# Cisco IOS XRv Router Overview

This chapter covers these topics:

## Cisco IOS XRv Router

The Cisco IOS XRv Router runs the Cisco IOS XR Software and operating system on generic virtualized hardware based on classic (32-bit QNX) Cisco IOS XR Software. It is provided as a virtual machine (VM) supporting full virtualization, and can be deployed on any x86 hardware (server or laptop) running standard hypervisors. It provides the functionality of a route processor and a line card in a combined route processor line card (RPLC) with both the RP control plane functionality, and the network interfaces and associated LC functionality running on the same virtual card.

The Cisco IOS XRv Router is a representation of the Cisco IOS XR Software and operating system, and does not provide a virtual representation of any physical router. As a result, some physical system components,

such as line cards, fabric cards, and multichassis, that are not appropriate for the VM setup, are not present in the Cisco IOS XRv Router system.

*Figure 1: Cisco IOS XRv Router Virtual Form Factor*
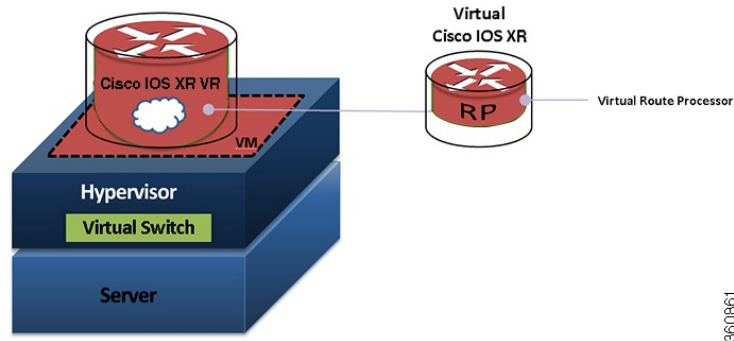


# Features and Usages

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

| Features | Description |
| --- | --- |
| SMUs and PIEs | Provides full support for SMUs and PIEs. |
| Cisco IOS XR Software Feature Set | Provides support for 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. The number of CPUs are configured in the hypervisor and automatically detected by the Cisco IOS XRv Router. |
| Network Drivers | Supports E1000 and VirtIO drivers to pass the traffic to support a wide array of hypervisors. <br><br> **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. <br><br> 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. |

# Benefits of Virtualization Using Cisco IOS XRv Router

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

| Benefits | Description |
|---|---|
| **Hardware independence** | The Cisco IOS XRv Router runs on a virtual machine, therefore, can be supported on any x86 hardware supported by the virtualization platform. |
| **Sharing of resources** | 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 management of 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 SSH/Telnet to connect to the management Ethernet interface to access the Cisco IOS XRv Router CLI commands.

# Cisco IOS XRv Router System Architecture

The Cisco IOS XRv Router is a single VM router that contains the combined functionality of a RPLC card with both the RP control plane functionality, and the network interfaces and associated LC functionality running on the same virtual card.

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

- CPU and memory

- Standard PC hardware such as clock, IRQ controller, and PCI bus

- Serial console and auxiliary ports

- Management Ethernet interface

- Network interfaces

- An optional CD-ROM drive which can be mounted by the hypervisor and used to apply bootstrap configuration.

**Note**    The Cisco IOS XRv Router supports disk0 (default) and disk1 (optional additional disk). No support for additional hard disks.

*Figure 2: Cisco IOS XRv Router System Architecture*
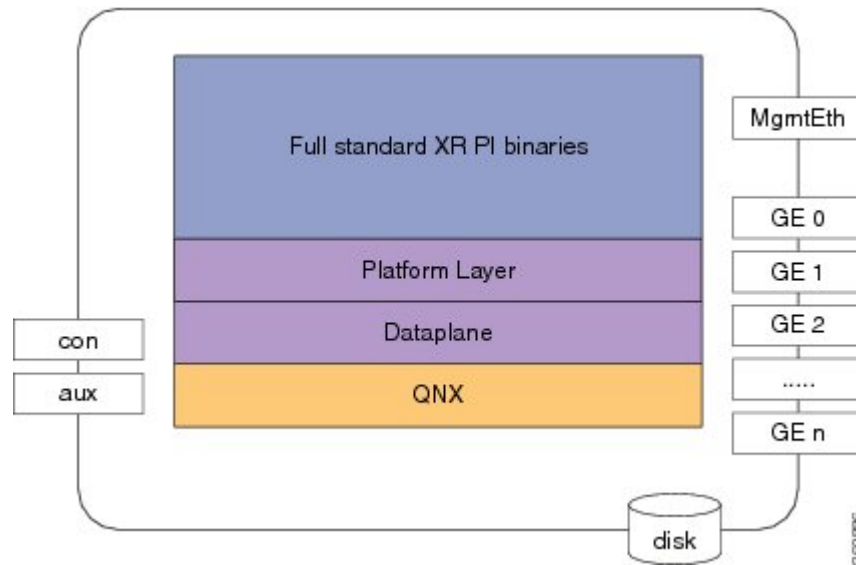


The Cisco IOS XRv Router platform image (see Figure) is made up of the these major components:

- XR PI Binaries: The standard platform independent XR packages, built in the same manner as for other 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 XR features, enabling forwarding and a host-stack to the router.

- QNX: The standard XR QNX kernel.

# Cisco IOS XRv Router Components

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

## Virtual Machine

A virtual machine (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 virtual machines.

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. A computer on which a hypervisor is running one or more virtual machines is defined as a host machine. Each virtual machine 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 supports these hypervisors:

- **VMware ESXi 5.0 and higher**—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. It 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), in the same fashion VMware Workstation and VirtualBox do. QEMU can also be used mainly 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 that QEMU can use to improve performance. KVM requires a processor with hardware virtualization extension.

> **Note**  Ubuntu is the recommended Linux distribution to support KVM/QEMU hypervisors.

# Router Interfaces

The Cisco IOS XRv Router interfaces behave in a similar fashion as those on hardware-based Cisco routers. These router interfaces function as follows:

- The supported interfaces are Management Ethernet and Gigabit Ethernet (GE) 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 vNIC interfaces on the VM.

For more information, see the Mapping the Cisco IOS XRv Router Network Interfaces to Virtual Network Interface Cards (vNICs)

## Server Requirements

The Cisco IOS XRv Router can run on 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 QEMU/KVM 1.0. The server must support at least the following:

- Intel Nehalem CPU with clock frequency 2.0 GHz.

- Gigabit Ethernet interfaces.

# Cisco IOS XRv Router Licensing

The license model for Cisco IOS XRv Router includes these images:

- Demo Image (xrvr-full-demo.vmdk)

- Production Image (xrvr-full-prod.vmdk)

| License Model | Description |
|---------------|-------------|
| **Demo Image** | **Demo Locked**—A portable, downloadable virtual machine that is hamstrung to limit its usefulness, but enables a number of internal and external use cases including IOS XR training and familiarization, demonstrations, sales tool, and early field trial (EFT) for control plane features. <br><br> • Available free for users <br><br> • AAA hardcoded users <br><br> • Rate Limit of 2 Mbps |

| License Model | Description |
|---|---|
| **Production Image** | **Production**—Provides a platform for IOS XR based virtual appliances, such as a virtualized route reflector (vRR),or as a network positioning system virtual appliance. <br><br> • No hardcoded AAA users <br><br> • No Rate Limit |
| | **Simulation**—Provides large-scale, high-fidelity control-plane network simulations. <br><br> • No hardcoded AAA users <br><br> • Rate Limit of 50 Mbps |
| | **Demo Unlocked**—A portable, downloadable virtual machine enables a number of internal and external use cases including IOS XR training and familiarization, demonstrations, sales tool, and early field trial (EFT) for control plane features. <br><br> • No hardcoded AAA users <br><br> • Rate Limit of 2 Mbps <br><br> • Typically not used, kept as a placeholder when Smart licensing is used |

**Note**

• To move from demo unlocked image to simulation or productions image, configure this command with the xrvr-full-prod.vmdk image:

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

• To return to demo unlocked image, configure this command:

```
no platform mode
```

# Supported Cisco IOS XRv Router Features

The Cisco IOS XRv Router supports the general IOS XR features as described at a high level in the table below. This list is not intended to be a fully complete list of IOS XR features, but rather a representative presentation of the types of features that are supported in Cisco IOS XRv Router.

*Table 1: Supported Cisco IOS XRv Router Features*

| Features | Supported from release |
|---|---|
| BGP | 4.3.2 |

| Features | Supported from release |
|----------|------------------------|
| OSPF | 4.3.2 |
| IS-IS | 4.3.2 |
| BVI | 4.3.2 |
| Syslog | 4.3.2 |