—A portable, downloadable VM that is hamstrung to limit its usefulness, but enables a number of internal and external use cases including Cisco IOS XR training and familiarization, demonstrations, sales tool, and early field trial (EFT) for control plane features.</p> <ul style="list-style-type: none"> • Available free for users • AAA hardcoded users • Rate limit of 2 Mbps
Production Capable Image and Production Capable Image with Crypto Support	<p>Production—Provides a platform for Cisco IOS XR based virtual appliances, such as a virtualized route reflector (vRR), or as a network positioning system virtual appliance.</p> <ul style="list-style-type: none"> • No hardcoded AAA users • No rate limit
	<p>Simulation—Provides large-scale, high-fidelity control-plane network simulations.</p> <ul style="list-style-type: none"> • No hardcoded AAA users • Rate limit of 50 Mbps
	<p>Demo Unlocked—Provides a platform for Cisco IOS XR based virtual appliances, such as a virtualized route reflector (vRR), or as a network positioning system virtual appliance.</p> <ul style="list-style-type: none"> • No hardcoded AAA users • No rate limit

**Note**

- You must extract the .ova and .vmdk files from .tar image file and deploy the Cisco IOS XRv Router.
- Use .ova file to deploy the Cisco IOS XRv Router on VMware ESXi.
- Use .vmdk file to deploy the Cisco IOS XRv Router on QEMU.
- After deployment the Cisco IOS XRv Router will default to demo mode. To move from demo mode to production or simulation mode, configure this command with the iosxrv-5.1.1.vmdk or iosxrv-5.1.1.ova image:

```
platform mode {simulation | production} accept-eula
```

- To return to demo, configure this command:

```
no platform mode
```

Supported Cisco IOS XRv Router Features

Cisco IOS XR Software running on the Cisco IOS XRv Router provides the following features:

- IP features—Supports a wide range of IPv4 and IPv6 services and routing protocols such as IPv4 unicast services, IPv6 unicast services, IPv4 Multicast services, IPv4 and IPv6 equal-cost multipathing (ECMP), IPv4 and IPv6 load balancing, Cisco Discovery Protocol, IPv4 and IPv6 addressing, and Internet Control Message Protocol (ICMP).
- Layer 3 routing protocols—Supports routing protocols such as Border Gateway Protocol Version 4 (BGPv4), Open Shortest Path First Version 2 (OSPFv2) and Version 3 (OSPFv3), and Intermediate System-to-Intermediate System (IS-IS) Protocol.
- Multiprotocol Label Switching (MPLS) features—Supports MPLS features such as MPLS Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), Diffserv Aware Traffic Engineering (TE), MPLS Traffic Engineering control plane (RFCs 2702 and 2430), MPLS forwarding and MPLS load balancing.
- Network Management—Supports features like Enhanced CLI, XML interface and Simple Network Management Protocol (SNMP) support.
- Software Maintenance Update (SMU)— Supports applying fixes for software defects between releases.